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Effect of Lifestyle on Body Fat Percentage and Visceral Fat in Indian Women with Above Normal Body Mass Index

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ABSTRACT

Objective: This study aimed to explore the effect of lifestyle on body fat percentage and visceral fat in Indian women with above normal Body Mass Index.

Methods: Body fat percentage and visceral fat was measured using a body composition analyzer that works on the principle of bio-electrical impedance. Information on lifestyle was collected using a questionnaire and a 3 day dietary record. Indian women (n= 100) in the age group of 25 to 35 years and having a Body mass index above 24.9from various fitness centers in Bangalore were enrolled for this study.

Results: The mean body fat percentage of the study group was 41.4% (±4.61) and mean visceral fat was 8.26 (±2.08). This study shows that as calories increased there was a positively significant association with fat percentage and visceral fat. Body fat percentage and visceral fat was lower in those who exercised 3-5 times/week in comparison to those who exercised 0-3 times/week depicting an inverse association. This study also showed that subjects with sleep duration of 5-6 hours per day had a higher fat percentage than those who slept for 8-9hours per day.

Conclusion: The evidence from the present study indicates that increased physical activity, longer sleep duration and decreased calorie consumption can be recommended as a long term treatment for obesity management. Furthermore, longitudinal research could be done for in-depth understanding of the impact of lifestyle on body fat percentage and visceral fat in Indian women.

Key Words: Body composition, Diet Intake, Dietary Assessment, Overweight, Obese

INTRODUCTION

Obesity is a major public health issue in India and worldwide and its prevalence is increasing. Obesity is associated with many health disorders such as diabetes mellitus, hypertension, dyslipidemia, and coronary heart disease especially when fat accumulation is in the abdominal area(visceral compartment). Indian populations have a tendency to accumulate fat in the abdominal region[1, 2].

According to the National Family Health Survey, the percentage of ever-married women aged 15-49 years who are overweight or obese increased from 11% to 15% between the two consecutive studies of National Family Health Survey. Overweight and obesity are more than three times higher in urban areas than rural areas. Furthermore, undernutrition and overweight/obesity are both higher among women than men[3]. According to National Family Health Survey-4 released on 17 January 2017, obesity in the country has doubled in the past 10 years [4].

Dietary factors are the major modifiable factors through which many of the external forces promoting weight gain act [5].Different methods are developed that are used to study the relationship between food and nutrient intake and health/disease occurrence. The methods developed should be able to measure food consumption relatively easily, with sufficient accuracy and at a reasonable cost [6]. Methods such as single or multiple 24 hour dietary recalls, weighed diet records,

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self-reported diet history and Food Frequency Questionnaires have been used to assess dietary intake in populations [7-9]. The Food record method is used in the present study since it does not rely on memory and have revealed relationships not observed in the Food Frequency Questionnaire[10].

Assessment of body composition is important in the prevention and treatment of obesity. Regular body composition analysis is used to monitor the effect of obesity treatment in weight loss interventions. Body mass index is the most commonly used measure which is only an indirect measure of fatness, so reliable methods of assessing body composition are also needed. Methods such as hydrodensitometry, stable isotope methods and X-ray densitometry are impractical and expensive while X-Ray densitometry equipment is non-portable. Hence an inexpensive and portable method such as Bioelectrical Impedance Analysis is valuable. The Bioelectrical Impedance Analysis procedure is simple, quick, safe, non-invasive and painless, making it a suitable method for studying large groups of participants. There are a great variety of Bioelectrical Impedance Analysis machines such as hand-to-foot and foot to foot. Unlike the foot to foot device, the hand to foot, 8-electrode Bioelectrical Impedance Analyzer estimates whole body compositions without by-passing the trunk and arms [11,12].

Obesity is commonly caused by excessive consumption of calories more than energy requirements over a long period [1]. Lifestyle behaviors such as physical activity, sleep duration, food habits etc can also impact energy consumption and/or expenditure[13]. In this context, this paper studies the effect of lifestyle on body fat percentage and visceral fat in Indian women with BMI(Body mass index) of more than 24.9.

MATERIAL AND METHODS

Participants

A sample of 100 subjects from various fitness centers in Bangalore, Karnataka, India attending a weight management program were selected by random sampling method. The sample was enrolled for the study considering the inclusion (age group of 25 years to 35 years, Body Mass Index of more than 24.9,exercising for a minimum of 60minutes) and exclusion (normal Body Mass Index, age group below 25 years or above 35 years of age, women who were pregnant or lactating, sedentary lifestyle) criteria.

