Research Paper

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Anthropometric Comparison of Children of Armed Forces Personnel With Civilians

Medical Science

KEYWORDS : Anthropometry, Growth, Overweight

***Dr Rajendra Pal Singh**	HQ 14 RAPID (S), PIN 908414, C/O 56 APO. *Corresponding author
Dr (Col) BS Deswal	Professor, Dept of Community Medicine, SGT Medical College, Budhera, Gurgaon-1225059.
Dr Alok Gupta	92/1, Mall Road, DEHRADUN -248003
Dr Deepali Tripathi	ECHS Regional Centre, Military Hospital Complex Dehradun Cantonment - 248003

ABSTRACT

Background: Anthropometric assessment provides an estimate of prevalence of malnutrition. Growth monitoring through anthropometric measurement is an important indicator of health during childhood and adolescence.

Objective: This study was undertaken at one of the Armed Forces schools with the objective of assessing and comparing the anthropometric status of children from defence (Army/Navy/Air Force) with children of civilian background, and increasing awareness of students, teachers and parents about the importance of balanced food and physical activity. We hypothesized that children of armed forces personnel have better anthropometric indices than children of civilians.

Metodology: All school children studying from first standard to tenth standard, both boys and girls were anthropometrically examined in the month of September to December 2014 . A total of 703 students were examined.

Results: Analysis was performed on 678 students (371 from defence background and 307 from civil background). Approximately 37% of students were females. There was no significant difference observed between mean heights for age of children of defence and civil background. Mean weight of boys of both background increased gradually with age. However, no significant difference was observed between weights of boys as well as girls of both background for any age. .

BMI for age increased consistently for boys of defence background However, overweight and obesity was observed in children of both backgrounds.

Introduction

The health and nutritional status of children is best defined by growth assessment, which not only serves as a means for evaluating the health and nutritional status of children, but also provides an indirect measurement of the quality of life of an entire population[1]. Anthropometry has always secured an important place among procedure for measuring the growth of children[2]

Anthropometric assessment provides an estimate of prevalence of malnutrition. Growth monitoring through anthropometric measurement is an important indicator of health during childhood and adolescence[3].

WHO recommends 3 anthropometric parameters (Weight for age, Height for age, and BMI for age) for measuring the growth of children. Weight for age is not a valid indicator beyond 10 years of age because of puberty spurt.[4] Clinical screening for high adiposity by comparing weight centiles to height centiles has its limitations.[5] Height for age and BMI for age are valid parameters from 5-19 years of age [4]. .BMI is an anthropometric index of height and weight. BMI is an indirect measure of body fatness. However, it parallels changes obtained by direct measures of fat. It is a screening tool for overweight and underweight. It is a better measure than weight for height. It is an inexpensive and easy to perform method of screening for weight categories that may lead to health problems. Although the BMI is calculated the same way for children and adults, the interpretations are different. For children and teens, BMI age- and- sex specific percentile are used for two reasons; first, the amount of body fat changes with age, and second, the amount of body fat differs between girls and boys [5].

This study was undertaken at one of the Armed Forces schools with the objective of assessing and comparing the anthropometric status of children from defence (Army/Navy/Air Force) with children of civilian background, and increasing awareness of students, teachers and parents about the importance of balanced food and physical activity,. We hypothesized that children of armed forces personnel have better anthropometric indices than children of civilians.

Materials and methods

This study was a cross sectional study to assess the well being of school children through anthropometric assessment at one of the Armed Forces schools run by Defence welfare education societies in a metropolitan city.. The school is a co-educational school with classes from I to X. The availability of children from two different background made it easier to compare the results of two different populations in the same school.

All school children studying from first standard to tenth standard, both boys and girls were anthropometrically examined in the month of September to December 2014. A total of 703 students were examined.. Statistically, the sample size required to detect a significant difference between mean height of two groups was 354 (assuming unequal sample size and variance, 95% confidence, 80% power, 2 tailed test).

