

Research Paper :

## Role of nutrients in the development of overweight and obesity of urban females in Western U.P.

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### ABSTRACT

Female obesity is the result of several factors culminated together. Most of the time weight is gained intake of more calories than what the body actually needs. In this perspective, the present study was fabricated to find out the quantity of macro-nutrients like protein, fat, carbohydrate and energy consumed by the overweight and obese females of Hathras city (Uttar Pradesh). The study revealed that the mean consumptions of protein, fat, carbohydrate and energy by overall females were assessed  $83.67 \pm 24.54$  g;  $79.60 \pm 21.35$  g;  $441.33 \pm 88.79$  g and  $2761.67 \pm$  Kcal, respectively. On comparison with recommended daily allowances, protein ranged from 146.00% to 196.80%; fat from 302.00% to 490.00% and energy from 119.21% to 127.87% in low to high income group. In addition, protein and fat consumptions were witnessed significantly increasing with the advancement of income. Nearly three quarter energy fulfilled by carbohydrate sources and three to five times of fat consumption were found responsible to cause overweight and obesity.

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Overweight is a weight in excess of the average for a given sex, height and age. It is usually due to obesity but it can rise from other causes such as abnormal muscle development or fluid retention. An enlargement in fat cell size or an increase in fat cell number or combination of both is known as obesity. Obesity develops when energy intake though in small quantity continuously exceeds more than the energy expenditure causing energy imbalance (Park, 2005) and Duvigneaud *et al.*, 2007). Consumption of increased amount of rich foods accounts for fat accumulation in the body. Dietary fat with high energy density and palatability with poor appetite control signals leads to increase energy and body fat (Blundell and King, 2001). Prevalence of obesity is more in the societies reliant on energy densed with large fast food meals providing less satiation. Total energy protein, sugar, iron and fat (saturated, poly and unsaturated) consumptions were found significantly higher in obese males and females than their normal counterparts. The contribution of energy from carbohydrate and fibres were negatively attributed with BMI in males. Whereas high quantity of carbohydrate and fibre were positively associated with BMI in females (Duvigneaud *et al.*, 2007, Agras and Mascola, 2005 and Rosenheck, 2008).

In view of the aforesaid statements, the present study was carried out to find out the quantity of macro-nutrients like protein, fat, carbohydrate and total energy consumed by the overweight and obese females residing in Hathras city situated in Western Uttar Pradesh.

### METHODOLOGY

The study was conducted on 300 overweight and obese females aged 30 to 50 years from four randomly selected areas of Hathras city (U.P.). The data were collected with the help of questionnaire-cum interview technique. One hundred subjects each related to socio-economic status low, middle and high were screened from the four areas of the city on the basis of door to door survey. The socio-economic status was assessed according to basic classification of socio-economic status (1960) and current price index as suggested by Kumar (1993). The overweight and obesity were assessed by body mass index (BMI). This index is expressed as a quotient of body weight (in kg) divided by square of the height presented in meter. The females measuring BMI 25 or more were considered overweight and obese (WHO, 1998).

In addition, 24 hours food recall method was employed to assess the nutrients intake of the desired subjects. Further, the nutrient intake was compared with recommended daily allowance (RDA) (ICMR, 2004) and inference regarding its adequacy was documented accordingly. Finally the results were inferred with the help of suitable statistical tools wherever felt necessary.

### FINDINGS AND DISCUSSION

Female obesity is result of several factors culminated together. Most of the time weight is gained by intake of more calories than what the body actually needs. Obesity

is a chronic disease with a strong genetic component. Fast food also causes obesity. In the societies consuming high fat, salt and sugar diets, the structure of the human body becomes oversized. This feature is predominantly common in developed affluent societies. Western Uttar Pradesh including Hathras has achieved prosperity due to its agricultural products and varied industries. As other affluent societies, the residents of the city including females are taking high energy and fat dense diet. In the present study, it is evident that more than two-fifth overall females (40.67%) consumed 80 to 100 g protein per day; followed by 60 to 80 g (33.33%). The mean  $\pm$  SD amount of protein consumption was assessed to  $83.67 \pm 24.54$  g per day. According to income category, the mean  $\pm$  SD consumptions of protein were ascertained  $73.00 \pm 10.78$  g. for low;  $86.40 \pm 14.87$  g. for middle and  $98.40 \pm 16.13$  g. for high income group (Table 1). The statistical analysis envisaged that the protein consumption was increasing with the increase in income ( $p < 0.001^{***}$ ).