Information was collected pertaining to age, sex, date of birth, education, occupation, health, lifestyle including dietary intake and habits.

Body Composition

Anthropometric measurements (height and body weight) were collected in the morning in fasting conditions according to the standardized procedures. This was then followed by body composition analysis. Weight was measured using the weight mode on the body composition analyzer (Tanita BC 601) and height was measured to the nearest 0.1cm using an anthropometric rod[14].

Dietary Intake

The data was collected based on the 3 day dietary record of the subjects. Before obtaining the information, subjects were informed on how to record their food intake. They were asked to mention the ingredients used in the preparation of the dish, the portion size and the time of consumption. The portion sizes of food were recorded using standard household measures such as cup, glass and spoon. The 3 day diet record method is considered as one of the most accurate methods to measure dietary intake and hence this method was used in this study[10].

Nutrient intake data from the 3 day dietary record were entered into the validated software 'DietCal' version 3·0 (Profound Tech Solution; http://dietcal.in/), which is based on values from the *Nutritive Value of Indian Foods* [15]. The data collected was then analyzed.

Statistical Analysis

Descriptive statistics was conducted comprising of number, frequency, mean and standard deviation(SD). Inferential statistics computed for the research findings were standard t test and F test. Age, food habits and sleeping duration were subjected to F test and Body Mass Index, smoking, drinking and physical activity pattern were subjected to t test. Relationship analysis was done using Karl pearson coefficient of correlation. The evidence of positive result indicates the existence of positive relationship between the two variables at 5% level of significance.

RESULTS

The study sample included 100 subjects. The mean age group of the study sample was 30.46 years (±3.4) with a mean weight of 73.48 kg (±10.57)and mean height of 159.77cm (±4.77). The mean BMI of the study group was 28.96(±3.93) with 67% of the subjects in the range of 25 – 29.9 and 33% above 30. Majority (63%) of the subjects were non-vegetarians followed by 27% vegetarians and 10% ovo-vegetarians.65% of the subjects were in the habit of consuming alcohol occasionally and 30% of the subjects were smoking on a regular basis. The duration of exercise being 60 minutes/day, 84% of the subjects exercised between 3-5 times/ week followed by 16%who exercised 0-3 times/week.

Data on body fat percentage and visceral fat was collected using the body composition analyzer Tanita BC 601 and compared with the ranges provided by Tanita. According to

Tanita the range of healthy percentage body fat is between 21-33% and healthy level of visceral fat is between 0-12[16]. The results of the present study showed that all the subjects had a body fat percentage above 33% (41.4 ±4.61) and 97% of the subjects had a visceral fat reading in the normal range (8.26 ±2.08).

It is evident from the findings (Table 1) that as the age increases the body fat percentage increases positively, however the relationship is non-significant statistically. The visceral fat had a positive significant relationship with increase in age. The table also depicts that with increase in weight and Body Mass Index there was a statistically significant increase in body fat percentage and visceral fat.

Table 2 shows that age group 29-32years had the highest fat and visceral fat. As per the food habits the non-vegetarians had the highest body fat percentage and visceral fat. Short sleep duration is a factor for obesity[17] and the results from this study show that subjects with sleeping duration per day between 8-9hours had the lowest fat and visceral fat compared to subjects with sleep duration between 5-7 hours however the relationship was statistically non-significant.

Table 3 which compared the relationship of Body Mass Index and lifestyle habits such as smoking, drinking and physical activity pattern per week with fat and visceral fat showed that there was a positive significant relationship of Body Mass Index with fat and visceral fat. The table also shows that the fat and visceral fat was higher in the obese group when compared to the overweight group. Obesity treatment should aim at decreasing fat mass and increasing the physical activity is an important factor that promotes the loss of body fat mass [18]. It is also evident from the findings in this study that with increased duration of physical activity the fat and visceral fat was lower. Further fat percentage depicts the existence of statistically significant positive relationship with physical activity.

The dietary intake data showed that the mean energy consumption of the study group was 1945Kcal (±255) with a mean carbohydrate consumption of 285.9g (±49.1), mean protein consumption of 61.5g(±14.4) and mean fat consumption of 60.3g(±16.5). Weight gain is usually due to excessive consumption of calories along with lifestyle habits and low physical activity. Along with the daily caloric intake, the composition of the diet may also be an important factor in understanding obesity and its prevention[2]. The result in Table 4 shows a positive significant relationship of fat percentage and visceral fat with energy and carbohydrate consumption.