Height of children was recorded to the nearest 0.1 cm using a standardized stadiometer, the student standing barefoot with his or her heels against the upright bar of the scale while standing erect, their buttock, shoulder and head touching the measurement scale rod in the Frankfurt plane. The arms of the students were hanging by the side of their body. For recording the weight, a digital weighing machine was used. The weighing machine was checked everyday for accuracy with standard weights.. The weight of the students was taken in the summer school uniform during morning hours, standing barefoot at the time of measurement. Weight was recorded in Kg to the nearest 0.1 Kg. Data was analyzed using SPSS software and Anthroplus [4] WHO. Anthroplus does not provide reference values for children more than 10 years of age. Therefore weight for age was measured up to 10 years of age. For minimizing the bias, height and weight of all students was recorded by single medical personnel. The examination was completed in 12 weeks. Weighing machine was calibrated before starting the medical examination every day. Age of the children was recorded in completed years as mentioned in Performa provided by school authority.

Results

The demographic profile of school children is given in table 1. Of the 782 students enrolled in school. analysis was performed on 678 students because of absence of students from school, incomplete, missing data. Out of 678 children, 371 (54.72%) were from defence background with at least one of their parent working in Army/Navy/Air force. A total of 307 children (45.28%) belonged to civil background, with none of their parent working in defence. Approximately 37% of students were female.

Mean height of boys and girls for children of each age is given in table 2 & 3 respectively. There was no significant difference observed between heights of children of defence and civil background. The mean height of boys of both backgrounds was more than mean height of WHO 2007 standard. The overall mean height of army background boys was 1.39 meter (median 1.36, SD .17, skewness and Kurtosis were respectively 0.86 and -.520). . Mean height for boys of civil background was 1.40 (median 1-38, SD 0.155, skewness and kurtosis being 0.502 and 0.011 respectively) which is more than defence boys . Mean height of girls of defence background being 1.38 meter (median 1.39, SD 0.16, skewness 0.008 and kurtosis -0.119), is more than girls of civil background (mean 1.36, median 1.35, SD 0.152, skewness 0.526, and kurtosis -0.559). However, the height of 0.9% of girls and 1% of boys of civil background was observed <-2SD, using WHO Anthroplus 2007 [4] .

Mean weight of boys of both background increased gradually with age. However, no significant difference was observed between weights of boys of both background for any age. Among girls, the mean weight for each age was not necessarily higher than the lower age group. However, there was no significant difference between mean weight of girls of both background. None of the student from defence background was <-2SD. However, 1.7% of boys of civilian background were <-2SD. There was no significant difference in overall mean weight of defence boys Vs civil boys (Table 4), defence girls Vs civil girls, and defence children Vs civil children. The range of weight was wide among defence children.

Mean BMI for age for different age group was compared for children of both background [Table 5,6] BMI for age increased consistently for boys of defence background.. Mean BMI of civil background children aged 11 years was significantly higher than boys of defence background (p value .03). The mean BMI for each age for girls in both defence as well as civil background was higher than mean BMI of WHO 2007 growth reference. Mean BMI was more than 85th percentile in defence girls aged 10 years. However overweight and obesity was observed in children of both backgrounds [table 7]

Discussion

Anthropometry has been widely and successfully applied to the assessment of health, especially in children. The implication of specific uses for the choice of indicator and interpretation of findings are not fully understood, even though the correct selection of anthropometric indicators depends entirely upon the purpose for which they are used. . Anthropometric parameters like weight for height and weight for age has different relevance in different settings. Even BMI has its drawback of not considering age, which is important in children and adolescence as BMI of 20 at the age of 5 and 15 have different relevance. WHO has advocated BMI for age as the best indicator for use in children and adolescence, as it takes age and sex into account.

