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## Food consumption pattern and dietary intake of obese vs non-obese women

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**Abstract**

The present study on 60 women in the age group of 30-45 years, residing in CCS HAU, Hisar Campus, was done to assess their dietary habits and food intake frequency. Sixty women selected were further classified as obese (30) and non-obese (30) on the basis of their Body Mass Index (BMI). Women having Body Mass Index (BMI) less than 25 were classified as non-obese and women having BMI more than 27.5 were classified as obese. It was found that majority (98.0%) of them were vegetarian. Majority (83 to 100%) of them were consuming wheat, potato, tomato, milk, curd, sugar, desi ghee, onion, garlic and green chillies on daily basis. Few (16.67%) of them consumed eggs on daily basis and 96.67 per cent were not consuming meat. Majority of obese (76.7%) and non-obese (86.7%) women consumed cereals, 100 per cent and above, the RDI. Only 20 and 16.7 per cent of obese and non-obese women, respectively, consumed adequate amount of pulses. Majority of obese respondents 66.7 to 83.3 per cent consumed inadequate amount of green leafy vegetables, other vegetables and fruits. Majority of obese women i.e. 93.3 and 100 per cent consumed sugar and jaggery and fats and oils in adequate amounts. Mean daily intake of pulses, roots and tubers, green leafy vegetables, other vegetables and fruits among non-obese women was 73, 48, 31, 40, and 24 percent of RDI, respectively. Milk and milk products' intake of majority (63.3%) of non-obese respondents was adequate while fruit intake by 63.3 per cent was inadequate. There is need to provide nutrition education to the women for improvement in their protective food intake specially milk, egg, fruits and vegetables.

**Keywords:** Food, food intake, food frequency, recommended dietary intake

**Introduction**

Overweight and obesity are the rapidly increasing public health problems in developing countries and India being a middle income country is undergoing with ever fast nutritional and epidemiological transitions [1]. A preliminary diet history survey of adult women and men qualified for surgical treatment of obesity indicated excessive intake of protein, fat, saturated fatty acids, cholesterol, certain vitamins, phosphorus and sodium, and insufficient intake of absorbable carbohydrates and dietary fibres [2]. Obese people are prone to develop diabetes mellitus, bone fractures, thyroids, cardiovascular disease, hypertension, and certain cancers, among other conditions [3].

Research studies have shown an association between socioeconomic status and education and income have been found the most dominating factors in occurrence of obesity [3, 4]. As per the statistics of recent report published by World Health Organization, globally 39% of women and 39% of men aged 18 and over were observed as overweight [5]. No doubt, overweight and obesity are multi-factorial diseased conditions and socioeconomic factors have become part of the explanation of these conditions. Actually, socio-economic factors have a direct impact on the selection of cheap foods that are high in calories, as well as having less access to healthcare and to healthy foods [6, 8]. These factors, together with the demographic, epidemiologic and nutritional transitions, are the main causes of the increase in the prevalence of overweight and obesity. Further, a positive and significant association was observed between the inter-generational transmission of overweight and obesity and the mother's socio-economic aspects. These evidences could be considered in the design and implementation of interventions or public health programs, as strategies for the prevention of overweight and obesity [9].

Luxurious life style and physical inactivity is another important factor after unhealthy eating practices. To answer that how much of obesity is related to physical inactivity a survey was conducted in 6-12 urban streets in each of five cities in five different regions of India. A total of 6940 subjects (3433 women and 3507 men) aged 25 years and above were randomly selected from Muradabad, Trivandrum, Kolkata, Nagpur and Mumbai. The overall prevalence of obesity and overweight was 6.8 and 33.5 per cent, respectively. Physical activity level was adversely affected between the age of 35-44 years in women and after 45 years of age in men. Sedentary behaviour was significantly ( $P < 0.05$ ) greater in more advanced cities i.e.

Trivandrum, Kolkata, and Mumbai as compared to Nagpur, and was significantly ( $P < 0.001$ ) associated with obesity in both the sexes<sup>[10]</sup>. This study was conducted to observe the critical differences in dietary pattern among obese and non-obese women of Hisar.

