Original article

Anthropometric studies on medical students of Nepal and Sri Lanka: height and weight

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Abstract

Nutritional status of a population or an individual could be assessed by clinical, biochemical and anthropometric means. It is widely used in the monitoring of growth and assessment of the nutritional status of children and adults. Even though a large number of anthropometric studies is done in Nepal and Sri Lanka, on various projects related to the nutritional aspects, but only few have been done on anthropometry and due to lack of information on anthropometric data of Nepalese and Sri Lankan medical students, the present study was initiated at Nepal Medical college and Faculty of Medicine, University of Peradeniya, Sri Lanka. The aim of the study was to measure height and weight of medical students of Nepal Medical College and Faculty of Medicine, University of Peradeniya. A total of 1228 (males 681; females 547) medical students participated in the study. The ratio of male to female was 1.24:1. The height was measured, to the nearest 0.1 cm without shoes, using a measuring tape affixed to the wall. The weight was recorded using weighing scale, with minimum clothes and without shoes to the nearest 0.1kg. Two tail unpaired t´test was performed to compare mean values. The percentile values were obtained using Microsoft excel for Windows 98. The age of the students varied from 18-26 years with a mean ± SD of 20.77 ± 1.17 and 20.90 ± 1.10 in males and females respectively. The heights of the male and female medical students were1.65 ±0.08 and 1.61 ±0.08 and the weight was 59.70 ±9.26 and 55.54 ± 9.16 respectively. The percentile values obtained for height and weight were compared with National Centre for Health statistics (NCHS) standards. The 50th percentile value of male's height and weight corresponded to the 20th percentile and below the 20th percentile values respectively of the NCHS standard. The 50th percentile value of female's height and weight corresponded to less than 10th and 15th percentiles respectively. The height and weight of only 9 males and 8 females were above the 50th percentile value of NCHS standards. The study reveals that the Nepalese medical students and Sri Lankan medical students are underweight and shorter compared to western standards.

Keywords: anthropometry, height, weight, Nepal medical college, faculty of medicine, university of Peradeniya, Nepal, Sri Lanka and medical students.

INTRODUCTION

Nutritional status of a population or an individual could be assessed by clinical, biochemical and anthropometric means. Anthropometric techniques are non-invasive, easy to perform by trained personnel and inexpensive. It is widely used in the monitoring of growth, especially of infants, and assessment of the nutritional status of children and adults.

Anthropometric measures such as height and weight depend on genetic and environmental factors. Therefore it is bound to vary with different populations and ethnic groups. Thus it becomes important to establish reference ranges for a given population or ethnic group. It will also enable a comparison to be

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made with NCHS standards to identify problems such as under nutrition and obesity that are responsible for the development of a number of clinical conditions[1,2].

In the Asian continent anthropometric studies have been widely carried out in India[3-7]. The National Nutrition Monitoring Bureau (NNMB) collected data on household and individual food consumption, and individual nutritional status (judged by anthropometric and clinical indicators) during the late 1970s and early 80s in ten major states of India on a sample basis. Literature review on anthropometric studies in Nepalese revealed studies were carried out in Dharan, Nepal where adolescent girls were detected for the prevalence of anemia and other micronutrient deficiencies[8]. Anthropometric study reveals the nutritional status of an individual and problems related to under nutrition[9].

In Nepal the major nutritional problems are under weight, anemia low birth weight, fetal loss and early infant mortality due to malnutrition during pregnancy[10], diarrhea, pneumonia, malaria and measles[2], Xeropthalmia during pregnancy[11] and micronutrient deficiencies. Large scale studies have been carried out in Nepal and neighboring countries to reduce these problems caused due to nutritional deficiencies by dietary supplementations[11,12]. In Nepal Anthropometrics studies were conducted on those subjects, who had nutritional problems but to detect nutritional problems there were only few studies conducted and the study observed the percentage of fat content in the body using skin fold thickness[13]. Most of the study was mainly focused to pre-school and school going children. In view of lack of information on anthropometric data of Nepalese and Sri Lankan, the present study was initiated at the Nepal Medical College, Kathmandu and Faculty of Medicine, University of Peradeniya to prepare a data bank and also to observe the problem of under nutrition in these countries. In the present study medical students were selected to observe the malnutrition amongst them so that they should be aware and would be able to take preventive measures to recover from the problems of malnutrition as they form the cream of society in future. The outcome of the study is presented in this paper. It is hoped to expand the study to other medical colleges, Teaching hospitals and private nursing homes with the aim of establishing a data bank for anthropometric measurements, which could be used in the identification of malnutritional status and problem associated with malnutrition in Nepal and Sri Lanka.