CONCLUSION

Classification of subjects into overweight and obesity is necessary in the treatment. Body Mass Index is the most commonly used method for such classification. However it takes into consideration only the weight and height of an individual under the assumption that higher weight is associated with increased body fat and consequent morbidity and mortality. When only Body Mass Index is considered there is a high chance of overlooking skinny fat subjects and subjects with higher muscle mass and lower body fat[19,20]. In this context the present study analyzed samples with above normal Body Mass Index to find out their percentage body fat and visceral fat and simultaneously study the impact of lifestyle factors on the above. This study is one of the first of its kind to study this impact in an Indian female population of Bangalore.

Weight is a combination of lean mass, fat mass, water, visceral fat etc and an understanding of which factors favour fat mass deposition could help in management of obesity in a scientific manner[2]. The results from this study provide scope to various researchers to study in-depth the various other factors impacting body composition. The study also showed the positive impact of exercise on body fat however further research on the type of exercise and its impact on body fat can be studied.

Evidence from the present study thus indicates that increased physical activity, longer sleep duration and decreased calorie consumption can be recommended as a long term treatment for obesity management.

One of the limitations of this study is the sample size. Increasing the sample size could help in obtaining significant associations between lifestyle factors and adiposity. The findings of this study are clinically relevant to public health interventions particularly in treating overweight and obesity. Furthermore, longitudinal research could be done for an in-depth understanding of the impact of lifestyle on body fat percentage and visceral fat in an Indian population.

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Conflict of interest

None

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Ethical clearance

The study was approved by the Institutional Ethical Committee of Smt. VHD Central Institute of Home Science, Bangalore.

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Table 1: Correlation coefficient between Somatic data with Fat and Visceral Fat

n=100

No.		Correlation coefficient (r)	
		Fat (%)	Visceral fat
1	Age	0.094 ^{NS}	0.262 *
2	Height	0.002 ^{NS}	-0.008 ^{NS}
3	Weight	0.869 *	0.853 *
4	Body mass index	0.922 *	0.909 *

* Significant at 5% Level, NS Non-Significant

Table 2: Relationship of Age, Food habit and Sleeping duration with Fat (%) and Visceral Fat

No	Characteristics	Category	Sample (n)	Fat (%)			Visceral Fat		
				Mean	SD	'F' Test	Mean	SD	'F' Test
1	Age group (years)	25-28	33	41.03	4.2	0.45 ^{NS}	7.82	2.0	1.28^{NS}
		29-32	31	42.04	5.2		8.32	1.8	
		33-35	36	41.14	4.5		8.31	2.2	
2	Food habit	Vegetarian	27	40.88	3.6	0.28 ^{NS}	8.00	1.9	0.29^{NS}
		Non-vegetarian	63	41.49	4.9		8.35	2.2	
		Ovo vegetarian	10	42.06	5.6		8.40	2.1	
3	Sleeping duration	5-6 hrs	29	42.09	4.4	0.50 ^{NS}	8.66	2.1	0.82^{NS}
		7 hrs	34	41.20	5.0		8.21	2.2	
		8-9 hrs	37	40.99	4.5		8.00	2.0	

NS: Non-Significant

Table 3: Relationship of BMI, Occupation and Lifestyle habits with Fat (%) and Visceral Fat

No.	Characteristics	Category	Sample (n)	Fat (%)			Visceral Fat		
				Mean	SD	't' Test	Mean	SD	't' Test
1	Body mass index	Overweight	67	39.01	2.6	9.26*	7.19	1.3	9.62*
		Obese	33	46.19	4.1		10.42	1.7	
2	Smoking	Yes	30	41.82	4.0	0.66 ^{NS}	8.47	2.0	0.67^{NS}
		No	70	41.19	4.9		8.17	2.1	
3	Drinking	Yes	65	41.17	4.5	0.60 ^{NS}	8.15	2.1	0.71^{NS}
		No	35	41.77	4.8		8.46	2.0	
4	Physical activity/ week	0-3 times	16	44.53	6.20	2.33*	9.19	3.17	1.35^{NS}
		3-5 times	84	40.78	4.01		8.08	1.78	

* Significant at 5% Level, NS Non-Significant,

Table 4: Correlation coefficient between Nutrients with Fat (%) and Visceral Fat

n=100

No.	Nutrients	Correlation coefficient (r)	
		Fat (%)	Visceral fat
1	Energy	+ 0.422 *	+ 0.451 *
2	CHO	+ 0.527 *	+ 0.568 *
3	Protein	+ 0.114 ^{NS}	+ 0.092 ^{NS}
4	Fat	+ 0.120 ^{NS}	+ 0.092 ^{NS}

* Significant at 5% Level, NS Non-Significant