Obesity Assessment Based on BMI in the Young Adults of Haryana- A State of India

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Abstract

Over the past 20 years a dramatic transition has altered the diet and health of hundreds of millions of people across the third world. In India, like most developing nations, obesity has emerged as a more serious health threat than hunger. The change of lifestyle and dietary habits is leading to the global paradox of obesity and malnutrition. The present study was planned with the objective to assess the nutritional status of the youth (18-21 yrs.) of Haryana state (India) using BMI, body fat per cent and waist to hip ratio as indicating parameters. A questionnaire was developed and pretested on 100 respondents. Appropriate changes were made in consultation with Statistician and subject experts. Seven districts namely Karnal, Panchkula, Ambala, Sirsa, Hisar, Sonipat and Rohtak from the Haryana state of India were (n=1482) studied. Students from private and government colleges who volunteered for the study were chosen as subjects. Of the total, 612 students mentioned family income below Rs. 30,000/- per month, 742 students had family income between 30,000 – 1,00,000/- month and 128 students had monthly family income above Rs.1,00,000/-. Majority (61.74 per cent) of students were categorized as normal/healthy weight based on their BMI, 23.01 per cent were under weight, 12.35 per cent were overweight while only 43 students (2.90 per cent) were categorized as obese. When considered gender wise, 18.95 per cent of male and 26.17 per cent of female students were underweight, while 16.64 and 14.16 per cent respectively were found to be overweight/obese. Body fat per cent correlated well with BMI categories but waist to hip ratio was contained within normal limits in all categories..

Keywords: Obesity, BMI, Young Adults, dramatic transition

Introduction

Obesity, a condition characterized by excess body fat, carries substantial health implications for both chronic disease and mortality. This fact and its increasing prevalence make obesity an important health problem. Obesity is usually defined in terms of the body mass index which is a measure of weight adjusted for height. Although numerous techniques are available for evaluating body fat, the variables for BMI are easy to measure. BMI has been shown to correlate closely with body fat content in adults and children[1]. Waist circumference and the waist-to-hip ratio are common adjuvant measures used to classify the distribution of body fat in people who are overweight, as obesity-related complications are most closely correlated with abdominal fat distribution[2-4].

Acc to WHO Obesity has reached epidemic proportions globally, with more than 1 billion adults overweight - at least 300 million of them clinically obese - and is a major contributor to the global burden of chronic disease and disability. Often coexisting in developing countries with under-nutrition, obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups. As under nutrition decreases, over nutrition increases by about the same amount. India is one of the dual burdened countries.

Haryana is amongst the richest states in northern India[5] and one of the preferred investment destinations in the country. In terms of the annual income of households — an important indicator of economic prosperity — Haryana ranks third amongst Indian states in terms of per capita income. Haryana's economy has touched growth rate of 9.6 per cent in the gross state domestic product during 2010-11.Also, advance estimates for the current financial year show the state's per capita income to be US$ 2,029.60 at current prices. Haryana's GDP touched US$ 22.37 billion between 1999–00 and 2005–06 — an impressive 12.73 per cent rise. Its per capita income in 2006 was US$ 862.90 — against the all-India average of US$ 573.10.

There is a dearth of regional data when it comes to the nutritional status of young adults in the age group 18-21. Considering the high pace of development in Haryana and the fact that this is the age group that would form the main work force in near future, a surveillance of their status is important. Present study provides the much lacking data of youth presently studying in colleges of Haryana.

Materials and Method

Keeping in view the objectives of study, questionnaire was developed and pretested. Appropriate changes were made in consultation with Statistician and subject experts. A total of 1500 subjects were studied from seven districts of Haryana (namely

Karnal, Panchkula, Ambala, Sirsa, Hisar, Sonipat and Rohtak) during 2010-2012. Students from private and government colleges who volunteered for the study were chosen as subjects. College students in the age group 18-21 were assessed for their body weight, BMI and body fat per cent using Digital weighing scale (Omron HN 283), BMI and body fat monitor (Omron HBF 306, based on hand to hand BIA method) respectively. Height was measured in cm using the standard height measuring rod. Consent from the Principal of the concerned colleges was taken. Colleges were visited with prior intimation. The students were briefed about the study through organized lectures. Only the students who themselves volunteered were included in the study. The physically challenged (differently abled) students were excluded. Subjects who did not provide complete information were also excluded from the study and thus the final data was available for 1482 subjects. The collected data were analyzed separately for boys and girls and tests of significance were

applied wherever applicable. The software SPSS 7.5 was used for statistical analysis.

