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Original Research Article

Assessment of Socio-Demographic Profile, Nutritional Status, Nutrient Intake and Food Consumption Pattern of Overweight and Obese Vegetarian, Eggitarian and Non-Vegetarian Women

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ABSTRACT

This cross sectional study investigates the association between nutritional status and dietary intake among vegetarian, eggitarian and non-vegetarian overweight and obese working women. Two hundred overweight and obese working women of Banaras Hindu University, Varanasi (respondents) were selected for this study by purposive sampling technique. Pretested and predesigned questionnaire - cum - interview schedule was used for data collection. Nutritional status of the respondents were assessed by using parameters like body mass index (BMI), waist circumference (WC), waist - hip-ratio (WHR), visceral fat (VF) and percent body fat (PBF). Anthropometric measurements were taken by using standard technique (Jeliffe, 1966). The values of PBF and VF were taken by Omron Body Composition Monitor; HBF 212. Dietary intake of the respondents was assessed by food consumption pattern and nutrient intake by 24 hour dietary recall method. The result revealed that there is a significant association between height ($F= 8.20$, $P < 0.001$) and weight ($F= 5.33$, $P < 0.01$) with food habits of respondents i.e. among vegetarian, eggitarian and non-vegetarian respondents. In context of nutrient intake, it was observed that the protein, carbohydrate, calcium, phosphorus and total fibre of all the respondents were greater than recommendation i.e. RDA 2010. There was no significant association found between nutrient intake of the respondents with their food habits except in the case of calcium ($F=5.24$, $P < 0.01$). Through food consumption pattern it was observed that all respondents include wheat daily in their diet. Significant difference was found between intake of rice, roots and tuber, fruits, egg, mustard oil and sugar and jaggery with food habits of respondents. Based on these findings, it was concluded that respondents include diet according to the recommendation as well as develop pattern of physical activity in many forms like yoga, running, stair workout, exercises etc to remain fit and healthy throughout their life course.

Keywords: nutritional status, anthropometric measurement, food consumption pattern, nutrient intake.

INTRODUCTION

Overweight and obesity is a major public health concern of today's era and become a global pandemic now. According to World Health Organization (WHO) statistics it was reported that 39 percent of adult aged 18 years or above were overweight in 2014 and 13 percent were obese. [1] It has also been projected that by 2025, approximately 3 billion people will be overweight worldwide; of these 700 million will be obese. [2] The most common form of obesity which affects the general population is the polygenic form which results from the long term positive energy balance and if this process persists for long time then obesity

develops. The balance between the energy intake and expenditure is influenced by a complex interplay of genetic, environment and social factor. [3,4]

Overweight and obesity is the major risk factor for cluster of diseases like menstrual dysfunction, hypertension, high cholesterol, cardiovascular diseases, respiratory problems as well as several types of cancer. It is prevalent among all the age groups and is on rise among adults especially women in both developed as well as in developing countries. [5,6] Previous studies show that women are more prone to putting on weight at three stages i.e. at puberty, after pregnancy and menopause.

Nutrition transition also plays a dramatic role in increasing the prevalence of overweight and obesity. This includes changes in dietary habits, excessive consumption of energy dense food, breakfast skipping, lack of exercise/physical activity, disorders of endocrine system and genetic predisposition. [7] Therefore, the attempt of this research paper is to discover the association of food habits with nutritional status, dietary intake and food consumption pattern of respondents.

METHODOLOGY

SELECTION OF RESPONDENTS

The present study has been carried out on total 200 respondents between the age group of 23-64 years, who were selected by purposive sampling technique from Banaras Hindu University, Varanasi, and Uttar Pradesh, India. The data were collected from all the respondents with the help of well-designed questionnaire - cum - interview schedule.

ETHICAL CONSIDERATIONS

The studies were conducted under the rules and regulation of Institute Ethical Committee, IMS, BHU (Ethical Committee Letter Number - Dean/2012-13/183).

Inclusion criteria

The enrolment of participants was based on their range of BMI i.e. only those respondents were selected whose BMI was more than 24.9 which is the upper limit of normalcy as per the guidelines of NHLBI Obesity Education Initiative 2000 and Report of WHO Expert Consultation 2008. [8,9]

Exclusion criteria

The BMI range of less than 24.9, pregnant women as well as those who have some hormonal aberrations was excluded from this present study.