## Materials and Methods

### Selection of Research Subjects

This study was conducted in Chaudhary Charan Singh Haryana Agricultural University, Hisar. On the basis of Body Mass Index, 30 obese and 30 non obese women in the age group of 30-45 years were selected purposively from CCS HAU Campus, Hisar for this study. Women having Body Mass Index (BMI) less than 25 were classified as non-obese and women having BMI more than 27.5 were classified as obese<sup>[11]</sup>.

### Data Collection

A well-structured questionnaire-cum-interview schedule was prepared in accordance with the methodological procedure keeping in view the objectives of the study. The interview schedule was pretested initially on non-sampled subjects. Based on the responses obtained and difficulties faced, suitable modifications were made to make questionnaire-cum-interview schedule more functional. The data on background information was collected with the help of interview schedule by paying repeated visits to the study area and the responses were obtained on various variables to meet the requirements of the study.

### Dietary survey

Information on dietary pattern and food intake of obese and non-obese women was collected using food frequency questionnaire and 24-h recall method. Subjects were asked whether they were consuming different foods belong to various food groups on daily, alternatively, weekly or rarely basis or not consumed. Twenty four hours recall was done for two non-consecutive days. Food groups included were cereals, pulses, fruits, green leafy vegetables, roots and tubers, other vegetables, milk & milk products, sugar and jaggery and fat and oils. Standard measures including spoons, bowls and cups were shown to them so as to help them in telling the amount of food consumed. Food intake was recorded in terms of standard sized utensils and weight of *chapaties*, *paranths*, vegetables, fruits etc. was taken. Information collected from them was about the consistency of cooked vegetables and pulses. Information was also collected about the raw ingredients used and methods of cooking used by them for cooking a particular food. All this was done to get more accuracy in the calculations. Cooked food consumed was converted into their raw equivalents. The Mean daily food intake was calculated by taking mean of two non-consecutive day's intake. Mean food intake of the subjects was compared with the Recommended Dietary Intake<sup>[12]</sup>.

## Results

It was found that out of 60 respondents surveyed, 35, 36.67 and 28.33 per cent were in the age group of 30-35, 35-40 and 40-45 years, respectively (Table 1). Maximum (71.67) number of the respondents had nuclear families and 28.33 percent were from joint families.

As many as 63.33% of the respondents belonged to small sized families while remaining 36.67 percent belonged to medium sized families. Seventy per cent of the respondents were non-working (housewives) and remaining 30.00 per cent were working. Majority (98.00%) of them were vegetarian. Data relating to food frequency indicated that the majority (83 to 100%) of them were consuming wheat, potato, tomato, milk, curd, sugar, desi ghee, onion, garlic and green chillies on daily basis (Table 2). Few (16.67%) of them consumed eggs on daily basis and 96.67 per cent were not consuming meat.

**Table 1:** Personal profile of women respondents (n=60)

Characteristics	Percentage
<b>Age</b>	
30-35 years	35
35-40 years	36.67
40-45 years	28.33
<b>Family Type</b>	
Nuclear	71.67
Joint	28.33
<b>Family size</b>	
Small (Upto 4 members)	63.33
Medium (5-7 members)	36.67
<b>Working Status</b>	
Working	30.00
Non-working (Housewives)	70.00
<b>Eating habits</b>	
Vegetarian	98.00
Non-vegetarian	2.00

It was found that the mean daily intake of cereals, milk and milk products, sugar and jaggery and fats and oils among obese women was 291, 320, 31 and 47g, respectively which was higher than their respective RDI (Table 3). The intake of milk and milk products was comparable to RDI. It was found that the mean daily intake of cereals, milk and milk products, sugar and jaggery and fats and oils among obese women was 108, 107, 155 and 235 per cent of RDI, respectively. It was observed that the mean daily intake of pulses, roots and tubers, green leafy vegetables, other vegetables and fruits among obese women was 44, 109, 43, 75 and 21g, respectively which was significantly lower than RDI. Mean daily intake of pulses, roots and tubers, green leafy vegetables, other vegetables and fruits among obese women was 73, 36, 43, 38 and 21 percent of RDI, respectively.

