ENERGY INTAKE, ENERGY REQUIREMENT AND ENERGY EXPENDITURE AMONG OVERWEIGHT WOMEN (21 TO 25YEARS) IN HYDERABAD CITY

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Abstract

The study on energy intake, energy requirement and energy expenditure of overweight women was conducted on 90 women aged between 21 to 25 years in Hyderabad city. It is an interventional study conducted in two stages. In stage one the dietary energy intake, the energy requirement and energy expenditure of each subject was assessed and compared to the standards. In stage two the sample were educated on overweight and the dietary nutrient intake and lifestyle. The knowledge of the sample before and after the educational intervention was assessed to study the impact of educational intervention. The food habits of the women were poor, as per their BMI they were overweight and obese and a notable percent of them consumed junk foods and meals less frequently. The physical activity levels of majority of women showed sedentary life styles, the energy intakes of majority of them were below normal though a good percentage of them showed above normal fat intake. The dietary nutrient intake for majority of them was inadequate.

Key words: Overweight women, Body Mass Index, Energy intake, Energy requirement, Energy expenditure

Introduction:

Indians are gaining weight, the prevalence of overweight rose from 2 to 17.1 percentage in recent years [Ramachandran et al., 2010].Traditionally known for malnutrition, Indians now report more and more frequently with overweight, obesity, and their consequences. Indians exhibit unique features of obesity: Express body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, in ectopic sites (such as liver, muscle, and other). Obesity is a major driver for the widely prevalent metabolic syndrome and Type-2 Diabetes Mellitus (T2DM). Although this phenomenon is a global one, India is unique in that it has to grapple with both over and under nutrition at the same time.

The life style and physical activity of women has an influence on their health and quality of life. The dietary energy intake, the energy expenditure and energy requirement are not balanced for majority of women. The lifestyles of women are becoming more sedentary due to lack of exercise and physical activity. The increased availability of convenience, ready prepared and fast foods are making families more dependent on these foods and family meals are partly or wholly are replaced by these foods which are mostly energy dense.

Lack of dietary diversity in food selection, preparation and consumption is contributing to overweight predisposing them to non-communicable diseases like Coronary Vascular Disease, Diabetes and other health problems. Obesity needs to be prevented by assessing energy requirement, energy intake and energy expenditure by making changes in dietary behavior and life style. With this background a study was under taken to study the energy intake, energy requirement and energy expenditure among overweight women (21 to 25years) in Hyderabad city.

Methodology

The study on energy intake, energy requirement and energy expenditure of overweight women was conducted on 90 women aged between 21 to 25 years in Hyderabad city. It is an interventional study conducted in two stages. In stage one the dietary energy intake, the energy requirement and energy expenditure of each subject was assessed and compared to the standards. In stage two the sample were educated on overweight and the dietary nutrient intake and lifestyle. The knowledge of the sample before and after the educational intervention was assessed to study the impact of educational intervention.

Sample selection :

The women aged between 21 to 25 years and looking overweight or obese were selected from post graduate colleges and Institutions in Hyderabad city. The weights and heights of 200 women was measured using a platform type of weighing machine and a Stadiometer. The BMI of each woman was calculated using the formula: Weight in kilograms/ Height in Metres^2. The women who had BMI above 25 were selected for the study, thus 92 women were included in the study. Of which two women dropped out of the study as they planned to join the slimming centre. Thus the final sample was 90 women aged between 21 to 25 years having BMI above 25.

Selection of variables:

The independent variables included in the study were age, marital status, monthly income, education, occupation, domicile, family size and family type.   The dependent variables included in the study were; dietary energy intake, energy requirement, energy expenditure, Body Mass Index, Physical Activity Ratio and knowledge on Overweight.