SOCIO - DEMOGRAPHIC PROFILE

This section deals with the general characteristics of the respondent i.e. about their age, marital status, type of family, religion, education, occupation, family income per month, socio - economic status [10] and physical activity level (PAL). [11]

ANTHROPOMETRICAL PARAMETERS

By using the standard protocol, height and weight of the respondents were measured [12] and then BMI was calculated by dividing weight in kilograms by height in meters square. [13] After that BMI was categorized based on standards i.e. NHLBI Obesity Education Initiative 2000 and Report of WHO Expert Consultation 2008 were utilized for the assessment of obesity as given below: [8,9]

World Body Mass Index (BMI) kg/m^2	Classification
>18.50	Underweight
18.5- 24.9	Normal
25.0-29.9	Overweight
30.0 - 34.9	Grade I obese
35.0 - 39.9	Grade II obese
> 40.0	Grade III obese

For the assessment of abdominal obesity, waist and hip circumference measurement was taken. Waist hip ratio (WHR) was calculated by dividing the waist circumference and hip circumference. As per classification of WHO Expert Consultation 2008, cut off values used for WC and WHR in the present study are as given below: [13]

Indicator	Cut off points	Risk of metabolic complications
Waist circumference	<80cm for women	Normal
	>80 cm for women	Increased risk
Waist- hip ratio	≥0.85 for women	Substantially increased
	< 0.85 for women	Normal

Omron Body Composition Monitor (HBF 212) was used to assess the visceral fat (VF) and percent body fat (PBF) of the respondents. As per Omron Body Composition guidelines, the cut off values used for VF and PBF for the assessment of abdominal obesity and percentage of fat in the body are as given below: [14]

Visceral fat level	Classification
1 - 9	Normal
10 - 14	High
15 - 30	Very high

Percent body fat	Classification
20.00 - 29.99	Normal
30.00 - 34.99	High
35.00 - 50.00	Very high

DIETARY ASSESSMENT

For the assessment of food consumption pattern frequency of food groups eaten by the respondents were recorded. The 24 hour dietary recall method was used to evaluate the nutrient intake of the respondents. The household measurements were used for the computation of portion sizes included in their meal which was later converted into metric system and then analyzed with the help of nutritive value of Indian foods. [15] The intake was then compared with recommended dietary allowances. [16]

Statistical analysis

Statistical analysis was performed by using trial version of Statistical Package of Social Sciences (SPSS) Version 20.0. The data was analyzed by using descriptive statistics such as frequency, percentage, mean and standard deviation. For determining the significance between the variables chi square test and F- test were used. To find correlation between the parameters Pearson correlation coefficient was used. Turkey HSD (post hoc) test was used to assess the significant pairs.

RESULTS

The demographic data of all the respondents are shown in Table 1. The table represents that75.5 percent of respondent were vegetarian, 6.7 percent of them were eggitarian in the age group of > 50 years whereas 56.9 percent of respondents were non vegetarian in the age group of ≤ 35 years. There is highly significant association found between age and food habits of respondents. In context of marital status, it was found that 61.9 percent of vegetarian respondents were widow and 50.3 percent of non-vegetarian respondents were married. It was also found that 49.2 percent and 50 percent of vegetarian respondents live in nuclear and joint family respectively.

In context of religion, it was found that 56.9 percent of vegetarian respondents were Hindu. In spite of this, 93.8 percent and 100 percent of non-vegetarian respondents were Muslim and Christian respectively. In the arena educational qualification, 67.8 percent of vegetarian respondent have educational qualification of graduation and above. In context of occupation 75 percent of vegetarian respondents were in high profession. It was also observed that 73.2 percent of vegetarian respondent have the family income per month of Rs. ≥36,997 and 88.2 percent of non-vegetarian have family income per month ranges between Rs. 5,547- 9,248. In context of socio-economic status 74.3 percent of vegetarian respondent lies in upper socio economic status and 87.5 percent of non-vegetarian lie in upper lower category of socio - economic status. Above all in context of physical activity level (PAL), it was observed that 68 percent of eggitarian respondents were in sedentary lifestyle category and 83.4 percent of non-vegetarian respondents were in moderate type of lifestyle category. There is highly significant association found between food habits of respondents and religion, educational qualification, occupation, income per month, SES and PAL.

Table No. 1: Socio-demographic distribution of respondents according to their food habits.