Results and Discussion

Table 1 presents the background characteristics of the subjects. The subject population comprised of 56.25 per cent females and 43.79 per cent males. Seventy six per cent of the respondents (n=1482) belonged to nuclear families. Majority of subjects (50.1) belonged to middle income groups (Rs. 30,000/- to 100,000/- per month) while only 8.6 per cent belonged to higher income group (monthly income >100,000/-). Majority of subjects had parents educated up to at least high school while 46 (3.10 per cent) students had both parents professionally qualified (above graduate). When asked whether the subjects were satisfied with their present physical appearance regarding body weight, 55 per cent were satisfied while 48 per cent said they wanted to add/ lose weight.

Table-1
Background characteristics of the study population (n= 1482)

Characteristics	Frequency	Per cent
Sex		
Male	649	43.79
Female	833	56.21
Family type		
Joint	354	23.9
Nuclear	1128	76.1
Income		
Low income group (<Rs.10,000/- pm)	612	41.3
Middle income group(Rs.10,000-60,000/- pm)	742	50.1
High income group (> 60,000/-pm)	128	8.6
Father education		
Uneducated	154	10.39
Upto High School	715	48.25
High School to Graduate	466	31.58
Professionally qualified	147	9.92
Mother education		
Uneducated	444	29.96
Below graduate	608	41.03
Graduate	351	23.68
Professionally qualified	79	5.33
Body Image		
Satisfied	790	53.31
unsatisfied	692	46.69

Table-2
Mean anthropometric measurements of subjects

	BMI kg/m^2	Body fat%	Waist/Hip	Body Weight (Kg)	Height (cm)
Male	21.24±4.06	18.97[*]±6.08	0.82[*]±0.08	59.33[*]±11.04	167.09[*]±7.47
Female	20.72± 4.09	24.85[*]±7.07	0.75[*]±0.09	49.74[*]±9.98	156.50[*]±6.17
Total N=1482	20.94 ± 4.09	22.34±7.27	0.77±0.09	53.94±11.49	161.13±8.56

Values are mean ± standard deviation, [*] Difference is significant (p<0.001)

Table-3
Health status of subjects based on BMI (n=1482)

Obesity category	Male	Female	Total
Underweight BMI≤18.5	123 (18.95)	218 (26.17)	341 (23.01)
Normal BMI 18.5 - 24.9	418 (64.41)	497 (59.66)	915 (61.74)
Overweight BMI 25-29.9	89 (13.71)	94 (11.28)	183 (12.35)
Obese ≥30	19 (2.93)	24 (2.88)	43 (2.90)

Classification of obesity is based upon WHO, 1998, Figures in parenthesis indicate per cent subjects

Table 4
Mean BMI, Waist to hip ratio and body fat per cent of subjects in different obesity categories

Obesity categories	Male (n=649)			Female (n=833)		
	BMI	waist/Hip	Fat %	BMI	waist/Hip	Fat %
Under weight	16.96±1.04	0.78±0.08	14.06±4.19	16.50±0.99	0.76±0.11	16.80±4.08
Normal weight	20.75±1.85	0.79±0.09	19.87±4.90	20.71±1.83	0.76±0.07	25.39±5.41
Overweight	26.95±1.47	0.80±0.06	29.87±4.50	26.86±1.38	0.78±0.07	33.91±4.98
Obese	33.60±2.93	0.80±0.06	35.23±3.43	34.90±4.54	0.80±0.07	37.96±4.06

Mean BMI was 20.72 kg/m^2 for females and 21.24 kg/m^2 for males (table 2). The body fat per cent ranged from 18.97 in males to 24.85 in females. Mean waist /hip ratio was 0.75 in females and 0.82 in males. Mean height of male subjects was 167.09 cm while that for female subjects was 156.50 cm. The body weight ranged from 49.74 kg in females to 59.33 kg in males. Independent sample t-test depicted significant difference (p< 0.001) in fat per cent, waist /Hip ratio, body weights and height between the two sexes.

When assessed for obesity categories based on BMI, 23.01 per cent of the subjects were underweight, 12.35 per cent were overweight and only 2.90 per cent were categorised as obese. Per cent of underweight females was 26.17 as against 18.95 per cent of males. At the same time, 13.71 per cent of male students and 11.28 per cent of female students were assessed as overweight. About three per cent of both were categorised as obese. Figure 1 presents the gender wise prevalence of underweight against combined overweight-obese category.

