Trends in height, weight and BMI in young Haryanvi females: an anthropometric analysis

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ABSTRACT

The present study has been done to find out the trends of height, weight and BMI of young Haryanvi females of Sirsa, Fathehabad, Hisar, Rohtak, Bhiwani, Sonipat, Karnal, Ambala and Jind Districts. The prime objective of the present study was to estimate the body mass index (BMI) among females of 5.00-20.99 year of age. Subjects are subdivided into eight age groups i.e. ranging from 5.00-20.99 years. Height and weight of the female subjects is measured using standard anthropometric techniques. BMI is computed for each individual. It has been found that the distribution of height and weight around the mean is increasing over the ages in all the age groups. Highest mean value for weight and BMI i.e. 50.39 ± 8.92 and 20.75 ± 3.95 is observed in the subjects of age group 19.00-20.99 whereas highest mean value for Height is observed in the age group 15.00- 16.99 i.e. 157.62 ± 5.00. Least mean values for height and weight and BMI (114.13 ± 3.155, 15.932 ± 1.79 & 12.295 ± 0.965 respectively) falls under same age group i.e. 5.00-6.99. Subjects are categorized under Normal, underweight and overweight according to International Classification of underweight, overweight and obesity according to body mass index (BMI) given by WHO. Z-scores (BMI in kg/m^2) are calculated. All the subjects from the age group 5.00-6.99 categories underweight, among them 40% of the subjects are severe thin and 28% are categorized as thin whereas overweight subjects are present in 9.00-10.99, 11.00-12.99 and 19.00-20.99 age groups i.e. 30%, 14% overweight and 34% in pre-obese category respectively.

Key words: BMI, Underweight, Overweight, Haryanvi females, Anthropometry.

INTRODUCTION

Anthropometry is the single most portable, universally applicable, inexpensive, and non-invasive method available to assess the size, proportions, and composition of the human body (WHO 1995). Anthropometric data have been extensively used in public health e.g. identification of significant growth retardation in children (Hop et al. 1997) and adolescents (Pawloski 2002). Measurements of HT and WT are important factors relating to growth and development, puberty, and nutritional status of children and adolescents (Bener and Kamal 2005).Over 1/5th of population in India comprises of children aged 5-14 years. The young age period is nutritionally significant because this is the prime time to build up body stores of nutrients in the preparation for rapid growth of adolescence (Awasthi, 2000). According to National Family Health Survey (2005-2006), in India the prevalence of wasted, stunted and underweight children was 19.8%, 48% and 42.5% respectively and in Haryana the prevalence of wasted, stunted and underweight children was 19.1 %, 45.7 % and 39.5 % respectively (NFHS-3, 2007).

Variation of height and weight is different among the males and females in India. It is mainly due to difference in nutritional status. A significant difference is observed in heights and weights of young females of Haryana across all age groups. Adolescents are not exceptional from this. During this teen period boys and girls gain their height and weight rapidly. A number of factors may be responsible for this difference.

Both height and weight is the reflection of an individual's nutritional status. The only difference between this two is that short height reflects chronic malnutrition (is considered as a long term condition), whereas underweight (measure through BMI) is considered as temporary malnutrition and can be regained through dietary intake. Therefore, height is thought to be a retrospective measure of an individual's health and biological standard of living and almost determined before the person reaches the age of twenty (Komlos and Baton 1998). Thus, height is the combination of genetic and environmental factors. Heights, between populations may differ due to genetic factor but within population differences are mainly due to several socio-economic, nutritional and health oriented factors. On the other hand, weight, is the reflection of short-term measure of nutritional status. Changes in a short time may occur due to inadequate or excess amount of food intake. In Indian situation, in view of endogamy, the variation of height is perhaps more influenced by population structure and less by climate and geography. This is because nearly eighty percent of stature (Bharati et al. 2010) is genetically regulated and non-

genetic factors such as climate, nutrition and socioeconomic factors together account for remaining twenty percent. In India very little work has been done relating to height and weight data on the age group of 15-19 years. It cannot be overlooked that rural children exhibit a wide spectrum of under nutrition in the pre- school and pre-pubertal period. Thus children entering adolescence with differing nutritional status are likely to differ greatly in their adolescent growth performance, resulting in the large difference between individual variations.