Characteristics	Food Habits							
	Vegetarian		Eggitarian		Non- vegetarian		Total	
	No.	%	No.	%	No.	%	No.	%
Age								
≤35 years	26	40.0	2	3.1	37	56.9	65	100.00
36-50 years	39	43.3	3	3.3	48	53.4	90	100.00
> 50years	34	75.5	3	6.7	8	17.8	45	100.00
Total	99	49.5	8	4	93	46.5	200	100.00
Statistical Significance χ^2 =19.49, df = 4, P < 0.001								
Marital status								
Single	11	78.6	1	7.1	2	14.3	14	100.00
Married	75	45.5	7	4.2	83	50.3	165	100.00
Widow	13	61.9	0	0.0	8	38.1	21	
Statistical significance χ^2 = 8.76, df = 4, P >0.05								
Type of family								
Nuclear	59	49.2	6	5.0	55	45.8	120	100.00
Joint	40	50.0	2	2.5	38	47.5	80	100.00
Statistical significance χ^2 = 0.79, df = 2, P >0.05								
Religion								
Hindu	99	56.9	7	4.0	68	39.1	174	100.00
Muslim	0	0.00	1	6.2	15	93.8	16	100.00
Christian	0	0.00	0	0.00	10	100.00	10	100.00
Statistical significance χ^2 = 31.29, df = 4, P < 0.001								
Educational Qualification								
Profession	22	64.7	3	8.8	9	26.5	34	100.00
Graduate or Postgraduate	61	67.8	3	3.3	26	28.9	90	100.00
Intermediate	5	41.7	0	0.0	7	58.3	12	100.00
High School	4	57.1	0	0.0	3	42.9	7	100.00
Middle School	4	20.0	1	5.0	15	75.0	20	100.00
Primary School	0	0.0	0	0.0	5	100.00	5	100.00
Illiterate	3	9.4	1	3.1	28	87.5	32	100.00
Statistical significance χ^2 = 54.90, df = 12, P < 0.001								
Occupation								
Profession	54	75.0	4	5.6	14	19.4	72	100.00
Semi – profession	11	45.8	1	4.2	12	50.0	24	100.00
Clerical	17	65.4	1	3.8	8	30.8	26	100.00
Skilled	3	75.0	0	0.0	1	25.0	4	100.00
Semi – skilled	4	33.3	0	0.0	8	66.7	12	100.00
Unskilled	10	16.1	2	3.2	50	80.7	62	100.00
Statistical significance χ^2 = 56.90, df = 10, P < 0.001								
Family income per month (in Rs.)								
≥36,997	41	73.2	3	5.4	12	21.4	56	100.00
18,498-36,996	34	58.6	3	5.2	21	36.2	58	100.00
13,847 – 18,497	10	76.9	0	0.0	3	23.1	13	100.00
9,249 – 13,873	9	40.9	1	4.5	12	54.6	22	100.00
5,547-9,248	5	9.8	1	2.0	45	88.2	51	100.00
Statistical significance χ^2 = 57.23, df = 8, P < 0.001								
Socio-economic status (SES)								
Upper	52	74.3	4	5.7	14	20.0	70	100.00
Upper-middle	30	60.0	1	2.0	19	38.0	50	100.00
Lower-middle	11	45.8	2	8.4	11	45.8	24	100.00
Upper- lower	6	10.7	1	1.8	49	87.5	56	100.00
Statistical significance χ^2 = 61.31, df = 6, P < 0.001								
Physical activity level (PAL)								
Sedentary	95	55.9	7	4.1	68	40.0	170	100.00
Moderate	4	13.3	1	3.3	25	83.4	30	100.00
Statistical significance χ^2 = 19.66, df = 2, P < 0.001								

Table No. 2: Mean and standard deviation of health parameters according to their food habits.

Nutrient intake	Food Habits			Statistical Significance
	Vegetarian (I) (n = 99)	Eggitarian (II) (n=8)	Non – vegetarian (III) (n=93)	
Height (cm)	153.91 ± 6.45	152.00 ± 4.28	150.01 ± 7.03	F= 8.20, P < 0.001
Weight (kg)	66.27 ± 8.44	66.88 ± 9.48	62.30 ± 8.35	F= 5.33, P < 0.01
BMI (kg/m^2)	27.94 ±2.80	27.88 ± 4.49	27.60 ± 2.79	F= 0.37, P > 0.05
WC (cm)	88.04 ± 8.40	81.50 ± 2.83	87.95 ± 8.09	F= 2.46, P > 0.05
WHR	0.89 ± 0.06	0.91 ± 0.07	0.87 ± 0.05	F= 2.28, P > 0.05
VF	10.53 ± 4.72	8.63 ± 3.02	10.37 ± 4.02	F= 2.51, P > 0.05
PBF	37.11 ± 3.17	37.25 ± 4.17	36.11 ± 3.14	F= 0.71, P > 0.05

All values are in mean ± S.D and Post- hoc turkey significant difference test is used.
Height: I vs. III, Weight: I vs. III

Table No. 3: Mean and standard deviation of nutrient intake according to their food habits.