Tools for measurement of variables :

The variables included in the study were measured using the following tools;

1) Questionnaire: A questionnaire was developed and administered to collect information on personal details, anthropometry, dietary intake (24 hour recall method), BMR ,physical activities performed in a day with duration, knowledge on obesity and energy requirement
2) The Body Mass Index(BMI): The heights of the respondents were measured with the help of a Stadiometer in centimeters and converted to meters. The weights of the sample were measured using plat form type of weighing scale in kilograms. The BMI of each respondent was calculated using, body weight in kilograms divided by height in meters square formula.
3) The dietary nutrient intake: The dietary intake of the sample was collected using ICMRs 24 hour recall method and a set of standardized vessels. From dietary intake of the respondents the energy intake was calculated using Nutritive Value of India Foods (ICMR, 2011). The total dietary energy intake of all the ninety respondents were calculated and recorded.
4) The total energy expenditure : of each subject was calculated from the activities performed by them in a day per minute using of energy cost per activity given in the Dietary guidelines for Indians (ICMR,2011). That is the energy cost all the activities performed in 24 hours or 1440 minutes was calculated for each respondent.

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5) Energy Requirement: The energy requirement of each respondent was calculated using total energy expenditure (TEE) + Basal Metabolic Rate (BMR) + 10 percent of BMR as thermic effect of feeding (TEF).

6) Physical Activity Ratio (PAR): The total energy expenditure of each respondent divided by the Basal Metabolic Rate was considered as PAR (Bamji,2011).

7)   Knowledge on Obesity: A 5 point scale consisting of 20 questions was developed and used to assess the knowledge of the sample on obesity

Data collection:

The tools developed and identified for measurement variables were used for data collection. The data collected was subjected to statistical analysis.

Results and Discussion

The data collected was subjected to statistical analysis and presented in tabels and discussed as under :

1. **Personal and family profile of sample:**

1.1Majority of the women (63 percent) were aged between 24-25 years followed by 13 percent of women aged between 23-24 years, and an equal percentage of women (12percent) were aged between 22-23 years and 21-22 years. This shows that women as they grow older are gaining weight.

1.2. Majority of the women understudy had college or technical or professional education. Only 15 percent of them had high school education. This shows that formal education may not have an influence on maintenance of   normal weight.

1.3. None of the sample was government employees or daily wage earners.   A notable percentage (45 percent) of them was employed in private sector, 38 percent were students, 10 percent were house wives attending training classes and 7 percent were self-employed.

1.4. Majority of the sample (62 percent) had a family monthly income above 50,001 rupees followed by 38 percent of women who had a family monthly income between 30,001 to 50,000 rupees.

1.5. A 82 percent of the women under study belonged to nuclear type of families and 18 percent of them were from joint families. None of the women belonged to extended families. The type of family reflects family structure and decision making power of women, especially in selection and purchase of food materials, which influences the weight and nutritional status of family members.

1.6. A 72 percent of the respondents had a family size of 4 to 7 members, a 10 percent had a family size less than 3 members and 18 percent had a family size above 8 members. This shows that majority of the women had medium size families. Family size also indicates the assistance available in household work, which includes food preparation and service.

2. Dietary nutrient intake:

The dietary nutrient intake of the women understudy was assessed from their 24 hour recall (the menu and food items quantity). The actual dietary intake of energy, protein, carbohydrate and fat of each respondent was compared with the Recommended Dietary Allowance (RDA) and categorized as Below Normal, Normal and Above Normal as shown in

Table 1 .

Table1:Nutritional adequacy of diets consumed by the overweight women

S.No.	Nutrients	Distribution of women as per their Nutritional Adequacy			Total
		Below Normal (%)	Normal (%)	Above Normal (%)	
1	Energy (Kcals)	63	27	10	100
2	Protein(g)	47	37	16	100
3	Carbohydrate(g)	56	39	5	100
4	Fat(g)	2	60	38	100

The table 1 shows that majority (63 percent) of the sample had below normal intakes of energy and carbohydrates (56 percent). A notable percent (47 percent) had below normal intake of protein and a 38 percent of the overweight women had above normal intakes of fat.

According to Prabal Roy (2014) India is currently witnessing rising numbers of people in the middle class who are obese. A lot of the Indian population has started relying on processed foods that contain large percentages of Trans – fat, sugars and other unhealthy and artificial ingredients. Obesity is considered the core of many diseases. Increased weight carries significant health health risks for come concerns, heart diseases and strokes.

3.Food habits and number of meals taken:

The food of the overweight and obese women understudy showed that 87 percent were non-vegetarians, 5 percent were ovo- vegetarians (taking only egg) and 8 percent were vegetarians.