**Table 2:** Frequency of food consumption of women respondents (n=60)

Food Stuffs	Daily	Alternately	Weekly	Fortnightly	Rarely	Not consumed
<b>Cereals</b>						
Wheat	60	-	-	-	-	-
Rice	4	18	20	18	-	-
Bajra	5	6	25	15	7	2
Maize	-	-	-	-	15	45
<b>Pulses</b>						
Bengal Gram	-	10	28	22	-	-
Black Gram	-	-	11	23	18	8
Green Gram	-	15	35	10	-	-
Soyabean	-	-	-	-	4	56
<b>Roots and Tubers</b>						
Potato	27	25	5	3	-	-
Onion	60	-	-	-	-	-
Garlic	32	23	5	-	-	-
<b>Other Vegetables</b>						
Tomato	50	10	-	-	-	-
Cauliflower	-	-	30	25	3	2
Cabbage	-	-	26	28	6	-
Green chillies	45	15	-	-	-	-
Lady finger	-	-	37	23	-	-
<b>Fruits</b>						
Guava	-	10	20	30	-	-
Apple	-	-	15	35	10	-
Banana	5	15	35	5	-	-
Lemon	15	26	19	-	-	-
<b>Milk and Milk Products</b>						
Cow's milk	10	-	-	-	-	50
Buffalo's milk	45	10	5	-	-	-
Curd	40	15	5	-	-	-
Buttermilk	12	15	25	8	-	-
Butter	10	15	30	5	-	-
Sugar	60	-	-	-	-	-
Sweets	-	-	25	30	5	-
<b>Fats and Oils</b>						
Desi ghee	60	-	-	-	-	-
Hydrogenated fat	5	15	-	-	15	25
Refined oil	15	20	10	8	-	7
<b>Meat products</b>						
Eggs	10	25	-	-	-	25
Meat	-	-	-	-	2	58

The results indicated that the mean daily intake of cereals, sugar and jaggery and fats and oils among non-obese women was 307, 29 and 48 g, respectively which was significantly higher than RDI. The intake of milk and milk products was 311g which was slightly towards higher side of RDI. Mean daily intake of cereals, milk and milk products, sugar and jaggery and fats and oils among non-obese women was 114, 104, 145 and 240 percent of RDI, respectively.

It was observed that the mean daily intake of pulses, roots and tubers, green leafy vegetable, other vegetables and fruits among non-obese women was 44, 95, 31, 79 and 24g, respectively which were significantly lower than RDI (Table 3). Mean daily intake of pulses, roots and tubers, green leafy vegetables, other vegetables and fruits among non-obese women was 73, 48, 31, 40, and 24 percent of RDI, respectively.

**Table 3:** Mean daily intake of food by obese and non-obese women (n=60)

Food Stuffs (g)	RDI (g)	Obese (n=30)	t-value	Non obese (n=30)	t-value
Cereals	270	291±7.89 (108)	2.66**	307±8.77 (114)	4.21**
Pulses	60	44±3.81 (73)	4.19**	44±4.12 (73)	3.88**
Milk & Milk products	300	320±11.29 (107)	1.77 <sup>NS</sup>	311±14.11(104)	0.77 <sup>NS</sup>
Roots & tubers	200	109±6.29 (36)	14.46**	95±4.51 (48)	23.21**
Green leafy vegetables	100	43±8.88(43)	6.41**	31±7.49 (31)	9.21**
Other vegetables	200	75±7.21(38)	17.33**	79±8.54 (40)	14.16**
Fruits	100	21±5.05 (21)	15.64**	24±6.01 (24)	12.64**
Sugar & Jaggery	20	31±2.18(155)	5.04**	29±1.53(145)	5.88**
Fats & Oils	20	47±0.91 (235)	29.67**	48±1.14 (240)	24.56**