Nutrient intake	Food Habits			Statistical Significance
	Vegetarian (I) (n=99)	Eggitarian (II) (n=8)	Non – vegetarian (III) (n=93)	
Energy (kcal)	1914.79 ± 345.67	1975.12 ± 325.33	1837.09 ± 342.75	F= 1.54, P > 0.05
Protein (g)	61.50 ± 13.40	62.75 ± 8.73	59.33 ± 12.15	F= 0.82, P > 0.05
Fat (g)	40.29 ± 12.61	33.88 ± 8.84	37.27 ± 13.44	F= 1.89, P > 0.05
Carbohydrate (g)	318.09 ± 63.79	333.00 ± 76.77	311.17 ± 64.66	F= 0.58, P > 0.05
Calcium (mg)	853.11 ± 260.47	801.25 ± 342.70	728.17 ± 268.32	F= 5.24, P < 0.01
Phosphorus (mg)	1527.27 ± 388.32	1552.63 ± 311.82	1437.10 ± 284.82	F= 1.83, P > 0.05
Iron (mg)	18.75± 5.42	19.00 ± 3.74	17.85 ± 4.94	F= 0.80, P > 0.05
Total fibre (g)	47.21 ± 13.24	50.38 ± 8.19	46.33 ± 12.34	F= 0.42, P > 0.05

All values are in mean ± S.D and Post- hoc turkey significant difference test is used.

Calcium: I vs. III

Table No. 4: Food consumption pattern of respondents according to food habits (from last two month)