MATERIALS AND METHODS

This cross sectional study was conducted at the Nepal Medical College Teaching Hospital, which is a private medical school, affiliated to Kathmandu University, Nepal and Faculty of Medicine, University of Peradeniya, which is a government medical school in Sri Lanka. The study was done for a period of 5 years from January 1999 till January 2003 on the first year medical students, every year when they got admitted in medical school. A total of 1228 medical students of both these medical colleges participated in the study. A written consent was taken from students and the study design was ethically approved from Nepal Medical College Research Committee and from the Ethical Review Board of the Faculty of Medicine, University of Peradeniya, Kandy, Sri Lanka. The race composition of the subjects from Nepal Medical College were as follows: Arians, 28.03%; Brahmins, 30.32%; Chetris, 13.03%; Christians 0.52%; Kashyaps, 1.08%; Marwaris, 0.26%; Mongolians, 12.35%; Newaris, 10.88%; Rais, 0.26%; Rajputs, 0.44%; Singhalese, 0.24%; Vaishyas, 2.61%.

The race composition of the subjects from Faculty of Medicine, University of Peradeniya were as follows: Singhalese, 77.34%; Hindu (Tamil), 9.32%; Christians 2.36%; Muslims, 10.98%.

The male to female ratio was 1.24:1. The height was measured, to the nearest 0.1 cm, without shoes, using a measuring tape affixed to the wall. The weight was recorded using a weighing scale, (KRUPS, New Delhi) with minimal clothes and without shoes to the nearest 0.1kg.

Two tail unpaired t test was performed to compare the mean values. The percentile values were obtained using Microsoft excel software for windows 98.

RESULTS

The age of the students varied from 18-26 years with a mean SD of 20.77 ± 1.17 and 20.90 ± 1.10 in males and females respectively. The anthropometric values obtained for male and female medical students are shown in table 1. The differences in the mean values of height and weight between the two medical schools, medical students were insignificant. The difference in the mean values for height and weight between males and females in the two medical schools when considered separately were found to be highly significant ($P < 0.001$) (Table 1). Inter-medical school difference between the mean values for height and weight were observed to be significant only amongst the females of both medical schools.

The height and weight according to the age and gender are shown in the table 2. The difference in the mean values between the age groups in a given school and gender was statistically insignificant.

The combined anthropometric values for the male and female students are shown in table 3. School-wise percentile values for the height and the weight are shown in table 4, and the combined percentile values for both schools students are shown in table 5.

When the percentile values (Table 4 and Table 5) were compared with the NCHS standards for height and weight[14], only 4.52% (12/265) males and 8.45% (18/213) females in the Nepal Medical College were observed to be above the 50th percentile value of the NCHS standards for height. Similarly 16.98% (45/265) males and 14.55% (31/213) females were above the 50th percentile value for weight. In Nepal Medical College the number of males and females with both height and weight above the 50th percentile of the NCHS standard were 4 and 5 respectively.

Analysis of the height of the medical students of the Faculty of Medicine, University of Peradeniya showed 10.81% (45/416) males and 9.58% (32/334) females to be above the 50th percentile value of the NCHS standard. With respect to weight 12.25% (51/416) of the males and 10.47 % (35/334) of the females were above the 50th percentile of NCHS standard. Three females and 5 males had both height and weight above the 50th percentile values of the NCHS standard.

The percentage of subjects below 5th percentile of the NCHS standard for height were 34.06% (232/681) and 36.74% (201/547), and for weight 29.66% (202/681) and 27.60% (151/547) in males and females of both medical schools respectively.

Table I: Age and anthropometric values for male and female medical students of Nepal medical college and faculty of medicine, university of Peradeniya, Sri Lanka