It is apparent that the body dimension of children increases as they grow, and as per their increasing body size, the need of energy also increases. It is apparent that the underweight, stunted and undernourished subjects have significant low BMI as compared to normal, overweight. Indian girls are excelling over boys on every aspect like school education, sports; but there is little information about their growth and nutritional status. This study has attempted to find out the trends in height, weight and BMI in young Haryanvi females

MATERIALS AND METHODS:

STUDY AREA AND SUBJECTS: The prime objective of the present study is to compare the height, weight and body mass index (BMI) among young Haryanvi females ranging in age from 5.00 to 20.99 years. The subjects are recruited from various urban and rural areas of Haryana including Sirsa, Fathehabad, Hisar, Rohtak, Bhiwani, Sonipat, Karnal, Ambala and Jind Districts. A total of 400 subjects examined on the simple random basis. Subjects further divided into eight distinct groups according to age. Ethical approval was taken from the university ethical committee before the commencement of study. Prior informed consent is taken from all the subjects (if adult) otherwise from their parents before their participation in the study. Date of birth of each subject is confirmed and noted from detailed mark sheets of previous classes or from birth certificates, identity proof whatever available for calculating the decimal age.

For the present investigation, data on anthropometric measurement (height and weight) is collected on each subject following the methodology given by **Lohman et al. (1998).** Height and weight of the female subjects is measured using standard anthropometric techniques. The subjects are selected at random and due care was taken to include only those subject who were physically fit and did not suffer from any apparent illness, which may have affected their normal process of growth and development. Portable weighing machine and anthropometric rod are used to measure height and weight of the girls. Body mass index (BMI) computed for each individual.

Body Mass Index is calculated as weight (in kg) divided by height (in m squared). Subjects are categorized under Normal, underweight and overweight according to International Classification of underweight, overweight and obesity according to body mass index (BMI) given by WHO.

RESULTS

Table 1 describes the trends in mean and SD of weight, height and BMI for all the age groups of present study. It has been found that the mean height and mean weight is increasing over the ages in all the groups. The mean height in the age group 5.00-6.99 is lowest i.e. 114.13 followed by 7.00-8.99 age group with the mean height value 125.09. It is found that highest mean values for height i.e. 157.62 and 156.20 lies under the age groups 15.00-16.99 & 17.00-18.99 respectively.

Table 1: Mean and Standard Deviation (SD) of Height, Weight and Body Mass Index.

Age Group (In Years)	N	Height (cm)		Weight (Kg)		Body Mass Index	
		Mean	SD	Mean	SD	Mean	SD
5.00-6.99	**50**	114.13	3.155	15.932	1.79	12.295	0.965
7.00-8.99	**50**	125.092	2.455	24.54	2.13	15.66	0.985
9.00-10.99	**50**	131.82	2.07	31.76	3.96	18.270	2.189
11.00-12.99	**50**	142.10	3.36	36.5	2.251	18.101	1.402
13.00-14.99	**50**	152.118	0.84	42.34	1.022	18.297	0.411
15.00-16.99	**50**	157.62	5.00	43.24	3.83	17.42	1.53
17.00-18.99	**50**	156.20	3.48	44.87	4.086	18.40	1.76
19.00-20.99	**50**	156.08	4.48	50.39	8.92	20.75	3.95

It is found that the mean weight is also increases with advancing age. Highest mean values for weight is 50.39 under 19.00-20.99 followed by 17.00-18.99 age group with the 44.87 mean weight value. Least mean values for weight is 15.93 & 24.54 under 5.00-6.99 and 7.00-8.99 age groups respectively. Highest mean value for BMI i.e. 20.75 & 18.40 is observed in the subjects of age groups 19.00-20.99 & 17.00-18.99 respectively.

Table 2 describes that all the subjects from the age group 5.00-6.99 are underweight, among them 40% subjects of the 5.00-6.99 group are severe thin and 28% are thin, whereas in 7.00-8.99 age group 50% of the subjects are underweight and 50% are normal. No normal subject is found

in. 5.00-6.99 age group whereas maximum of normal subjects lies under 7.00-8.99 age group i.e. 50%. Overweight subjects are present among two age groups i.e. 9.00-10.99, 11.00-12.99. No subject is found in obese category of any age group.

Table 3 explains the subjects of 19.00-20.99 age group that are classified according to the WHO classification for adult subjects. Among these subjects 2% were severe thin 14% moderate thin 38% mild thin and 34% subjects falls in pre obese category.