Food Groups		Cereals		Pulses & Legumes	Vegetables			Fruits	Non - Veg			Milk & its products	Food cooking medium			Sugar & Jaggery
Food Habits	Consumption pattern	Wheat	Rice		Green leafy vegetables	Other Vegetables	Roots & Tubers		Meat	Fish	Egg		Refine Oil	Mustard oil	Desi ghee	
VEGETARIAN	D	99 (100.00)	66 (66.7)	82 (82.8)	42 (42.4)	89 (89.9)	80 (80.9)	58 (58.6)	--	--	--	89 (90.0)	66 (66.7)	91 (92.0)	50 (50.4)	90 (91.0)
	A	--	14 (14.1)	12 (12.1)	19 (19.2)	8 (8.1)	13 (13.1)	12 (12.1)	--	--	--	3 (3.0)	10 (10.1)	4 (4.1)	6 (6.1)	1 (1.0)
	W	--	10 (10.1)	4 (4.0)	28 (28.3)	2 (2.0)	2 (2.0)	18 (18.2)	--	--	--	4 (4.0)	11 (11.1)	2 (2.0)	5 (5.1)	1 (1.0)
	M	--	0 (0.0)	--	4 (4.0)	--	0 (0.0)	4 (4.0)	--	--	--	--	3 (3.0)	--	6 (6.1)	1 (1.0)
	S	--	8 (8.1)	1 (1.0)	5 (5.1)	--	4 (4.0)	7 (7.1)	--	--	--	2 (2.0)	7 (7.1)	1 (1.0)	20 (20.2)	2 (2.0)
	N	--	1 (1.0)	--	1 (1.0)	--	--	0 (0.0)	99 (100.00)	99 (100.00)	99 (100.00)	1 (1.0)	2 (2.0)	1 (1.0)	12 (12.1)	4 (4.0)
EGGITARIAN	D	8 (100.00)	4 (50.0)	8 (100.0)	2 (25.0)	8 (100.00)	6 (75.0)	4 (50.0)	--	--	2 (25.0)	6 (75.0)	4 (50.0)	8 (100.00)	0 (0.0)	7 (87.5)
	A	--	1 (12.5)	0 (0.0)	2 (25.0)	0 (0.0)	0 (0.0)	2 (25.0)	--	--	1 (12.5)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	--	1 (12.5)	0 (0.0)	3 (37.5)	0 (0.0)	1 (12.5)	0 (0.0)	--	--	2 (25.0)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)
	M	--	1 (12.5)	--	1 (12.5)	--	1 (12.5)	0 (0.0)	--	--	2 (25.0)	--	1 (12.5)	--	1 (12.5)	0 (0.0)
	S	--	1 (12.5)	0 (0.0)	0 (0.0)	--	0 (0.0)	2 (25.0)	--	--	1 (12.5)	1 (12.5)	1 (12.5)	0 (0.0)	6 (75.0)	0 (0.0)
	N	--	0 (0.0)	--	0 (0.0)	--	--	0 (0.0)	8 (100.00)	8 (100.00)	0 (0.0)	0 (0.0)	1 (12.5)	0 (0.0)	1 (12.5)	1 (12.5)
NONVEGITARIAN	D	93 (100.00)	77 (82.8)	80 (85.9)	24 (25.8)	86 (92.4)	82 (88.2)	23 (24.7)	--	2 (2.2)	4 (4.3)	54 (58.0)	42 (45.1)	79 (84.9)	21 (22.6)	85 (91.3)
	A	--	8 (8.6)	5 (5.4)	15 (16.1)	5 (5.4)	3 (3.2)	11 (11.8)	3 (3.2)	4 (4.3)	25 (26.9)	10 (10.8)	8 (8.6)	5 (5.4)	4 (4.3)	1 (1.1)
	W	--	4 (4.3)	6 (6.5)	47 (50.5)	2 (2.2)	4 (4.3)	27 (29.0)	30 (32.3)	36 (38.6)	39 (41.9)	6 (6.5)	11 (11.8)	4 (4.3)	4 (4.3)	1 (1.1)
	M	--	1 (1.1)	--	5 (5.4)	--	0 (0.0)	10 (10.8)	30 (32.3)	21 (22.6)	13 (14.9)	--	4 (4.3)	--	6 (6.5)	2 (2.2)
	S	--	3 (3.2)	2 (2.2)	2 (2.2)	--	4 (4.3)	20 (21.5)	23 (24.7)	24 (25.8)	7 (7.5)	14 (15.0)	22 (23.7)	3 (3.2)	34 (36.5)	0 (0.0)
	N	--	0 (0.0)	--	0 (0.0)	--	--	2 (2.2)	7 (7.5)	6 (6.5)	5 (5.4)	9 (9.7)	6 (6.5)	2 (2.2)	24 (25.8)	4 (4.3)
χ^2			21.11	5.07	14.24	1.35	33.93	31.97	--	--	95.37	18.72	3.91	30.03	3.96	29.31
df			10	6	10	4	8	10	--	--	5	10	8	10	10	8
P			<0.05	>0.05	>0.05	>0.05	<0.001	<0.001	--	--	<0.001	<0.05	>0.05	<0.01	>0.05	<0.001

Here, D = Daily, A = Alternate, W = Weekly, M = Monthly, S = Sometimes and N = Not consume.

In context of pulses and legumes it was found that 82.9 of vegetarian respondents and 80 percent of non-vegetarian respondents include daily in their diet. In context of green leafy vegetables it was interpreted that 42.4 percent of vegetarian and 25.8 percent of non-vegetarian respondents include daily in their diet. It was also observed that 89.9 percent of vegetarian, 100 percent of eggitarian respondents and 92.4 percent of non-vegetarian respondents include daily in their diet. It was also found that 80.9 percent of vegetarian respondents, 75 percent of eggitarian respondents and 88.2 percent of non-vegetarian respondents includes roots and tubers daily in their diet. In context of fruit intake it was found that 58.6 percent of vegetarian respondents and 50 percent of eggitarian respondents include daily in their diet but 29 percent of non-vegetarian include weekly in their diet. In spite of these it was found that 32.3 percent of non-vegetarian include meat weekly and monthly in their diet. However, 38.6 percent and 41.9 percent of non-vegetarian respondents include fish and egg weekly in their diet respectively. It was also observed that 66.7 percent of vegetarian respondents, 50 percent of eggitarian respondents and 45 percent of non-vegetarian respondents include milk daily in their diet. In context of cooking medium, it was observed that 66.7 percent of vegetarian respondents, 50 percent of eggitarian and 45 percent of non-vegetarian respondents include refined oil daily in their diet. It was also observed that 92 percent of vegetarian, 100 percent of eggitarian and 84.9 percent of non-vegetarian respondents include mustard oil daily in their diet. In context of desi ghee, it was found that 50 percent of vegetarian respondents include daily in their diet but 75 percent of eggitarian respondents and 36.5 percent of non-vegetarian respondent include sometime in their diet. In context of sugar and jaggery, it was found that 91 percent of vegetarian, 87.5 of eggitarian and 91.3 percent of non-vegetarian respondents include daily in their diet. There is significant association exist between the consumption of rice, roots and tubers, fruits, eggs, milk and its products, mustard oil and sugar and jaggery with the different food habits of the respondents.

