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Research Paper :

Correlation between anthropometric measurements and nutrient intake of different weight status of women

SHILPI SRIVASTAVA AND ARCHANA CHAKRAVARTY

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See end of the article for authors' affiliations

Correspondence to:
SHILPI SRIVASTAVA
Department of Home Science,
Mahila Mahavidyalaya,
Banaras Hindu University,
VARANASI (U.P.) INDIA

ABSTRACT

The present study was undertaken to find out the correlation between anthropometric measurements and nutrient intake of different weight status women. To fulfill these objectives, 350 women (15-49 yrs) were selected from Banaras Hindu University, Varanasi. In anthropometry measurements, different assessment methods were used *i.e.* Body mass index, Skinfold thickness, Waist circumference and Waist hip ratio and nutrient intake was taken by 24 hour diet recall method. The study showed that there was non-significant association between anthropometric measurements and nutrient intake except fat but correlation of waist and hip circumference was observed with all nutrient intake (except fibre).

Key words : Anthropometric measurement, Nutrient intake, BMI (Body Mass Index)

A proper body weight is most conducive to good health. The problem of excess body weight is confronting more and more people in the prosperous communities. Because of this, obesity can be seen as the first wave of a defined cluster of non-communicable diseases called "New world Syndrome" creating an enormous socioeconomic and public health burden in poorer countries (WHO, 2000 a and b). Obesity among women is a growing problem in India, with the percentage of ever-married women age 15-49 who are overweight or obese increasing from 11 per cent in NFHS-2 to 15 per cent in NFHS-3 (Solanki *et al*., 2008). In Northern India obesity was more prevalent in urban populations (male = 5.5%, female = 12.6%). According to Third National Family Health Survey (2006) only in Uttar Pradesh 12% females and 9.9% males were found overweight or obese and their rank in the list of Indian state were 18 and 17, respectively.

Measures commonly used for assessing obesity are Body Mass Index (BMI) Skinfold thickness (SFT), Waist circumference (WC) and Waist Hip Ratio (WHR). BMI is a scale used for determining the weight status of an individual and the associated risks. It does not provide any clue for the distribution of fat in the various parts of the body. The simpler methods to estimate body fat is, to measure the thickness of the layer of fat just under the skin in several parts of the body (Afride *et al*., 2004). According to Yusuf *et al*., 2005; International Diabetes Institute, 2000; Mellin-Olsen and Wandel, 2005, Waist circumference and waist-hip-ratio are better measures of body fat for South Asians because this group tend to have a more centralised distribution of body fat without developing generalised obesity. Problems of overweight and obesity are caused by chronic imbalance between energy intake and actual energy needs of the study. In many developing countries with increasing urbanization, mechanization of jobs and transportation, availability of processed and fast foods and dependence on television for leisure, people are fast adopting less physically active lifestyles and consuming more "energy-dense, nutrient-poor" diets (WHO 2003; Bell and Popkin, 2002; Popkin, 1998, 2002, 2001; Popkin *et al.*, 2001; Drewnowski and Popkin, 1997). As a result, overweight and obesity and associated chronic health problems, such as diabetes, hypertension, cardiovascular disease, cancer and muscular skeletal disorders, are increasing rapidly, particularly among the middle class urban populations (WHO, 2003; Popkin, 1998; Tanaka and Nakanishi, 1996; Saw and Rajan, 1997).

Reduced physical activity and excess energy intake are strongly linked to weight gain (Lombard and Teede, 2009). Therefore, this study was undertaken to find out the correlation between anthropometric measurements and nutrient intake of different weight status women.

METHODOLOGY

The study was carried out in Banaras Hindu University (BHU), Varanasi on 350 women (15-49 years). The residents of BHU campus are the employee of various categories and they belong to different socio-economic groups. Residential area is divided into 12 colonies in BHU. In each colony number of quarters are not same. To select the samples from each colony stratified

random sampling (proportional allocation) technique was considered. Since, the women characteristics are heterogeneous between colonies only eligible population (15-49 years of women, excluding pregnant women) of these colonies were taken as sample. The subjects were requested to make an appointment at their house and a pretested schedule was used to collect information. All body measurements *i.e.* weight (kg), height (cm), skinfold thickness (mm) and waist hip ratio (cm) were taken by using standard techniques (Jelliffe, 1966). Body Mass Index was calculated with height and weight measurements. The weight was taken by using the electronic weighing machine. Height and Waist hip circumference measured by measuring tape and skinfold measurements were taken by using Harpenden Caliper. BMI (kg/m^2) and waist circumference of the women were compared with the cut-off points suggested by WHO (2000 a and b). Skinfold thickness at four sites of the women compared with cut-off points suggested by Durnin and Womersley (1974) and Waist Hip Ratio were compared with cut-off points given by Park (2007). Nutrient intake of women by 24 hours recall method for three consecutive days were collected. Nutrient composition of the diet was calculated using Nutritive value of Indian foods. Statistical measure like mean, standard deviation and correlation were used to analyze the collected data.

FINDINGS AND DISCUSSION

Identification of obesity according to BMI indicated that 16.57% and 33.43% of the women were categorized as underweight and normal weight, respectively. Forteen per cent of the women were classified as overweight, 30.29% and 5.71% of the women were identified as obese I and obese II categories, respectively (Table 1). Asthana *et al*. (1998) also observed higher prevalence (21.92%) of obesity in grade I obese women (25-29%) and prevalence of obese grade II (30-40) and obese grade III(>40) women were observed 5.92% and 2.40%, respectively in Varanasi.

The mean weight, all four sites of skinfold thickness ,waist and hip circumference and WHR of the study women were increased with increasing of BMI (Table 2). In anthropometry, Body Mass Index is the most commonly used measures of overall obesity (generalized obesity) while circumferences and skinfolds are measures of central obesity (Bhadra *et al*., 2005).

