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Research Article

DIETARY INTAKE AND LIPID PROFILE OF OVERWEIGHT AND OBESE ADULTS FROM MUMBAI CITY

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ABSTRACT

Introduction: Identifying vitamin D deficiency in overweight individuals may be particularly important for their skeletal and cardiovascular health. Fractures, Blount disease, and slipped capital femoral epiphysis are more common in overweight individuals, and research suggests that vitamin D deficiency increases the risk of these conditions.

Objective: To study dietary intake and lipid profile of overweight and obese adults from Mumbai City

Methods: A cross sectional study was conducted in 100 (53 males) overweight and obese adults visiting a multi-speciality hospital. Anthropometry and body fat percentage was analysed. Dietary intake was calculated using 3-diet recall. Serum lipid profile was measured.

Results: Body fat percentage was significantly higher in females as compared to males ($p<0.05$). 42% were overweight and 58% were obese. The mean triglyceride was 391.7±100.8 mg/dl, total cholesterol was 212±18.6 mg/dl, LDL cholesterol was 140±29 mg/dl and HDL cholesterol was 41.8±8.2 mg/dl. For total cholesterol, 62% had borderline high (201 – 239 mg/dl) and 6% has high levels (> 240 mg/dl). For HDL cholesterol, 42% had low levels (< 40 mg/dl). For LDL cholesterol, 19% had low risk (100 – 129 mg/dl), 34% had borderline high levels (130 – 159 mg/dl) and 32% had high levels (160 – 189 mg/dl). For triglycerides, 82% had high levels (200 – 499 mg/dl) whereas 18% had very high levels (>500 mg/dl). Percentage RDA intake for energy was 70.0±11.5% and for proteins was 70.7±13.5%. In females, there was a significant negative correlation of fat and energy intake with BMI and body fat percentage indicating that those with higher body fat percentage and BMI may be consuming less calorie dense and fat dense food to reduce weight ($p<0.05$).

Conclusion: Overweight and obese adults are at high risk levels of lipid profile with inadequate protein intake. Hence, diet modifications and counseling is required to control both weight and lipid profile levels for overweight and obese adults.

INTRODUCTION

Being overweight is having more body fat than is optimally healthy, more than 1 billion adults were found to be either overweight or obese in 2003 which increased to more than 2 billion in 2013 (across all age groups). [1]

The degree to which a person is overweight is generally described by the body mass index (BMI) and Overweight is defined as a BMI of 25 or more, thus it includes pre-obesity defined as a BMI between 25 and 30 and obesity as defined by a BMI of 30 or more. Pre-obese and overweight however are often used interchangeably, thus giving overweight a common definition of a BMI between 25 and 30. [2] Vitamin D is a fat-soluble vitamin that is naturally present in very few foods, added to others, and available as a dietary supplement which is produced endogenously when ultraviolet rays from sunlight strike the skin and trigger vitamin D synthesis. [3]

Without sufficient vitamin D, bones can become thin, brittle, or misshapen and its Vitamin D sufficiency prevents rickets in children and osteomalacia and together with calcium, it also helps protect older adults from osteoporosis. [4] Vitamin D intake has been reported as being lower in obese men, but not women, when compared to their non-obese counterparts [5]. Low calcium and D intake have also been associated with obesity in both men and women [6].

Overweight individuals expose less skin to the sun less often than non-obese individuals, resulting in reduced synthesis of vitamin D. BMI, % body fat and sunbathing have been shown to be related in a population-based sample [7]

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It has also been noted that obesity results in larger body surface area, thus could be expected to increase cutaneous vitamin D synthesis [8] Hypovitaminosis D is well-documented in those who have had bariatric or gastric bypass procedures, in which a malabsorptive state is deliberately induced but there is no evidence that obesity itself results in reduced absorption of dietary vitamin D[9].

Vitamin D is fat-soluble, and calcium absorption has been shown to be increased in diets high in fats, it is unlikely that obesity affects vitamin D-calcium homeostasis through altered gut absorption [10].