DISCUSSION

Overweight and obesity are driving the global pandemic of today's era. Reported in some papers that the pandemic of obesity was originated from U.S and crossed to Europe and other rich nations before it penetrated in world's poorest countries especially in urban areas. [17] But now-a-days the burden of obesity affects both developed as well as developing countries. Reported in various papers that the pandemic is transmitted through the vectors of subsidized agriculture and by multinational companies providing cheap, highly refined fat and oils and carbohydrates, labour saving mechanized devices, affordable motorized transport and the seductions of sedentary pastime such as television, playing games on computer etc. [17]

Our findings indicated that maximum i.e. 75.5 percent of respondents were vegetarian in the age group of greater than 50 years and only 6.7 percent and 17.8 percent were eggitarian and non-vegetarian respectively, in the age group of > 50 years. It was also observed that 74.3 percent of vegetarian respondents were in upper socioeconomic status category and 83.4 percent of non-vegetarian respondents have moderate type of physical activity level (PAL).

As we know that overweight and obesity have an adverse effect on health via metabolic changes and the increased mass is due to increased fat. The pathophysiology of fat is best ascertained when viewing adipose as an endocrine cell comprising of a larger endocrine organ. The excess dietary calories leads to an increase in size and number of fat cells that results in excess fat mass as well as metabolic changes and hence leads to metabolic aberrations. [18,19] The overweight and obesity are measured by

various health parameters. To find out the risk of metabolic aberration in respondents, comparison between different types of food habits with various types of health parameters was done. Previously reported in papers that BMI was lowest among vegetarians (25.7 kg/m^2), intermediate in semi-vegetarians (27.6 kg/m^2) and highest in non-vegetarian (29.9 kg/m^2). But, adverse result was interpreted in present study i.e. BMI of all respondents of all food habits was almost equal. It was also reported in several papers that central adiposity is an important risk factor for disorders such as type II diabetes and cardiovascular diseases and was considered to play an important role in the development of these diseases than the total amount of body fat. [20-24] It was also reported in various papers that computed tomography scans and magnetic resonance imaging methods are accurate for assessing the central adiposity but they are expensive and difficult to apply on epidemiological studies. [24,25] The World Health Organisation (WHO) recommends that anthropometric measurements such as waist circumference (WC) and waist - to - hip ratio (WHR) are adequate and accurate indicator of abdominal obesity. [24,26] It was found in the present study that the waist circumference was higher among vegetarian respondents and in context of WHR it was higher among eggitarian respondents.

Diet also plays a leading role in developing the nutritional disorders like overweight, obesity, type II diabetes etc. In this context, nutrient intake of respondents according to their food habits was calculated. There is no significant association exist between nutrient intake of the respondents and food habits except in the case of calcium. Since calcium plays a key role in bone health and is involved in vascular contraction, neural transmission and glandular secretion. [27,28] Several cross sectional and longitudinal studies have widely reported that calcium has an effect on hypertension, metabolic syndrome and obesity regulation. [28-32] The mechanism behind the anti-obesity effect of calcium is reduction in the intracellular calcium concentration of adipose cells, thereby preventing the storage of fat in these cells through inhibition of lipogenesis and stimulation of lipolysis and thus reducing weight gain. [28,31] Several papers reported that the adult population is not reaching the recommended daily calcium intake in various countries [28,33,34] but converse result is found in this present study according to the recommendation i.e. RDA 2010.