The present study showed that there was no significant difference between mean height of boys and girls of defence background in comparison to children of civil background. Mean height of boys and girls of both groups is more than the 50th percentile of WHO 2007 growth standards [4] for 5-19 years Study from school from North Bengal has reported a significant difference in height of boys and girls [6] which was different from our study.. A study of nutritional status among school age children at urban slum in UP, India has reported the mean height of boys and girls being lower than CDC 2000 standards in all group [7], which is different from our study. The average height of children aged 3-16 years in Pakistan was 139 cm which is similar to our study [8] Anthropometric study of Indian school children living in Bahrain also reported the height of boys between the 10th and 25th percentile, and girls between 5th and 25th percentile of NCHS standard growth charts.[9]. Mean height of our study children was higher than 50th percentile of school children at a Air Force station in India, affluent children and NCHS [2]. The mean height of boys and girls of our study is similar to children from Maputo [10]. The variation in mean height of children from other studies may be due to the fact that this study has been performed among urban children in a metropolitan city. The parents have generally better socio economic status than other studies..

In the present study, only 1% of boys and 0.9% of girls of civil background were short statured (height <-2SD). Findings of our study are better than a study among school children in rural area of Varanasi where 5.7% of boys and 5.1% of girls had their height <-2SD [3]. In another study among Kendriya Vidalaya children, 7.21% of boys and 6.77% of girls had short stature [2]. The prevalence of stunting was 3% among males and 2.3% among children in Maputo, which is closest to the present study. The study among children of North Bengal has reported 4.76% of severe stunting and 41% of moderate stunting among 12+ year age group [6] . Among s population based study in Lahore, Pakistan the mean height among 5-12 year old children was 128.4 cm, which was lesser than our study [11]. Most of the studies have been used NCHS and CDC 2000 data set as reference.

Weight of all boys increased gradually with age. Except in age group 7 and 10, the mean weight of boys of civil background was more than army background boys. However the difference was not statistically significant between any group. The mean weight of girls was less than the boys till 9 year age, then it became higher than the mean weight of boys, probably due to the pubertal hormonal changes.. The mean weight among girls dropped in 14 year age group. It may be due to increased awareness about the health and conscious efforts to stay slim. The mean weight in a Pakistani study among 5-12 years was 26.9 kg [11] which is lesser than our study. The Mean height in all age group is more than kendriya Vidyalaya children [2]. Mean weight of all groups is more than Pakistani pediatric population [8]. None of the defence background child was underweight (<-2SD). Among civilian children 6.7% of boys of 5 year age group and 2.9% of 9 year age were <-2SD of weight for age. Overall, it was 1.7% in 5-9 year age group among boys of civil background. The results of study are better than results of a secondary school students aged 10-19 years in port Harcourt [12], urban and rural school children of Coimbatore [13], study among children from Maputo [12], school children in Ludhiana city [14], school going children in rural areas of Varanasi [3], children of North Bengal [6] and children of urban slum [7]. The lesser prevalence of underweight for age may be because of increased awareness because of regular health education programs being conducted by army preventive health authorities. An analysis of changes in levels of child malnutrition since 1980 has documented that child malnutrition has fallen progressively [15].

Weight for age is not an adequate indicator for monitoring child growth beyond pre school years just because of it's inability to distinguish between relative height and body mass. Therefore BMI for age has been recommended by WHO [4] and USCDC to assess thinning/wasting in school age children and adolescents [16] .

The mean BMI among boys increased with age. Generally, boys from civil background had more BMI than children of defence