Aim: To study dietary intake and lipid profile of overweight and obese adults from Mumbai City

METHODOLOGY

A Sample size of 100 individuals was selected for the study. The study included assessment and correlation of Vitamin D Levels with the Lipid profile of the individual. Anthropometric measurements of the study group was taken and Diet and lifestyle was studied by means of Questionnaire, diet recall and food frequency chart. The sample study excluded study in relation to age, sex and location. Body composition was calculated using the body composition monitor. Vitamin B 12 (Cyancoblamin), Vitamin D (25 Hydroxy Cholecalciferol) and Lipid profiles were measured and related pertaining to the given study.

Statistical Methods

Analyses were performed using SPSS software for Windows (version 16.0, 2007, SPSS Inc, Chicago, IL). Data are presented as Mean ± SD or frequency (percentage). Pearson' correlation was used to establish correlation of anthropometry with blood parameters. Pearson's correlation as used to establish correlation dietary intake with anthropometry and blood parameters. Independent sample T test was used to analyse the difference between anthropometry, body fat percentage, blood parameters and dietary intake when classified according to gender. P value < 0.05 was considered to be statistically significant.

RESULTS

Data on 100 overweight/ obese adults (53 males, 47 females) with the mean age of 37.1±7.0 years are presented in the current study.

Anthropometric parameters

The mean height of the study participants was 160.8±4.4 cm, weight was 71.2±5.8 kg, body mass index was 27.5±1.4 kg/m2 and body fat percentage was 25.3±3.0%. **Table 1** gives anthropometric parameters of study participants when classified according to gender. Height and weight was significantly higher in males as compared to females (p<0.05) (**Table 1**). Body fat percentage was significantly higher in females as compared to males (p<0.05) (**Table 1**). There was no significant difference in body mass index of males and females (p>0.05) (Table 1).

Table 1 Anthropometry and body fat percentage of study participants when classified according to gender

Anthropometric Measurement	Males (n=53)	Females (n=47)	P value
Height (cm)	162.1±4.5	159.3±3.9	0.001
Weight (kg)	72.6±6.0	69.6±5.2	0.001
Body mass index (kg/m2)	27.6±1.4	24.7±1.4	0.599
Body fat (%)	24.6±2.2	26.0±3.5	0.019

Data presented as Mean±SD

Observational studies have demonstrated calcium intake is inversely associated with body weight [11]. Based on body mass index, out of 100 individuals, 42% were overweight and 58% were obese. Figure 1 gives percentage of overweight and obese participants when classified according to gender. There was no significant association of BMI category with age ($\chi 2$= 0.262, p=-.609) i.e. similar percentage of males and females were either overweight or obese (Figure 1).

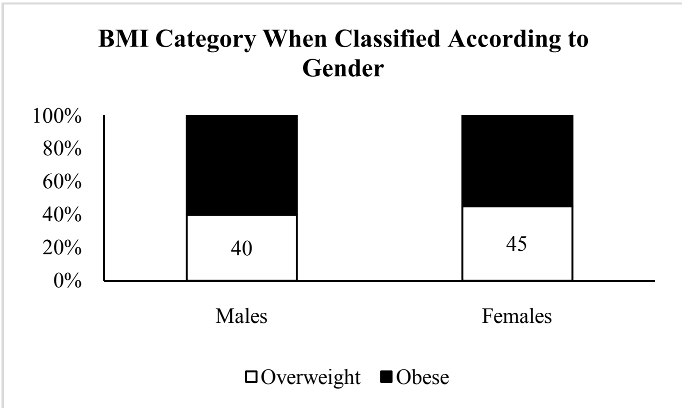

Figure 1 BMI category when classified according to gender

Data presented as percentage

Blood Parameters

The mean triglyceride was 391.7±100.8 mg/dl, total cholesterol was 212±18.6 mg/dl, LDL cholesterol was 140±29 mg/dl, HDL cholesterol was 41.8±8.2 mg/dl, 25 hydroxy vitamin D was 19.8±2.7 ng/ml and vitamin B12 was 450±100 pg/ml. Table 2 presents blood parameters of study participants was classified according to gender. There was no significant difference in blood parameters of males and females (p>0.05) (Table 2).