Waist to hip ratio for males should be less than 1.00 and those of females should be less than 0.8 [6]. Acceptable range for body fat per cent is 25-31% for female and 18-25% for males. In male subjects waist to hip ratio varied from 0.78 in underweight categories to 0.80 in obese categories. In female subjects the ratio varied from 0.76 in underweight categories to 0.80 in obese categories. Female subjects had higher fat per cent as compared to their male counterparts in all weight categories. The waist to hip ratio for all subjects was contained within acceptable limits. Body fat per cent was beyond acceptable limits in underweight as well as overweight / obese subjects. Obese male and female had fat per cent as high as 35.23 and 37.96 per cent respectively.

Results and Discussion

Obesity is globally on a rise. Data from the National Centre for Health Statistics show that, in 40 years, obesity prevalence increased from 13% to 27% of the U.S. adult population[7,8]. Obesity prevalence is higher in women; overweight is more common in men[8]. Kim and Kim in 2005[9] investigated the Body Mass Index among 266 Korean girls (M age= 16.6 yr., SD= .9). Based on Body Mass Index, 73.7% were normal weight, 22.9% were underweight, and 3.4% were overweight.

In India, the issue of overweight/obesity was not even addressed during National Family Health Survey-1 in 1992-1993. In 1998-99, NFHS-2 depicted 16.6 per cent women in Haryana as underweight and 25.9 per cent as overweight/ obese. As per NFHS-3 in 2005-2006, Haryana had 27.8 per cent of its women and 26.8 per cent male below normal weight[10]. At the same time the survey indicated prevalence of overweight/obesity in 21 per cent of females and 14.4 per cent males. The survey included female subjects in the age 15-49 and male subjects in the age 15-54. Subramanian *et al*[11] used the NFHS data and calculated a ratio of the number of underweight women to overweight women in India. They concluded that although the ratio of underweight to overweight women decreased from 3.3 in 1998–1999 to 2.2 in 2005–2006, there were still considerably more underweight women than overweight women.

Chatwal *et al*[12] determined the prevalence of obesity in pre-adolescent and adolescent children of northern India. Using WHO references, overall prevalence of obesity and overweight was 11.1% and 14.2% respectively. The prevalence of obesity as well as overweight was higher in boys as compared to girls (12.4% vs 9.9%, 15.7% vs 12.9%). Our study indicates

existence of dual problem in young adults with 23.01 per cent of total subjects in under weight and 15.25 per cent in overweight/obese categories.

Obesity is a risk factor for major causes of death, including cardiovascular disease, some cancers and diabetes. Obesity has also been linked with many sources of morbidity, including osteoarthritis, gall bladder disease; sleep apnea, and respiratory impairment. It is also associated with concerns of quality of life, including diminished mobility and social stigmatization[13, 14]. Considering the alarming rise in overweight/obesity in developed as well as developing countries, the situation warrants urgent attention.

A WHO expert consultation[15] addressed the debate about interpretation of recommended body-mass index (BMI) cut-off points for determining overweight and obesity in Asian populations They reviewed scientific evidence which suggested that Asian populations have different associations between BMI, percentage of body fat, and health risks than do European populations. The consultation however agreed that the WHO BMI cut-off points should be retained as international classifications. Dudeja _et al_[16] studied appropriate cut-off levels of the BMI for defining overweight, considering percentage body fat in healthy Asian Indians in northern India as the standard and concluded that the conventional cut-off level of the BMI underestimates overweight and obesity when percentage body fat is used as the standard to define overweight. However in present study, body fat per cent correlated well with BMI cut off points. These preliminary findings, if confirmed in a larger number of subjects and with the use of instruments having a higher accuracy of body fat assessment, would be crucial for planning, prevention and treatment of various obesity-related metabolic diseases in the Asian Indian population.

Conclusion

The present study was conducted in one of the most progressive states of Northern India as per the WHO guidelines and is probably the only one other than NFHS, reporting obesity prevalence in the age group of 18-21 of this region using these guidelines. The results indicate coexistence of underweight and overweight/obese subjects. There is a need to assess obesity prevalence by conducting wider, nationally representative studies and also create awareness regarding the emerging trend. Such studies would be instrumental in policy formulation for handling the malnutrition.

Acknowledgement

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