Food consumption pattern is also one of the important parameter that reflects the dietary pattern of the individual. Dietary pattern can be defined as set of foods commonly consumed by a specific population and may be explained by using food intake reports or methods for estimating the food availability. [24,35] Therefore, this approach provides a more realistic reflection of food habits of the group of interest because it reveals the overall dietary pattern rather than isolated estimates of energy and nutrient intake or general food intake. [24,36,37] In the present study, it was elucidated that the roots and tuber consumption of all the respondents irrespective of their food habits was 75 percent or above which is quite high on daily basis while the fruit intake of all the respondents of all the food habits was low on daily basis. Previous studies shows that fruits and vegetables consumption was found to be associated with decreased incidence of diabetes and mortality from various metabolic disorders including obesity, hypertension and cardiovascular diseases. [38] It was also estimated that insufficient intake of fruits and vegetables may cause approximately (14%) of gastrointestinal cancer worldwide, (10%) in Africa and, (3%) in Nigeria; approximately (11%) of ischemic heart disease deaths and about 9% stroke deaths globally. [39] From previous studies, it was also found that 8.3% burden of diseases was also attributed to low fruits and vegetables intakes worldwide. [40] Therefore, it was suggested to the respondents that fruits must be included in

their diet on daily basis and include non - starchy roots and tuber mainly in their diet.

CONCLUSION

Etiologically, overweight and obesity can be stated as imbalance in energy intake and energy expenditure. The present study demonstrated that the nutritional status of the respondents does not totally depends upon food habits of respondents but many other factors like physical activity, lifestyle, dietary pattern, frequency of eating outside, genetic predisposition etc also plays role in individual health status. Therefore, it is recommended to the respondents of all the food habits that develop regular pattern of physical activity in many forms like yoga, running, stair workout, exercises etc to remain fit and healthy throughout their life course. In spite of these, some dietary manipulations are also required in their diet according to their recommendations for combating the problem of weight gain i.e. overweight and obesity.

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REFERENCES

1. World Health Organisation. Obesity and overweight, Fact sheet N°311, Updated on January 2015. Available from: http://www.who.int/mediacentre/factsheets/fs311/en/.
2. World Health Organization. Obesity and overweight: What are overweight and obesity? Geneva; 2006.
3. Achike FI, To NHP, Wang H and Kwan CY. Obesity, metabolic syndrome, adipocytes and vascular function: a holistic viewpoint. Clin. Exp. Pharmacol. Physiol. 2011; 38(1):1-10.
4. Emanuela F, Grazia M, Marco R, Paola LM, Giorgio F and Marco B. Inflammation as a link between obesity and metabolic syndrome. Journal of Nutrition and Metabolism. 2012; 1-7.
5. Wang Z, Hoy WE. Waist circumference, body mass index, hip circumference and waist-hip- ratio as predictors of cardiovascular disease in Aboriginal people. Eur J ClinNutr.2004; 58: 888-893.
6. Flegal KM. Epidemiologic aspects of overweight and obesity in United States. Physiol Behav. 2005; 86: 57-62.
7. OECD: Overweight and obesity in OECD Factbook 2011-2012: Economic, Environmental and Social Statistics, OECD Publishing; 2011. Available from: http:// dx.doi.org /10.1787/ factbook-2011-109-en.
8. The Practical Guide Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, National Institute of Health, 2000 (NIH Publication Number 00-4048). Available from: http://www.nhlbi.nih.gov/files/docs/guidelines/prctgd_c.pd.
9. Waist circumference and Waist Hip Ratio: Report of a WHO Expert Consultation, Geneva, December 8-11, 2008.
10. FAO: Food and Nutrition Technical Report Series, Human Energy Requirement, Report of a Joint FAO/WHO/UNU Expert Consultation Rome, 2001: 35 - 38.
11. Oberoi SS. Updating Income Ranges for Kuppuswamy Socio - Economic Status Scale for the year 2014. Indian Journal of Public Health, 2014; 59 (2).
12. Jelliffe DB. The assessment of nutritional status of the community: WHO monograph, No. 53, Geneva; 1966.
13. Garrow JS, Webster J. Quetelet's index (W/H2) as a measure of fatness. Int J Obes1985; 9:147-153.
14. Omron Body Composition monitor, Model HBF- 212 (HBF - 212- IN), Karada Scan.
15. Gopalan C, Sastri BVR, Balasubramanian SC et al. Nutritive