Table 2 Blood parameters when classified according to gender

Blood Parameter	Males (n=53)	Females (n=47)	P value
Triglyceride (mg/dl)	397.4±97	385.4±105.6	0.554
Total cholesterol (mg/dl)	211.1±18.2	212.9±19.2	0.625
LDL cholesterol (mg/dl)	138.4±29.0	142.0±29.3	0.532
HDL cholesterol (mg/dl)	40.7±8.1	43.0±8.2	0.163

Data presented as Mean±SD

From the 100 participants, for total cholesterol, 32% had desirable levels (<200 mg/dl), 62% had borderline high (201 – 239 mg/dl) and 6% has high levels (> 240 mg/dl). For HDL cholesterol, 42% had low levels (< 40 mg/dl) whereas 58% had normal levels (40 – 60 mg/dl). For LDL cholesterol, 15% had desirable levels (< 100 mg/dl), 19% had low risk (100 – 129 mg/dl), 34% had borderline high levels (130 – 159 mg/dl) and 32% had high levels (160 – 189 mg/dl). For triglycerides, 82%

had high levels (200 – 499 mg/dl) whereas 18% had very high levels (>500 mg/dl).

There is strong experimental evidence that vitamin D status may influence cardiovascular structure and function which indicates a link between low Vitamin D Status and elevated Cardiovascular disease risk. [12]

Correlation between anthropometric parameters and blood parameters

Correlation between anthropometric parameters and blood parameters are presented in Table 3. As seen in Table 3, there was as significant positive correlation of triglycerides with weight, body mass index and body fat percentage in males ($p<0.05$). (Table 3). No other significant correlation of anthropometry and blood parameters were observed in either gender ($p>0.05$) (Table 3).

Table 3 Correlation of anthropometry with Blood parameters

	Males			Females		
Blood Parameter	**Weight**	**Body mass index**	**Body Fat percentage**	**Weight**	**Body mass index**	**Body Fat percentage**
Triglyceride	0.437*	0.343*	0.275*	-0.072	-0.186	-0.153
Total cholesterol	-0.135	-0.071	0.025	-0.027	0.05	0.063
LDL cholesterol	-0.022	0.124	0.081	-0.125	-0.262	-0.236
HDL cholesterol	0.101	0.008	0.058	0.099	0.220	0.206

Data presented as Pearson's correlation value. * indicates $p<0.05$ for correlation

Dietary intake

The mean energy intake of the participants was 1473±203 kcal/ day, proteins was 40.7±7.8 g/day, carbohydrates was 230±33.8 g/day, fat was 40.0±6.1 g/day and calcium was 518.6±89.6 mg/day. Mean energy intake from proteins was 11.0±1.4%, from carbohydrates was 62.6±2.4% and from fats was 24.4±2.0%. Percentage RDA intake for energy was 70.0±11.5%, for proteins was 70.7±13.5% and for calcium was 86.4±14.9%. Table 4 gives dietary intake of study participants when classified according to gender. As seen in Table 4, females consumed significantly higher percentage RDA intake for energy as compared to males ($p<0.05$). There was no other significant difference found in nutrient intake between males and females indicating that intake was similar in both gender ($p>0.05$) (Table 4).