The mean caloric intake of women were quietly

Table 1 : Idendification of obesity according to BMI

Nutritional status	BMI range*	Number of respondent	Per cent
Underweight	< 18.5	58	16.57
Normal weight	18.5-22.99	117	33.43
Overweight	23-24.99	49	14.00
Obese grade I	25-29.99	106	30.29
Obese grade II	≥ 30	20	5.71
Total		350	100.00

*WHO (2000)

Table 2 : Mean and standard deviation (±SD) of different anthropometric measurements of women according to BMI

Anthropometric measurements	Body mass index				
	Under weight	Normal weight	Over weight	Obese grade I	Obese grade II
Height (cm)	155.53±6.49	155.50±5.7	153.73±4.90	153.69±5.31	154.25±6.01
Weight (kg)	41.32±3.83	50.39±4.33	57.04±3.48	64.15±6.02	79.95±8.81
Biceps(mm)	6.22±2.42	9.26±3.23	10.98±3.64	13.75±4.24	16.75±4.32
Triceps (mm)	12.0±3.08	18.11±4.89	20.97±4.51	24.97±5.39	29.00±7.11
Subscapular(mm)	8.72±1.66	13.58±4.27	17.10±3.85	20.63±4.93	27.5±4.84
Suprailiac (mm)	10.36±3.87	17.68±5.50	23.73±5.39	26.76±5.64	31.25±5.33
Sum of four sites of skinfold thickness (mm)	35.12±8.15	57.98±14.80	72.39±11.98	82.78±10.34	88.95±4.35
Waist circumference(cm)	65.81±6.23	74.52±7.09	84.19±8.29	91.93±8.37	101.90±10.9
Hip circumference (cm)	80.47±5.62	89.22±5.11	93.72±4.79	100.51±6.16	112.45±8.29
WHR (cm)	0.80±0.05	0.84±0.07	0.89±0.08	0.89±0.07	0.90±0.09
Total	58	117	49	106	20

Table 3: Mean and standard deviation (±SD) of nutrient intake of women according to BMI

Nutrient intake	Body mass index				
	Underweight	Normal weight	Over weight	Obese grade I	Obese grade II
Calorie (kcal)	1490.15±416.60	1570.49±387.64	1603.82±2.58	1597.39±360.00	1494.02±299.80
Protein (g)	43.84±15.34	44.58±17.26	45.72±13.34	47.33±15.74	44.23±10.31
Fat (g)	38.88±14.34	44.37±16.83	45.85±17.33	47.68±17.75	44.84±12.46
Carbohydrate (g)	236.46±65.02	225.86±55.83	246.85±64.55	245.38±59.05	230.63±65.37
Fibre (g)	7.63±5.12	6.77±2.64	6.92±2.84	6.99±2.97	6.76±2.36
Total	58	117	49	106	20

Table 4 : Correlation between anthropometric measurements and nutrient intake

Anthropometric measurement	'r' value				
	Calorie	Protein	Fat	Carbohydrate	Fibre
Weight	0.061^{NS}	0.059^{NS}	0.068^{NS}	0.084^{NS}	0.034^{NS}
BMI	0.099^{NS}	0.067^{NS}	0.154**	0.061^{NS}	0.004^{NS}
Biceps	-0.041^{NS}	0.013^{NS}	0.040^{NS}	-0.032^{NS}	-0.032^{NS}
Triceps	0.021^{NS}	0.024^{NS}	0.087^{NS}	0.014^{NS}	-0.009^{NS}
Subscapular	0.004^{NS}	0.052^{NS}	0.105*	-0.028^{NS}	-0.028^{NS}
Suprailiac	0.096^{NS}	0.092^{NS}	0.144**	0.094^{NS}	-0.017^{NS}
Sum of four sites of Skinfold thickness (mm)	0.067^{NS}	0.095^{NS}	0.162**	0.098^{NS}	-0.030^{NS}
Waist circumference	0.146**	0.167**	0.134*	0.129*	0.080^{NS}
Hip circumference	0.139**	0.138**	0.148**	-0.143**	0.079^{NS}
WHR	0.096^{NS}	0.150**	0.111*	0.081^{NS}	0.042^{NS}

* and ** indicate significance of values at P=0.05 and 0.01, respectively NS-Non significant

increased from underweight to overweight women and quietly decreased after overweight to obese grade II women. Very little increment of protein and fat intake in underweight to obese grade I women but in obese grade II women protein and fat intake decreased. Carbohydrate and fibre intake of women were found approximately same in all BMI group. According to Arshad *et al*. (1996), some studies report that obese individuals consume a minimal amount of energy per day.

Table 4 shows that there was significant relationship was observed between fat and anthropometric measures except weight, biceps and triceps. Correlation of other nutrient intake (calorie, protein and carbohydrate) were found only with waist and hip circumference and waist hip ratio. According to Arshad *et al*. (1996), the total energy content of obese individuals is not the main cause of obesity. Other aspects, like the dietary composition of fat, protein and carbohydrate may be contributing factors.

Conclusion:

It has been concluded that 50% of the adult women were overweight and had different grade of obesity I, II. Mean anthropometric measurements of all BMI group women were increased with increasing of BMI. Nutrient intake of obese grade II women were found less than other women of different BMI , and there was non significant association were found in between anthropometric measurements and nutrient intake (except fat) of Varanasi women but correlation of waist and hip circumference were observed with all nutrient intake (except fibre).

Authors' affiliations:
ARCHANA CHAKRAVARTY, Department of Home Science, Mahila Mahavidyalaya, Banaras Hindu University, VARANASI (U.P.) INDIA

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