The data collected on number of meals showed that 62 percent were taking three meals in a day meals in a day, 30 percent were taking four meals a day and a 8 percent were taking two meals a day. This shows that majority of sample had food less frequently; consumption of meals less frequently makes a person consume more quantity of food which is also a reason for obesity.

4. Junk food consumption:

Junk food includes snacks, savories, drinks, chocolates, ice creams, and sweets etc., eaten by people. Junk foods are usually tasty, crispy, , colorful and eaten for pleasure or time pass. These foods are rich in fat, sugars, salt and spicy.   They are harmful for health; the women's frequency of consumption of junk foods was collected and presented in table 2.

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Table 2:   Frequency of junk food consumption by the sample

S.No.	Food items	Frequency of junk food consumption and percentage of sample			
		Daily (%)	Weekly (%)	Occasionally (%)	Never (%)
1	Ice creams	-	13	67	20
2	Cakes	-	9	63	28
3	Pizzas and burgers	-	41	52	7
4	Indian Savories	18	49	28	5
5	Chat items	10	36	38	16
6	Indian Snacks	10	13	47	30
7	Indian Sweets	7	58	31	3
8	Manchuria's	-	50	59	11
9	Potato chips	30	52	18	-
10	Noodles	-	50	37	13

The table2 shows that majority of the sample consumed junk foods weekly, only a small percentage consumed regularly and a notable percent of women under study consumed occasionally. The Junk foods, Fast foods, Competitive foods, Ready prepared, Convenience foods are more popular among children, adolescents and young adults as they are easily accessible, tasty, attractively packed, easy to carry , store, easy to thermalize, easy to serve and eat. Today many urban families depend on these foods and include them in their meals as a whole or part of the meal, especially the starters, sweets, savories etc., This inculcates the habit of taking junk and other commercial foods among the young family members. Conscious eating of food is necessary to overcome obesity .
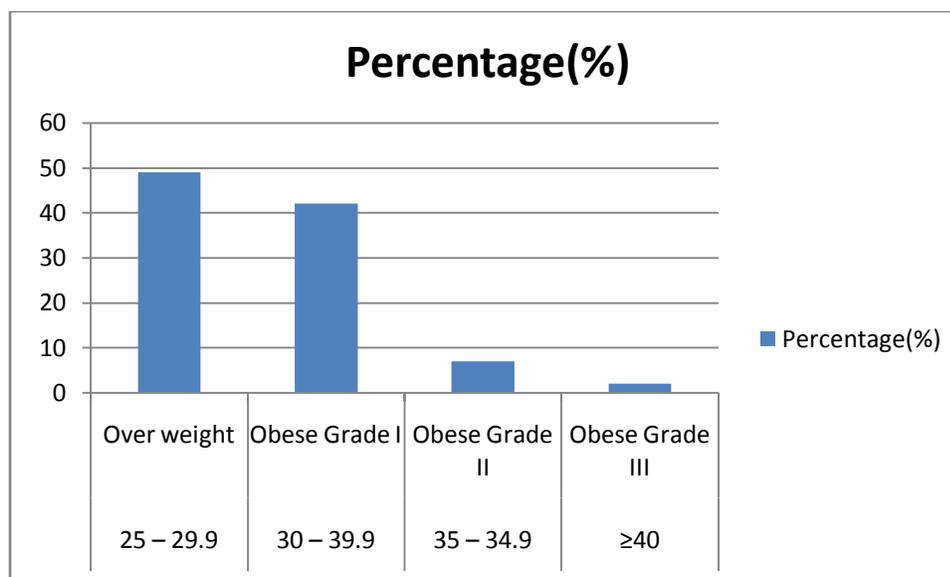
5. Body Mass Index:

The body dimensions of the overweight women; height and weight were measured to calculate their Body Mass Index and categories their obesity; overweight, Grade-I and II obesity.