Table 4 Dietary intake of study participants when classified according to gender

	Males (n = 53)	**Females (n = 47)**	**P Value**
Energy (kcal/day)	1488±210	1456±195	0.432
Proteins (g/day)	41.4±8.5	40±6.8	0.365
Carbohydrates (g/day)	233.7±35	227.3±32.4	0.351
Fats (g/day)	40.2±6.3	39.8±6.0	0.745
Calcium (mg/day)	518±76	519±103	0.927
Percentage energy from proteins (%)	11.1±1.7	11.0±1.1	0.597
Percentage energy from carbohydrates (%)	62.8±2.6	62.4±2.2	0.515
Percentage energy from fats (%)	24.3±2.1	24.6±1.8	0.483
Percentage RDA for energy (%)	64.1±9.1	76.6±10.3	0.001
Percentage RDA for proteins (%)	68.9±14.3	72.6±12.4	0.175
Percentage RDA for calcium (%)	86.3±12.6	86.6±17.2	0.922

Data presented as Mean±SD

It is suggested, however, that vitamin D deficiency increases appetite and decreases energy [13].

Correlation of dietary intake with anthropometry and body fat %

Table 5 shows correlation of dietary intake with anthropometry and body fat percentage when classified according to gender. There was a significant negative correlation of fat and energy intake with BMI and body fat percentage indicating that those with higher body fat percentage and BMI may be consuming less calorie dense and fat dense food to reduce weight in females ($p<0.05$) (Table 5). No other significant association of dietary intake with anthropometry and body fat percentage was found in either males or females ($p>0.05$) (Table 5).

Table 5 Correlation of dietary intake with anthropometry and body fat percentage when classified according to gender

	Males (n=53)			Females (n=47)		
	Weight	**BMI**	**Body fat %**	**Weight**	**BMI**	**Body fat %**
Energy	0.026	-0.045	0.008	-0.125	-0.312*	-0.318*
Proteins	-0.037	-0.079	-0.007	-0.097	-0.258	-0.272
Carbohydrates	0.048	-0.041	-0.026	-0.124	-0.276	-0.281
Fats	-0.061	-0.018	0.146	-0.146	-0.335*	-0.343*
Calcium	-0.025	-0.027	-0.021	-0.197	-0.049	-0.084

Data presented as Pearson's correlation value. *$p<0.05$ for significance

A study shows that 25(OH)D deficiency is associated with endothelial dysfunction and increased lipid peroxidation. Vitamin D deficiency can be seen as an independent risk factor of atherosclerosis. [14]

Correlation of dietary intake with blood parameters

Table 6 shows correlation of dietary intake with blood parameters when classified according to gender. As seen in Table 6, there was a significant association of HDL cholesterol with fat intake in males ($p<0.05$). A significant positive correlation of energy, proteins, carbohydrate intake was found with HDL cholesterol in females ($p<0.05$) (Table 6). No other significant correlation was found between dietary intake and blood parameters in males or females ($p>0.05$) (**Table 6**).

Table 6 Correlation of dietary intake with blood parameters when classified according to gender

	Total cholesterol	**HDL Cholesterol**	**LDL cholesterol**	**Triglyceride**
Males (n=53)				
Energy	-0.159	-0.231	-0.118	0.198
Proteins	-0.118	-0.223	-0.024	0.054
Carbohydrates	-0.148	-0.200	-0.084	0.245
Fats	-0.077	-0.313*	-0.184	0.002
Calcium	0.111	0.029	-0.098	-0.17
Females (n=47)				
Energy	-0.207	0.332*	-0.042	0.069
Proteins	-0.217	0.336*	-0.083	0.082
Carbohydrates	-0.225	0.353*	-0.042	0.079
Fats	-0.115	0.201	-0.025	-0.003
Calcium	0.107	-0.044	-0.200	-0.297*

Data presented as Pearson's correlation value. *$p<0.05$ for significance

Dietary calcium, a non-energy-supplying nutrient, has been identified as playing a pivotal role in the regulation of energy and lipid metabolism[15]

CONCLUSION

Overweight and obese adults are at high risk levels of lipid profile with inadequate protein intake. Hence, diet modifications and counseling is required to control both weight and lipid profile levels for overweight and obese adults.

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