Indian Council of Medical Research (2004) recommends 50 g RDA of protein to the females employed in sedentary, moderate and heavy activities. In view of this recommendation, only 2.0% overall females were consuming proper quantity of the protein, whereas majority of them (98.0%) were taking protein more than their requirements. According to income category, 96.0% low; 98.5% middle and 99.5% high income females consumed more than the recommended amount. This high consumption of protein is one of the vital causes of overweight and obesity in these females. In a study held in Varanasi (1993) high protein consumption in comparison to RDA by the obese females has also been reported. Mikkelsen *et al.* (2000) mentioned high protein diet might increase 24 hours energy expenditure by 2 to 3%. While Porrini *et al.* (1997) expressed that high protein content induces a stronger

satiating effect than fat and carbohydrate.

So far as consumption of fat by the subjects is concerned (Table 2), more than one third overall females (33.67%) consumed 60 to 80 g fat in a day; followed by 80 to 100 g (30.67%). The mean  $\pm$  SD consumption of fat by these females was assessed to be  $79.60 \pm 21.35$  g. According to income category, the females related to low; middle and high categories, consumed  $60.40 \pm 11.88$  g;  $80.00 \pm 15.70$  g and  $98.40 \pm 16.13$  g of fat, respectively. The statistical analysis suggested that the mean consumption of fat is significantly increasing with socio-economic status of the subjects ( $p < 0.001^{***}$ ). The RDA consumption of fat has been mentioned 20 g. in a day for the non-pregnant females (ICMR, 2004). The findings apprehend that the females in every income category consumed fat in more and more quantity than the recommended allowance. The fat consumption in the study subjects are more than three to five times of the RDA. The studies conducted abroad have also reported positive association between higher fat intake and obesity (Stam-Morage *et al.*, 1999 and Davis *et al.*, 2006). Samaha *et al.* (2003) prescribed 33% of total calories intake as fat which is more than the 20 to 30% energy intake normally indicated of a low fat diet.

In the present study more than two fifth overall females (Table 3) consumed 400 to 500 g of carbohydrate in a day; followed by 300 to 400 g (29.00%) and 500 to 600 g (19.6%). The mean  $\pm$  SD consumption was assessed to be  $441.33 \pm 88.79$  g. According to income category, the mean  $\pm$  SD consumptions were obtained  $455.00 \pm 90.31$  g for low;  $437.00 \pm 84.88$  g for middle and  $432.00 \pm 90.32$  g for high income category. The statistical analysis conveyed that similar mean amount of carbohydrate is consumed by the females in all the three income categories ( $p > 0.05$  NS). It was further assessed that 77.45%;

**Table 1 : Consumption of protein by the females according to group**

Sr. No.	Amount of protein (g.) (RDA = 50 g.)	Income group			Total	
		Low	Middle	High	No.	%
1.	40-60	8	3	1	12	4.00
2.	60-80	69	28	3	100	33.33
3.	80-100	23	54	45	122	40.67
4.	100-120	-	14	47	61	20.33
5.	120-140	-	1	4	5	1.67
Total		100	100	100	300	100
Mean $\pm$ SD		$73.00 \pm 10.78$	$86.40 \pm 14.87$	$98.40 \pm 16.13$		$83.67 \pm 24.54$
% RDA		146.00%	172.80%	196.80%		167.34%

Statistical significance:

Low vs. Middle  $t = 7.296$ ,  $df = 198$ ,  $p < 0.001^{***}$

Low vs. High  $t = 13.092$ ,  $df = 198$ ,  $p < 0.001^{***}$

Middle vs. High  $t = 5.470$ ,  $df = 198$ ,  $p < 0.001^{***}$

**Table 2 : Consumption of fat by the females according to group**

Sr. No.	Amount of fat (g) (RDA= 20 g)	Income group			Total	
		Low	Middle	High	No.	%
1.	20-40	5	-	-	5	1.67
2.	40-60	38	11	1	50	16.67
3.	60-80	57	35	9	101	33.67
4.	80-100	-	47	45	92	30.67
5.	100-120	-	7	37	44	14.67
6.	120-140	-	-	8	8	2.67
Total		100	100	100	300	100
Mean ± SD		60.40 ± 11.88	80.00 ± 15.70	98.40 ± 16.13	79.60 ± 21.35	
% RDA		302.00%	400.00%	490.00%	398.00%	

Statistical significance:

Low vs. Middle t = 9.955, df = 198, p < 0.001 \*\*\*.  
 Low vs.. High t = 18.969, df = 198, p < 0.001 \*\*\*.  
 Middle vs. High t = 8.174, df = 198, p < 0.001 \*\*\*.