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

background, the difference in mean BMI was significant among boys of 11 year of age. The mean BMI of girls was higher than WHO mean. BMI of girls of 10 years age is more than 85th percentile of WHO mean. However the difference between two groups is not significant. The mean BMI of our study is more than Pakistani school aged children and percentage of overweight and obesity is also more than the same study [11]. The prevalence of overweight and obesity was more than school children of urban and rural schools of Coimbatore [13]. Percentage of overweight was higher than high socio economic group of Maputo [10] which further confirms the increased prevalence of overweight and obesity among children with improvement in socioeconomic status. Childhood obesity is a global epidemic involving both developing and developed countries. The prevalence of overweight in our study was higher than school children of Dera Ismail Khan [17]. The high prevalence of overweight and obesity in present study is probably because of using WHO reference [4]. The over- nutrition estimates of WHO reference are higher as compared to USCDC standards. Prevalence of overweight and obesity in this study is comparable to a Italian study where 23% children were overweight and 11% obese [18]. Among urban children in Delhi also the prevalence of overweight and obesity was 18.6% in boys and 16.5% in girls in April 2006 [19].

Increasing incidence of childhood overweight and obesity is potential emerging public health problem in our country. Declining trend of physical activity and nutrition transition are partly responsible for increase in risk factors for Non Communicable Diseases [20]. Television viewing and television in bed rooms also has been found to be associated with risk of being overweight [21].

Conclusion: In present study Anthropometrically the children of both groups were almost similar, and no statistically significant difference was found in their mean height, weight or BMI. The mean height, weight and BMI of children was better than 50th percentile of WHO 2007 growth standards. However, the cause of worry was alarming increase in overweight and obesity among children of both group. A educational campaign to lifestyle modification has been started in school for students, teachers and parents.

TABLE 1:DEMOGRAPHIC PROFILE OF STUDENTS

	ARMY					CIVIL				
	BOYS		GIRLS		TOTAL	BOYS		GIRLS		TOTAL
	No	%	No	%	No %	No	%	No	%	No %
AGE										
5	37	64.9	20	35.1	57 (100)	15	53.6	13	46.4	28 100
6	22	50	22	50	44 (100)	17	51.5	16	48.5	33 100
7	27	67.5	13	32.5	40 (100)	25	61.0	16	39.0	41 100
8	36	78.3	10	21.7	46 (100)	29	65.9	15	34.1	44 100
9	22	68.8	10	31.2	32 (100)	34	77.3	10	22.3	44 100
10	22	71.9	9	28.1	32 (100)	19	59.4	13	40.6	32 100
11	21	55.3	17	44.7	38 (100)	16	55.2	13	44.8	29 100
12	19	65.5	10	34.5	29 (100)	19	65.5	10	34.5	29 100
13	10	37.0	17	63.0	27 (100)	7	53.8	06	46.2	13 100
14	18	69.2	8	30.8	26 (100)	11	78.6	03	21.4	14 100
TOTAL	235	63.3	136	36.7	371 (100)	192	62.5	115	37.5	307 100

TABLE 2: COMPARISON OF MEAN HEIGHT OF BOYS (IN METER)

	ARMY			CIVIL			p value	95% CI
Age	No	Mean height	SD	No	Mean height	SD		
5	37	1.19	.60	15	1.20	.102	.599	-.07 to .599
6	22	1.23	.07	17	1.25	.052	.224	-.05 to .01
7	27	1.31	.056	25	1.30	.062	.330	-.01 to .04
8	36	1.32	.060	29	1.34	.071	.378	-.05 to .02
9	22	1.40	.073	34	1.38	.063	.348	-.02 to .06
10	23	1.43	.048	19	1.43	.069	.859	-.03 to .06
11	21	1.51	.087	16	1.49	.093	.396	-.03 to .09
12	19	1.57	.082	19	1.58	.095	.871	-.06 to .05
13	10	1.64	.084	7	1.66	.035	.633	-08 t0 .05
14	18	1.71	.058	11	1.71	.069	.844	-.06 to .05

TABLE 3: COMPARISON OF MEAN HEIGHT OF GIRLS (IN METER)