value of Indian foods: Food composition tables (Reprinted revised edition) Hyderabad: National Institute of Nutrition; 2007.
16. A Report of the Expert Group of the Indians Council of Medical Research. Final Draft: Nutrient Requirements and Recommended Dietary Allowances for Indians, National Institute of Nutrition, ICMR: Hyderabad; 2009.
17. Prentice AM. The emerging epidemic of obesity in developing countries. Int. J. Epidemiol. 2006; 35: 93-99.
18. Bray GA. Medical consequences of obesity. J. Clin. Endocrinol. Metab. 2004; 89: 2583 - 2589.
19. Sullivan D. Association between vegan, vegetarian and omnivorous diets and overweight and obesity, Walden University Scholar Works. 2011.
20. Lemos-Santos MGF, Valente JG, Gonçalves-Silva RMV et al. Waist circumference and waist-to hip ratio as predictors of serum concentration of lipids in Brazilian Men. Nutrition. 2004; 20:857-62.
21. Chen CC, Wang WS, Chang HY et al. Heterogeneity of body mass index, waist circumference, and waist-to-hip ratio in predicting obesity- related metabolic disorders for Taiwanese aged 35-64y. Clin Nutr. 2009; 28:543-8.
22. Oliveira LPM, Assis AMO, Silva MCM et al. Factors associated with overweight and abdominal fat in adults in Salvador, Bahia, Brazil. Cad Saude Publica, Rio de Janeiro. 2009; 25(3):570-82.
23. Sousa TF, Nahas VM, Silva DAS et al. Factors associated with central obesity in adults from Florianopolis, Santa Catarina: a population based-study. Rev Bras Epidemiol. 2011;14:296-309
24. Vilela AAF, Sichieri R, Pereira RA. Dietary patterns associated with anthropometric indicators of abdominal fat in adults. Cad. Saude Publica, Riode Janeiro. 2014; 30(3): 502-510.
25. Dalton M, Cameron AJ, Zimmet PZ et al. Waist circumference, waist hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults. J Intern Med. 2003; 254:555-63.
26. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 1998. (WHO Technical Report Series, 894).
27. Otten JJ, Hellwig JP, Meyers LD. Dietary Reference Intake: the essential guide to nutrient requirements. Washington: The National Academies Press; 2006.
28. Eilat-Adar S, Xu J, Loria C et al. Dietary calcium is associated with body mass index and body fat in American Indians. J Nutr. 2007; 137:1955-1960.
29. Beydoun MA, Gary TL, Caballero BH et al. Ethnic differences in dairy and related nutrient consumption among US adults and their association with obesity, central obesity, and the metabolic syndrome. Am J Clin Nutr. 2008; 87:1914-1925.
30. Torres MRSG, Francischetti EA, Genelhu V et al. Effect of a high calcium energy-reduced diet on abdominal obesity and cardiometabolic risk factors in obese Brazilian subjects. Int J Clin Pract. 2010; 64:1076-1083.
31. Torres MRSG, Ferreira TS, Carvalho DC et al. Dietary calcium intake and its relationship with adiposity and metabolic profile in hypertensive patients. Nutrition, 2011; 27:666-671.
32. Pereira DC, Lima RPA, Lima RT. Association between obesity and calcium: phosphorus ratio in the habitual diets of adults in a city of North-eastern Brazil: an epidemiological study. Nutrition Journal. 2013; 12:90
33. Nicklas TA, O'Neil CE, Fulgoni VL. The role of dairy in meeting the recommendations for shortfall nutrients in the American diet. J Am Coll Nutr. 2009; 28(Suppl 1):73-81.
34. Rodriguez-Rodriguez E, Lombán BN, Lopez-Sobaler AM et al. Review and future perspectives on recommended calcium intake. Nutr Hosp. 2010; 25:366-374.
35. Olinto MTA. Eating patterns: principal component analysis. In: Kac G, R Sichieri Giant DP Organisers. Nutritional Epidemiology. Riode

Janeiro: Editora Fiocruz/Publisher Atheneu; 2007:213-25.
36. Hu FB. Dietary pattern analysis: a new direction in nutritional epidemiology. Curr Opin Lipidol. 2002; 13:3-9.
37. Sieri S, Krogh V, Pala Vet al. Dietary patterns and risk of breast cancer in the ORDET cohort. Cancer Epidemiol Biomarkers Prev. 2004; 13:567-72.
38. Thomas MS. Relationship between dietary fibre composition in food and glyceamic index. America Journal of Nutrition. 2005; 72-75.
39. WHO/FAO. Promoting fruits and vegetables consumption around the world: A joint meeting of WHO/FAO on fruits and vegetables for health improvement Kobe, Japan. 2004.
40. WHO. Action Plan for food and nutrition Copenhagen, Denmark. 2008.

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