**Table 3 : Consumption of carbohydrate by the females according to income group**

Sr. No.	Amount of carbohydrate (g)	Income group			Total	
		Low	Middle	High	No.	%
1.	≤300	1	3	7	11	3.67
2.	300-400	26	31	30	87	29.00
3.	400-500	49	45	37	131	43.67
4.	500-600	15	18	26	59	19.67
5.	≥600	9	3	-	12	4.00
Total		100	100	100	300	100
Mean ± SD		455.00 ± 90.31	437.00 ± 84.88	432.00 ± 90.32	441.33 ± 88.79	
Calorie equivalent (% RDA)		1820 Kcal (77.45%)	1748 Kcal (74.38%)	1728 Kcal (73.53%)	1765.32 Kcal (75.12%)	

Statistical significance:

Low vs. Middle t = 1.452, df = 198, p > 0.05 NS.  
 Low vs. High t = 1.801, df = 198, p > 0.05 NS.  
 Middle vs. High t = 0.403, df = 198, p > 0.05 NS.

**Table 4 : Consumption of energy by the females according to energy group**

Sr. No.	Amount of energy (Kcal) (RDA = 2225 Kcal) for moderate workers	Income group			Total	
		Low	Middle	High	No.	%
1.	≤1750	4	1	-	5	1.67
2.	1750-2000	5	3	-	8	2.67
3.	2000-2250	12	9	7	28	9.33
4.	2250-2500	22	18	17	57	19.00
5.	2500-2750	15	19	25	59	19.67
6.	2750-3000	15	19	17	51	17.00
7.	3000-3250	13	11	13	37	12.33
8.	3250-3500	11	11	12	34	11.33
9.	3500-3750	1	5	5	11	3.67
10.	3750-4000	2	4	4	10	3.33
Total		100	100	100	300	100
Mean ± SD		2652.50 ± 508.63	2787.50 ± 550.52	2845.00 ± 452.66	2761.67 ± 492.92	
% RDA		119.21%	125.28%	127.87%	124.12%	

Statistical significance:

Low vs. Middle t = 1.801, df = 198, p > 0.05 NS.  
 Low vs. High t = 2.827, df = 198, p < 0.01 \*\*.  
 Middle vs. High t = 0.869, df = 198, p > 0.05 NS.

74.38% and 73.53% RDA requirement of the energy is fulfilled in the females related to income groups low; middle and high, respectively. This finding shows that the diet in the present study is mainly based on carbohydrate sources. Significantly high percentage of energy from carbohydrate source have also been reported by other workers (Duvigneaud *et al.*, 2007 and Flegal, 2002).

Nearly one fifth overall females (19.67%) consumed 2500 to 2750 Kcal per day; followed by 2250 to 2500 Kcal (19.00%) and 2750 to 3000 Kcal (17.00%). The overall mean  $\pm$  SD amount of energy consumption was accounted 2761.67  $\pm$  492.92 Kcal and this mean amount is equivalent to 124.12%; of the RDA. According to income category, the mean amounts were equivalent to 119.21%; 125.28% and 127.87% of the RDA in low; middle and high income group, respectively (Table 4). High energy intake by the obese subjects has also reported in an study held in Varanasi (Asthana, 1993). Flegal *et al.* (2002) reported that in the period of 1971-2000, obesity rates in United States increased from 14.5% to 30.9%. During the same period, an increase also occurred in the average amount of calories consumed. For women, the average increase was 335 calorie per day and this amount was comparatively more than the average increase of males which was found ameliorated 168 calories per day. These findings confirmed that nutrients are responsible to cause overweight and obesity. The overweight and obese females in the present study consumed more amounts of protein, fat, carbohydrate and energy than the recommended daily allowance.

### Conclusion:

The study revealed that the overweight and obese females were consuming more amounts of macro-nutrients, than the recommended allowances. In addition, protein and fat consumptions were witnessed significantly increasing with the advancement of income.

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