Table 3: Body Mass Index of the sample

S.No.	BMI	Criteria	Percentage (%)
1	25 – 29.9	Over weight	49
2	30 – 39.9	Obese Grade I	42
3	35 – 34.9	Obese Grade II	7
4	≥40	Obese Grade III	2
Total			100

Figure-1: Body Mass Index of the sample

 The table 3 and figure 1 shows that 49 percent of the sample were overweight, 42 percent were obese grade – 1, a 7 percent were obese grade – II and 2 percent were obese grade - III. Over weight in adults is categorized as Body Mass Index of 25 kg/m2 to 30 kg/m2 and obesity as BMI of more than 30 kg/m2. BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and for all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals (WHO,2016).

6.   Energy Expenditure :

The energy expenditure is the total energy cost of all the activities performed by the respondent. The energy expenditure also includes the Basal Metabolic Rate, energy expended on occupation related activities and non-occupational activities.
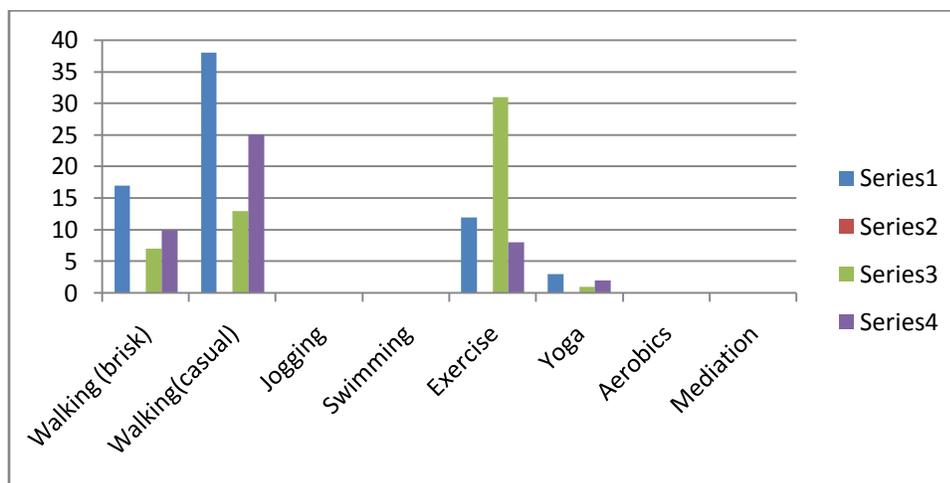
6.1   Physical Activity:

The physical activity done as a planned exercise by the sample was gathered along with the regularity with which exercise was done.

Table 4: Distribution of sample according to their physical activity

S.No.	Type of physical activity	Duration of physical activity		Regularity of physical activity	
		<1 hour (%)	>1 hour (%)	Regular (%)	Not –Regular (%)
1	Walking (brisk)	17	-	7	10
2	Walking(casual)	38	-	13	25
3	Jogging	-	-	-	-
4	Swimming	-	-	-	-
5	Exercise	12	-	31	8
6	Yoga	3	-	1	2
7	Aerobics	-	-	-	-
8	Mediation	-	-	-	-

Figure-2 : Distribution of sample according to their physical activity

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The table 4 and Figure – 2 shows that 38 percent of the women walked casually, a17 percent did brisk walking and a 12 percent of the sample   engaged in walking and 3 percent did Yoga. Around 55 percent did the physical activity regularly and 45 percent were irregular in their respective physical activities. Jakicic et.al.,(1995) conducted a study on 56 overweight women with a BMI of 36kg/m^2, maintaining a caloric intake between 1200 to 1500 kcal/day to assess if physical activity(40 minutes); of multiple bouts result in similar weight loss to one longer bout. A significant(p<0.05) and similar , weight loss for both groups of women and significant increases in cardiorespiratory fitness in both the groups was reported.

6.2   The Physical Activity Level:

The energy expenditure per minute for various activities was taken from Dietary guideline for Indians (ICMR, 2011). The energy expended during 24 hours on various activities were added to arrive at Total Energy Expenditure(TEE) Physical Activity Ratio of each respondent was calculated from their total energy cost and Basal Metabolic Rate. The BMR of the sample was computed using the formula given by FAO/WHO (2004).