Values in parentheses indicate percent RDI \*\*Significant at 1% level, NS = Non-significant

RDI- Recommended Dietary Intake as per Indian Council of Medical Research<sup>4</sup>

As far as Food adequacy was concerned majority of obese women (76.7%) consumed cereals, 100 per cent and above the RDI (Table 4). The remaining 20 and 3.3 per cent of them took cereals 75 to 99.9 and 50 to 74.9 per cent of RDI, respectively. It was found that adequacy of pulses intake by 43.3 per cent of obese women was 50 to 74.9 per cent of RDI. As many as 13.3 and 23.4 per cent of obese women consumed 75 to 99.9 per cent and less than 50 per cent of RDI of pulses, respectively. It was observed that twenty per cent of respondents consumed 100 per cent and above the RDI of pulses. The intake of milk and milk products by the

respondents ranged between adequate and marginally inadequate. The daily intake of roots and tubers by 43.3 per cent of the obese respondents, each, ranged between inadequate and marginally inadequate. The majority of obese respondents (83.3%) consumed inadequate amount of green leafy vegetables. Similarly maximum number of obese respondents i.e. 73.3 and 66.7 per cent, respectively, consumed inadequate amounts of other vegetables and fruits. Majority of respondent's i.e 93.3 and 100 per cent consumed sugar and jaggery and fats and oils, 100 per cent and above the RDI in their diets.

**Table 1:** Adequacy of food intake by obese women (n=30)

Adequacy of food intake	Cereals	Pulses	Milk & milk products	Roots & tubers	Green leafy veg.	Other veg.	Fruits	Sugar and jaggery	Fats and oils
I	23 (76.7)	6 (20.0)	22 (73.3)	1 (3.3)	-	-	-	28 (93.3)	30 (100)
II	6 (20)	4 (13.3)	4 (13.3)	3 (10)	-	2 (6.7)	1 (3.3)	1 (3.3)	-
III	1 (3.3)	13 (43.3)	4 (13.3)	13 (43.3)	5 (16.7)	6 (20)	9 (30)	1 (3.3)	-
IV	-	7 (23.4)	-	13 (43.3)	25 (83.3)	22 (73.3)	20 (66.7)	-	-

I 100 per cent and above the RDI (Adequate)

II 75 to 99.9 per cent of RDI (Marginally adequate)

III 50 to 74.9 per cent of RDI (Marginally inadequate)

IV Less than 50 per cent of RDI (Inadequate) Values in parenthesis indicate per cent.

As far as for non-obese women were concerned it was found that the majority (86.7%) of non-obese women consumed cereals, 100 per cent and above, the RDI and remaining 10 and 3.3 per cent of them took cereals 75 to 99.9 and 50 to 74.9 per cent of RDI, respectively (Table 5). Consumption of pulses among forty per cent of non-obese women was 50 to 74.9 per cent of RDI. As many as 26.6 and 16.7 per cent of non-obese women consumed 75 to 99.9 per cent and less than 50 per cent of RDI of pulses, respectively. Only 16.7 per cent of respondents consumed adequate amount of pulses. Milk and milk products' intake of 63.3, 20 and 13.3 per cent of the

respondents was 100 per cent and above the RDI, 75 to 99.9 per cent of RDI and 50 to 74.9 per cent of RDI, respectively. Majority of the respondents (70%) consumed green leafy vegetables less than 50 percent of RDI and 30 per cent of them consumed green leafy vegetables 50 to 74.9 per cent of the RDI. Fruit intake by 63.3 per cent of non-obese respondents was less than 50 per cent of RDI i.e inadequate intake. Only 6.7 percent of them consumed adequate amounts of fruits. Sugar and jaggery and fats and oils intake of majority of respondent's i.e 93.4 and 100 per cent, respectively was adequate.