	Medical students, NMC		Medica students, Faculty of Medicine, University of Peradeniya (UoP)	
	Males (N = 265) mean ± SD (range)	Females (N = 213) mean ± SD (range)	Males (N = 416) mean ± SD (range)	Females (N = 334) mean ± SD (range)
Age (Years)	20.55 ± 1.17 (18 -25)	20.77 ± 1.13 (19 -24)	20.92 ± 1.15 (18 -26)	20.93 ± 1.18 (19-25)
Height (m)	1.67 ± 0.07 (1.48 -1.82)	1.62 ± 0.08 (1.45-1.69)	1.64 ± 0.08 (1.45 -1.82)	1.65 ± 0.08 (1.45 -1.71)
Weight (kg)	61.88 ± 8.51 (41.5 - 93)	56.32 ± 9.27 (41-65)	58.28 ± 9.43 (41-78)	58.95 ± 9.34 (41-75)
Body Mass Index (kg/m^2)	22.22 ± 3.72 (15.94 -35.00)	21.36 ± 2.42 (15.24 -30.02)	21.46 ± 2.54 (15.24-27.20)	21.57 ± 2.61 (15.24 - 27.20)

The differences in mean values for height and weight between males and females in both medical colleges´students are significant ($P < 0.001$)

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Table II: Anthropometric measurements and body mass index according to age and gender

	Age	N	Height	Weight	BMI
NMC Male Students	18	1	1.64	56.00	18.07
	19	10	1.68 ± 0.06	62.15 ± 0.25	21.92 ± 1.78
	20	77	1.65 ± 0.07	61.26 ± 4.13	22.56 ± 2.79
	21	108	1.67 ± 0.07	63.01 ± 10.41	22.68 ± 4.35
	22	42	1.67 ± 0.07	60.88 ± 6.79	21.75 ± 3.15
	23	15	1.68 ± 0.07	60.78 ± 7.77	21.61 ± 3.32
	24	7	1.72 ± 0.06	60.28 ± 10.16	20.40 ± 3.98
	25	5	1.65 ± 0.03	64.80 ± 4.02	2373 ± 2.20
NMC Female Students	19	16	1.53 ± 0.02	50.45 ± 4.43	21.54 ± 2.45
	20	85	1.54 ± 0.05	48.54 ± 5.35	20.35 ± 2.09
	21	65	1.56 ± 0.06	51.45 ± 5.64	20.96 ± 2.03
	22	35	1.51 ± 0.04	48.85 ± 5.52	21.18 ± 1.89
	23	8	1.52 ± 0.05	51.50 ± 7.23	21.99 ± 1.44
	24	4	1.60 0.11	53.50 ± 3.00	20.89 ± 1.17
UoP Male Students	18	7	1.57 ± 0.05	55.05 ± 6.87	21.03 ± 2.34
	19	31	1.66 ± 0.06	59.60 ± 10.47	21.51 ± 3.13
	20	145	1.65 ± 0.08	58.21 ± 8.89	21.06 ± 2.24
	21	123	1.64 ± 0.08	57.89 ± 10.10	21.41 ± 2.68
	22	73	1.62 ± 0.07	57.83 ± 8.86	21.78 ± 2.65
	23	31	1.63 ± 0.09	59.02 ± 9.99	22.05 ± 2.06
	25	4	1.63 ± 0.10	62.50 ± 5.19	23.31 ± 1.97
	26	2	1.61 ± 0.11	62.57 ± 5.78	23.45 ± 1.84
UoP Female Students	19	7	1.65 ± 0.07	59.07 ± 9.59	21.43 ± 2.91
	20	111	1.66 ± 0.08	59.44 ± 8.59	21.31 ± 2.42
	21	102	1.64 ± 0.08	58.98 ± 10.07	21.70 ± 2.83
	22	82	1.63 0.08	58.26 ± 9.29	21.73 ± 2.64
	23	28	1.64 ± 0.09	58.46 ± 10.37	21.57 ± 2.26
	25	4	1.59 ± 0.07	60.12 ± 8.83	23.44 ± 1.79

The differences in the mean values between the age groups in a given college and gender are not statisticaly significant

Table III: Combined anthropometric values for male and female students of both medical colleges

	Both Medical Colleges	
	Males (N = 681)	Females (N = 547)
Age (Years)	20.77 ± 1.17 (18-26)	20.90 ± 1.10 (19-25)
Height (cm)	1.65 ± 0.08 (1.45-1.85)	1.61 ± 0.08 (1.45-1.71)
Weight (kg)	59.70 ± 9.26 (41.00-93.00)	55.54 ± 9.16 (41.00-78.00)
Body Mass Index (kg/m^2)	21.76 ± 3.08 (15.84-35.00)	21.29 ± 2.76 (15.24-27.20)

The differences in the combined mean values for height and weight between males and females are significant ($P < 0.001$)