Table 2: International Classification of underweight, overweight and obesity according to body mass index (BMI) of subjects age ranging from 5.00-18.99.

WHO Classification	Z-SCORES SD	5.00-6.99 N (50)	7.00-8.99 N (50)	9.00-10.99 N (50)	11.00-12.99 N (50)	13.00-14.99 N (50)	15.00-16.99 N (50)	17.00-18.99 N (50)
Underweight		32%	48%	32%	48%	90%	72%	84%
Thinness	<-2SD	28%	2%	-------	-------	-------	20%	2%
Severe thinness	<-3SD	40%	-------	-------	-------	-------	-------	-------
NORMAL		-------	50%	38%	38%	10%	8%	14%
Over weight	>+1SD	-------	-------	30%	14%	-------	-------	-------
Obese	>+2SD	-------	-------	-------	-------	-------	-------	-------

DISCUSSION

Gross body measurements such that height and weight gives an important indication about the health status of the children and are good indicators of a nation's progress in socio-economic terms **(Tanner, 1994**). It is apparent that the present studied subjects have low mean height and weight. It is found that the mean height increases with advancing age, mean height difference widens among the first five groups i.e. age ranging from 5.00-6.99 to 13.00-14.99 but thereafter the difference in the height is very less or reported almost similar values for mean height i.e. 157.62, 156.20 and 156.08 with the SD ± 5.00 , ± 3.48 and ± 4.48 (**Table 1).**

Table 3: International Classification of underweight, overweight and obesity according to body mass index (BMI) of the subjects age ranging from 19.00-20.99.

Classification	BMI	19.00-20.99
		N (50)
Underweight	<18.50	-
Severe thinness	<16.00	2%
Moderate thinness	16.00-16.99	14%
Mild thinness	17.00-18.49	38%
NORMAL	**18.50-24.99**	12%
Over weight	≥25.00	-
Pre-obese	25.00-29.99	34%
Obese	≥30.00	-
Obese class I	30.00-34.99	-
Obese class II	35.00-39.99	-
Obese class III	≥40.00	-

Although, BMI vary from individual to individual, even in the same age and sex, based on their physical activity level, occupation and body dimensions. Still the information of average BMI for a particular group has practical implications.

Several studies have been done in different parts of India on health and nutritional status. A study from West Bengal among Lodha children found the prevalence of underweight, stunting and wasting to be 50.0%, 38.0% and 24.0 %, respectively (Bisai et al 2008). An earlier study among Kodaku tribal pre-school children of Central India also found high prevalence of under nutrition by Dolla et al. (2005). Chowdhury et al. (2008) were reported that the incidences of stunting and underweight among Santhal children of Purulia district of West Bengal were 17.62% and 33.70% respectively. Similarly, Joseph et al. (2002) have reported 9.40% stunting and 31.20% underweight among children of Karnataka. Further the prevalence of stunting was reported 50% among the Kamar tribe of Chhattisgarh (Mitra et al. 2007), 54% among Oraon of North Bengal and tribal children of Bihar (Mittal and Srivastava 2006, Rao and Vijay 2006) and 45.80% among the children of West Bengal (Som et al. 2006).

Similarly supporting the above facts, in the present study maximum number of the subjects is found to be in the underweight category followed by normal and overweight/obese (**Table 2 & 3**). Malnutrition rates are more than the normal and overweight or obese. Possible cause for the malnutrition in the young girls could be media exposure. The photographs of models and actresses displayed in these magazines might create a positive impact on adolescent girls over their weight concern and subsequent feeling of dissatisfaction. Girls feel greatly attracted to the articles and figures displayed in fashion magazines and initiate exercise and dieting to reduce body weight resulting in malnutrition. Another factor that influences the nutritional status of girls is wide discrimination on the basis of caste and sex. There is strong son preference. There is discrimination in nurturing and education of boys and girls. Since very beginning the discrimination started. As they grow, extent of discrimination further widens. Female feticide and infanticide was widely prevalent in different Indian societies, which has resulted in the declining population of women folk around the globe (Gautam et al. 2015).

Conclusion

Improper dietary habits and unawareness of balanced diet in young growing females leads to the malnutrition and various related metabolic syndromes that shows its impact later in life. In present study, percentage of underweight subjects is greater than the percentages of normal and obese subjects. This suggests that there is need for nutrition and health awareness among the

Haryanvi parents and their children. Further mother's literacy can play important role to reduce under nutrition.

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