Table 5 : Physical Activity Levels of the Sample

S.No.	Life style Category	PAL Value	Percentage of Women
1	Sedentary	1.40 – 1.69	82
2	Active or Moderately active	1.70 – 1.99	18
3	Vigorously active life style	2.00 – 2.40	0

The Physical Activity Level is the total energy expended over 24 hours divided by the energy needed for Basal Metabolism over 24 hours. TEE for 24 hours expressed as a multiple of BMR and calculated as TEE/BMR for 24 hours. Based on PAL of the respondents, they were categorized (WHO, 2004) as sedentary, moderate and vigorous as shown in table 5 . Majority of the sample were found to sedentary according their PAL value (1.40 – 1.69) and only 18 percent had moderate life style (PAL = 1.70 to 1.99).

7.   Relationship between Energy Intake, Energy Expenditure And Energy Requirement

 The association between the dietary energy intake, expenditure and energy requirement was calculated using chi square test shown in table – 12

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Table 6 : Association between energy intake, energy expenditure and energy requirement of the sample

S.No.	Variables	Chi Square value	P value	Value of Significant
1	Energy expenditure	3.4702	0.9427	@
2	Energy requirement	9.4196	0.399	@

@ - Not significant at 0.01 level

The table 6 shows that there is no association between energy intake, energy expenditure and energy requirement of the women study. Obesity is complex issue that requires a multifaceted approach to result in success. Although it is clearly a gene- environment interaction , the onus is still placed on greater energy expenditure combined with decreased energy intake (Stella Lucia Volpe,2009).

8. Association between BMI and dietary nutrient intake
The chi square was used to study the association between the BMI and dietary nutrient intake of the women under study.
Table 7 Association between BMI AND DIETARY NUTRIENT INTAKE

S.No.	Name of the nutrient	Chi Square value	P value	Value of Significant
1	Energy(k cal)	9.4196	0.399	@
2	Protein(g)	12.0714	0.4399	@
3	Carbohydrates(g)	11.9808	0.4472	@
4	Fat(g)	6.8545	0.8670	@

From table – 13 it is evident that there is no association between the BMI and dietary nutrient intake of the sample. The maintenance of weight loss in probably the most difficult phase of many weight loss programmes. After a person feels successful in losing weight,   she often returns to eating the amount of foods consumed before weight loss and decrease physical activity,. Though there may be many psychological and even perhaps physiological, reasons behind this. There are practical ways in which people can incorporate physical activity into their daily routine. Which helps in increasing energy expenditure and maintain weight loss and / or prevent weight gain

9. Nutrition Education:
The knowledge of the sample before and after education programme was assessed on a five point scale to know the effect of education programme. The education was a simple one to high light the foods to be consumed liberally, foods to consumed moderately and foods to be avoided and also to stress on regular physical activity.

The five point knowledge scale consisted of fourteen items. The minimum score was 14 and maximum score was 70. The respondents were asked to rate for each statement as; 5 strongly agree, 4 agree, 3 do not know, 2 do not agree, 1 strongly do not agree. Each respondents score for all 14 statements was calculated before and after the education programme and subjected to t – test. It was found that the t – value was 1.98 and table value was 1.96 which is significant at 0,1 percent level. Which shows that the women under study differed significantly after the education programme in their knowledge on obesity. Thus the education on obesity and physical activity was effective.

Conclusion:

The study carried out on ;the ;energy intake, energy requirement and expenditure on ninety over weight women in Hyderabad allows to conclude that the food habits of the women were poor, as per their BMI they were overweight and obese and a notable percent of them consumed junk foods and meals less frequently. The physical activity levels of majority of women showed sedentary life styles, the energy intakes of majority of them were below normal though a good percentage of them showed above normal fat intake. The dietary nutrient intake for majority of them was inadequate. There was no association found between the energy of the intake, energy requirement and energy expenditure. This may be due to their changed behavior to reduce weight. The knowledge of the women understudy on obesity was poor before the education and has improved significantly after the education. The education was a simple one to promote physical activity, consume low calorie foods like green leafy vegetables, other vegetables and indigenous fruits liberally, to eat moderately the poultry products, milk and fruits (calorie rich fruits) and to avoid junk foods, calorie rich and refined foods. Further   to increase the frequency of small meals to avoid eating bulk meals.

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