Table IV: School-wise percentile values for height and weight of students

	Medical Students, NMC				Medical students, Faculty of Medicine, University of Peradeniya (UoP)			
	Males (N=265)		Females (N=213)		Males (N=416)		Females (N=334)	
	Height	Weight	Height	Weight	Height	Weight	Height	Weight
5th	1.56	50.00	1.46	42.00	1.48	44.87	1.49	45.00
10th	1.58	52.00	1.48	43.00	1.52	46.00	1.54	46.00
30th	1.63	57.10	1.52	47.00	1.6	52.00	1.60	52.00
50th	1.68	61.50	1.54	49.50	1.65	58.50	1.66	60.00
70th	1.71	65.40	1.58	52.50	1.69	63.00	1.70	64.05
90th	1.76	71.00	1.64	59.00	1.75	72.00	1.74	72.00
95th	1.79	76.00	1.65	60.50	1.79	75.00	1.79	75.00

Table V: Combined percentile values for height and weight of students of both medical colleges

	Nepal Medical College and Faculty of Medicine-Peradeniya Combined			
	Males (N=681)		Females (N=547)	
	Height	Weight	Height	Weight
5th	1.49	45.00	1.48	42.50
10th	1.55	47.00	1.49	45.20
30th	1.61	55.75	1.55	49.03
50th	1.67	60.00	1.60	54.10
70th	1.70	65.25	1.66	61.21
90th	1.75	72.00	1.73	69.06
95th	1.79	75.00	1.75	73.05

DISCUSSION

The present study revealed that the differences in the mean values for height and weight between the medical students of two medical schools were not significant. Therefore the anthropometric values of both schools medical students were combined to obtain composite values. The school-wise 50th percentile values for height and weight for both genders when combined remained more or less the same seen in table 4. When combined, height for males (n=681) varied from 1.45 m to 1.85 m with a mean SD of 1.65 ± 0.08 m, and the height for females (n=547) varied from 1.45 m to 1.71 m with a mean SD of 1.61 ± 0.08 m. The combined height for the males was significantly ($P<0.001$) higher than the females. The mean height and weight observed in the study closely resembled the values reported for colored 15 and black[16] populations of the Cape Peninsula in South Africa. The combined value for weight in males varied from 41.0 kg to 93.0 kg with a mean SD of 59.70 ± 9.26 kg, whereas in females it varied from 41 kg to 78 kg with a mean SD of 55.54 ± 9.16 kg. The males were significantly ($P<0.001$) heavier than the females. This observation was similar to the study conducted among 50% of the population of village in Khargual of the Chitwan district, Nepal where the study was conducted on 55 males and 54 females of ages ranging from 10-68 years (mean SD 28.8 ± 12.7 years), where they observed the mean values of height and weight for males were significantly higher than females ($P<0.01$) where the mean SD of height was 162.0 ± 10.0 cm and weight was 49.3 ± 6.4 kg in males and 151.0 ± 6.0 cm of height and 41.1 ± 5.6 kg of weight in females[17]. The mean value of the present study was lower than the mean values obtained in a study in 1990 for colored population of Cape Peninsula where it was observed that the males and females had similar weight of 65.9 kg and 65.8 kg respectively 16. Study conducted in the government girls school of Dharan Municipality in 2002, where 225 girls between age group of 11 to 18 years participated in the study, the mean SD of height and weight was 150.1 ± 6.7 cm

(range 127cm-168 cm) and 42.8±6.2 kg (range 27-59 kg) showed that the females were shorter and lighter than the females of the present study which could be due to variation in the age group of the study subjects[8].

The combined percentile values for height and weight revealed that the 50th percentile value of the male's height corresponded to 20th percentile value of NCHS standard. Similarly the 50th percentile of the male's weight was found to be below the 20th percentile values of NCHS standard. For females the combined 50th percentile value for height was less than 10th percentile value of NCHS standard and the 50th percentile value for weight was less than 15th percentile value of NCHS standard. The height and weight of the Nepalese medical students was found to be higher than an unrelated group Sugalis, a tribal population of Andhra Pradesh whose median heights and weights were below the 5th percentile of NCHS standard[18]. Anthropometric values obtained for Bahraini adults indicated that they were shorter but heavier[19].

CONCLUSION

The present study observed that medical students of the Nepal Medical College and Faculty of Medical, University of Peradeniya were underweight and shorter. The mean weight of males and females compared with NCHS standard were less than 20th percentile and 15th percentile values and the mean height of males and females were less than 20th and 10th percentiles respectively. Nevertheless the height and weight of males were found to be significantly higher than the females.

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