**Table 5:** Adequacy of food intake by non-obese women (n=30)

Adequacy of food intake	Cereals	Pulses	Milk & milk products	Roots & tubers	Green leafy veg.	Other veg.	Fruits	Sugar and jaggery	Fats and oils
I	26 (86.7)	5 (16.7)	19 (63.3)	-	-	-	2 (6.7)	28 (93.4)	30 (100)
II	3 (10)	8 (26.6)	6 (20)	-	-	3 (10)	-	1 (3.3)	-
III	1 (3.3)	12 (40)	4 (13.3)	15 (50)	9 (30)	9 (30)	9 (30)	-	-
IV	-	5 (16.7)	1 (3.3)	15 (50)	21 (70)	18 (60)	19 (63.3)	1 (3.3)	-

I 100 per cent and above the RDI (Adequate)

II 75 to 99.9 per cent of RDI (Marginally adequate)

III 50 to 74.9 per cent of RDI (Marginally inadequate)

IV Less than 50 per cent of RDI (Inadequate) Values in parenthesis indicate per cent.

## Discussions

Results of this study indicated that majority of both the obese and non-obese women consumed cereals, milk and milk products, sugar and jaggery and fats and oils, 100 per cent and above the Recommended Dietary Intake (RDI) in their diets. However, none of the obese and non-obese women consumed green leafy vegetables, fruits and other vegetables, 100 per cent and above the Recommended Dietary Intake (RDI) in their diets. Results of present study did not show any significant difference in the current dietary intakes of obese and non-obese women. It is assumed that current dietary intake of obese and non-obese women may not be different since the obese women have been more conscious about their current dietary intake. However, the dietary intake of past years could be the useful information in this regards and definitely was having some correlation. In a previous study patients qualified for bariatric surgery were surveyed for their dietary history and it was observed that animal fleshy foods,

processed foods, sea foods, saturated fatty acids, cholesterol, certain vitamins, phosphorus and sodium were the dominant foods and nutrients in their past diets and insufficient intake of absorbable carbohydrates and dietary fibres was the second reason behind they had become obese [2]. To prevent the incidences of obesity in India it was suggested that one should choose the most health-friendly among our traditions and customs, and apply them to prevent obesity. This may help improve the implementation of an obesity prevention program. It is high time that endocrinologists spearhead a national obesity prevention program in our country, in order to prevent the looming threat of increasing obesity and its complications like diabetes, hypertension, dyslipidemia, cardiovascular disease, cancer, sleep apnea, and osteoarthritis, to name a few [13]. As a disease, obesity is complex due to the involvement of multi-factors therefore, as a solutions approach should be multi-level too. The epidemic of obesity needs to be tackled at the individual level, community level,

and the government level. It needs to be addressed at the socioeconomic level as well as in the biological and the behavioural arenas.

### Conclusion

Out of 60 respondents surveyed 35, 36.67 and 28.33 per cent were in the age group of 30-35, 35-40 and 40-45 years, respectively. Maximum (71.67%) number of the respondents had nuclear families and 28.33 percent were from joint families. Mean daily intake of cereals, milk and milk products, sugar and jaggery and fats and oils among obese women was 291, 320, 31 and 47g, respectively which was higher than their respective RDI. Mean daily intake of cereals, milk and milk products, sugar and jaggery and fats and oils among non-obese women was 114, 104, 145 and 240 percent of RDI, respectively. The mean daily intake of pulses, roots and tubers, green leafy vegetable, other vegetables and fruits among non-obese women was 44, 95, 31, 79 and 24g, respectively which was significantly lower than RDI. Majority of obese and non-obese women consumed cereals, milk and milk products, sugar and jaggery and fats and oils, 100 per cent and above the Recommended Dietary Intake (RDI) in their diets. None of the respondents consumed green leafy vegetables and other vegetables, 100 per cent and above the Recommended Dietary Intake (RDI) in their diets. Consumption of pulses among forty per cent of non-obese women was marginally inadequate. Majority i.e. 98 per cent of respondents were vegetarian while a few (16.67%) of them consumed eggs on daily basis and 96.67 per cent were not consuming meat. There is need to provide nutrition education to the masses for improvement in their food intake to include more of fruits, vegetables, pulses and other protective foods for health protection and promotion.

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