	ARMY			CIVIL			p value	95% CI
Age	No	Mean height	SD	No	Mean height	SD		
5	20	1.17	.070	13	1.20	.043	.086	-.07 to .00
6	22	1.24	.069	16	1.21	.056	.134	-.01 to .07
7	13	1.30	.068	16	1.28	,065	.450	-.03 to .07
8	10	1.31	.074	15	1.33	.083	.553	-.08 to .05
9	10	1.39	.063	10	1.36	.099	.545	-.05 to .10
10	9	1.46	.073	13	1.41	.070	.182	-.02 to .10
11	17	1.50	.059	13	1.49	.088	.812	-.05 to .06
12	10	1.51	.100	10	1.53	.066	.699	-.09 to .06
13	17	1.59	.059	6	1.66	.078	.123	-.14 to .02
14	8	1.59	.066	3	1.64	.080	.408	-.21 to .11

TABLE 4: COMPARISON OF WEIGHT BETWEEN GROUPS

	N	MEAN	SD	MINIMUM	MAX	SKEWNESS	KURTOSIS
ARMY BOYS	235	33.98	12.17	16	76	1.037	.805
CIVIL BOYS	192	35.72	12.51	17	64	.938	.601
ARMY GIRLS	136	36.21	14.04	16	81	.691	.024
CIVIL GIRLS	115	33.86	12.17	19	71	1.006	.457

- **Difference between boys not significant (p value .147). Difference between girls not significant (p value .161. Difference not significant between army & civil children as a whole.**

TABLE 5 : COMPARISON OF MEAN BMI OF BOYS

	ARMY			CIVIL			p value	95% CI
Age	No	Mean BMI	SD	No	Mean BMI	SD		
5	37	15.24	1.79	15	15.88	2.49	.302	-1.87 - .59
6	22	15.64	1.86	17	16.13	2.35	.475	-1.85 - .88
7	27	16.14	2.47	25	15.69	2.09	.487	-.83 - 1.72
8	36	17.07	2.66	29	17.23	3.00	.821	-1.57 - 1.24
9	22	17.83	2.80	34	18.34	3.08	.493	-1.99 - .97

10	23	18.04	2.66	19	17.53	2,81	.546	-1.19 – 2.22
11	21	17.42	2.71	16	20.25	4.82	**.03**	-5.6 - -.39
12	19	18.14	4.07	19	19.27	2.79	.324	-5.09 – 1.73
13	10	18.19	3.09	7	19.88	3.47	.309	-5.24 – 1.87
14	10	19.07	2.92	11	18.51	2.78	.618	-1.70 – 2.81

TABLE 6 : COMPARISON OF MEAN BMI OF GIRLS

	ARMY			CIVIL			p value	95% CI
Age	No	Mean BMI	SD	No	Mean BMI	SD		
5	20	15.29	2.17	13	15.91	1.96	.410	-2.14 - .89
6	22	16.10	2.27	16	15.68	2.54	.590	-1.16 – 2.02
7	13	17.22	2.24	16	17.25	2.94	.976	-2.06 - 2.00
8	10	16.42	1.96	15	17.47	2,43	.269	-2.95 - .86
9	10	16.81	2.50	10	16.55	2.80	.825	-2.22 – 2.76
10	9	19.97	3.62	13	18.81	4.04	.495	-2.33 – 4.67
11	17	19.36	3.04	13	19.56	2.82	.853	-2.42 – 2.02
12	10	20.42	3.01	10	18.58	2.48	.154	-.75 – 4.43
13	17	22.04	4.84	6	20.67	2.96	.517	-.75 – 4.43
14	8	20.68	1.79	3	17.54	3.55	.075	-.39 – 6.6

TABLE 7: BMI FOR AGE (%)

	N	< -3SD	< -2SD	>+1SD	>+2SD	>+3SD
ARMY BOYS	235	1.3	4.3	27.2	8.5	1.7
CIVIL BOYS	192	1	6.3	40.1	13.5	3.6
ARMY GIRLS	136	0.7	2.9	33.1	10.3	0.7
CIVIL GIRLS	115	1.7	3.5	33	8.7	0.9

References

1. De Onis M, Monteiro C, Akré J, Clugston G. The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth. *Bulleti n of the World Health Organization* 1993; 71(6): 703-12.
2. Banerjee A. Height and weight patterns as indicators of growth among school children in an Air Force Station: A cross-sectional study. *Medical Journal Armed Forces India* 2001; 57(1): 8-11.
3. Gupta M, Mohapatra A, Shivalli S, Mishra C. Nutritional estimates of school going children based on anthropometric measurements: study from a rural area of Varanasi. *Indian Journal of Community Health (IJCH)* 2012; 23(2): 58-9.
4. World Health Organisation. Growth reference 5-19 years, Anthroplus. 2007. http://www.who.int/growthref/tools/en/ accessed 01 Feb 2013.
5. Must A, Anderson S. Body mass index in children and adolescents: considerations for population-based applications. *International journal of obesity* 2006; 30(4): 590-4.
6. Manna PK, De D, Bera TK, Chatterjee K, Ghosh D. Anthropometric Assessment of Physical Growth and Nutritional Status among School Children of North Bengal. *Anthropologist* 2011; 13(4): 299-305.
7. Srivastava A, Mahmood SE, Srivastava PM, Shrotriya VP, Kumar B. Nutritional status of school-age children-A scenario of urban slums in India. *Archives of Public Health* 2012; 70(1): 8.
8. Aziz S, Noor-ul-Ain W, Majeed R, et al. Growth centile charts (anthropometric measurement) of Pakistani pediatric population. *Growth* 2012.
9. Musaiger AO, D'Souza R. Anthropometric characteristics of Indian school children living in Bahrain. *International journal of adolescent medicine and health* 2008; 20(3): 293-306.
10. Prista A, Maia JAR, Damasceno A, Beunen G. Anthropometric indicators of nutritional status: implications for fitness, activity, and health in school-age children and adolescents from Maputo, Mozambique. *The American journal of clinical nutrition* 2003; 77(4): 952-9.
11. Mushtaq MU, Gull S, Mushtaq K, et al. Height, weight and BMI percentiles and nutritional status relative to the international growth references among Pakistani school-aged children. *BMC Pediatrics* 2012; 12(1): 31.
12. Adesina AF, Peterside O, Anochie I, Akani NA. Weight status of adolescents in secondary schools in port Harcourt using Body Mass Index (BMI). *Italian Journal of Pediatrics* 2012; 38(1): 31.
13. Rema N, Vasanthamani G. Prevalence of nutritional and lifestyle disorders among school going children in urban and rural areas of Coimbatore in Tamil Nadu, India. *Indian Journal of Science and Technology* 2011; 4(2).
14. Panda P, Benjamin A, Singh S, Zachariah P. Health status of school children in Ludhiana city. *Indian Journal of Community Medicine* 2000; 25(4): 150.
15. Onis M, Frongillo EA, Blössner M. Is malnutrition declining? An analysis of changes in levels of child malnutrition since 1980. *Bulletin of the World Health Organization* 2000; 78(10): 1222-33.
16. Onis Md, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization* 2007; 85: 660-7.
17. Ramzan M, Ali I. Body mass status of school children of Dera Ismail Khan, Pakistan. *J Ayub Med Coll Abbottabad* 2008; 20(4).
18. Bozzola M, Bozzola E, Abela S, Amato S. Childhood obesity: know it to prevent it. *Igiene e sanita pubblica* 2012; 68(3): 473-82.
19. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle associated risk factors in adolescents. *Indian journal of pediatrics* 2006; 73(10): 901-6.
20. Kelishadi R, Ardalan G, Gheiratmand R, et al. Association of physical activity and dietary behaviours in relation to the body mass index in a national sample of Iranian children and adolescents: CASPIAN Study. *Bulletin of the World Health Organization* 2007; 85(1): 19-26.
21. Dennison BA, Erb TA, Jenkins PL. Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics* 2002; 109(6): 1028-35.