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Original article

Lipid profile in relation to dietary calorie intake and anthropometric measurement of healthy women taking part in Shiraz diabetes screening test

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ABSTRACT

Background and aims: It is well known that dyslipidemia is related to cardiovascular disease, dietary aspect and obesity play an important role in CVD risk factor. In the present study, we investigated the relationship between calorie intake, anthropometrical parameters and serum lipids in apparently healthy women.
Methods: The subject were 90 healthy women aged between 20-55 who were taken part in diabetes screening plan of Shiraz University of Medical Sciences in 2011 anthropometric measurement were done by standard methods. Lipid profile was measured after 10 to 12 hours overnight fasting. Dietary calorie intake was assessed using 24h food recall. The bivariate associations between variables were examined with the Pearson correlation analysis and comparison of the calorie groups was done by t-test. Significance was accepted at P<0.05.
Results: No significant relationships were seen between calorie intake, anthropometric measurements and serum lipids. Although TG level was positively correlated with BMI (r=0.4, P=0.000), WC (r=0.408, P=0.00) and WHR (r=0.33, P=0.003).
Conclusion: Higher calorie intake was not significantly correlated with cardiovascular risk factor including Higher BMI,WC,WHR and abnormal serum lipids, but higher BMI,WC,WHR were directly associated with TG in healthy people. Although the association between these parameters and TG may be explained by insulin resistance, the lack of a significant association between anthropometric measurements and LDL in healthy people and limited studies in relation to net calorie and these variables remains an unexpected finding requiring further investigation.

Keywords: Calorie intake, Obesity, Lipid profile, Anthropometric measurement.

INTRODUCTION

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.[1]

It is widely recognized that excess body fat (BF) and obesity form risk factors for hypertension, diabetes, cardiovascular disease

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and dyslipidemia.[2-5] In addition, different epidemiologic studies have indicated a direct correlation between body mass index increase (BMI) and increased level of total cholesterol (TC), low-density lipoprotein cholesterol (LDL), and triglycerides (TG) and an inverse relationship with high density lipoprotein cholesterol (HDL).[6-8] This association between BMI and lipoprotein levels, particularly LDL, has been suggested to contribute in the higher rates of obesity induced cardiovascular events.

Recent observational studies of obese patients have confirmed a correlation between BMI and TG or HDL, but with LDL levels.[9] On the other hand, many cardiovascular risk factors such as abnormal lipid profile and obesity are affected by dietary factors, especially high calorie intake as well as low physical activity and sedentary life in the population.[10,11]

In spite of the fact that there are several publications on the relation between anthropometric markers and lipid profile, the results remain controversial. Controversies may be explained partly by body composition and fat distribution differences in racial groups, age groups, sexes and dietary patterns.[12] Compared to different CVD risk factors, the role of diet is highlight. The relation between dietary calorie intake and CVD risk factor is less certain.[13] Iranian population tend to consume high oil and sugar in their daily diet, by increasing their calorie intake.[14]

Therefore, it is necessary to investigate the impact of caloric diet as a main factor for abnormal lipids and obesity.

Thus, present study conducted to investigate the relationship between dietary calorie intake, anthropometric measurement and lipid profile in Iranian healthy women.

METHODS

This is a cross sectional study to determine the relationship of calorie intake, anthropometrical indexes such as waist circumference (WC), body mass index (BMI), waist to hip ratio (WHR), and lipid profiles (total cholesterol, triglyceride, low density cholesterol, high density cholesterol)

The subject were 90 healthy women aged 20-55 who were taking part in diabetes screening plan of Shiraz University of Medical Sciences in 2011. Subjects were apparently healthy individuals who didn’t take any medication and took part in screening test only for checking up.

Patient demographics and medical data were collected through questionnaire including the age, gender, height, weight, BMI, waist size, menopausal status, history of diabetes, hypertension, coronary heart disease (CHD), myocardial infarction, and use of hormone replacement therapy, insulin, statin, or other cholesterol-lowering medication and current tobacco use. The subjects who had history of disease were excluded.

Body weight and height were measured with a standard method, while subjects were in a fasting state with thin clothes without any shoes. Waist circumference and hip circumference were measured in the most condensed part using a non-elastic cloth meter. Body mass index was measured by division of body weight (kg) by height (m^2) for each person. Participants were asked to report their daily physical activity by questionnaire filling. They were classified as physically active if the amount of self-reported weekly aerobic exercise during the last 12 months was ≥3 times and ≥ 30 min per session. Unless, they were considered as low active to sedentary. Blood samplings were done after 10 to 12 hours overnight fasting in order to measuring high density lipoprotein (HDL), total cholesterol, low density lipoprotein (LDL) and triglyceride. Dietary calorie intake was assessed using 24h food recall and modified Nutritionist IV program (San Bruno, CA).

Then, individuals were divided in to two subgroups i.e high (Kcal ≥ 1800), and low calorie diet (Kcal < 1800).[11]

Total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides were measured using the colorimetric enzymatic method (pars azmoon kit), and using Abbott- USA Auto-analyzer.

Statistical Analysis

Statistical analysis was carried out using SPSS software version 16.0. The normality of the variables was checked using the Kolmogorov-Smirnov test. The bivariate associations between above mentioned variables were examined with the Pearson correlation analysis in studied subjects and independent sample t test was used to compare lipid profile and anthropometric parameters between high and low caloric diets. Significance was accepted at $P<0.05$ with 95% confidence interval.

RESULTS

In the present study that was done in order to assess the correlation between calorie intake, anthropometrical indexes and blood lipids, 90 healthy women were studied. Table 1 shows demographic findings of the study. For the overall population, after adjusting the age and physical activity as a confounding factor, no significant association was seen between calorie intake, lipid profiles and anthropometrical measurements.

Table 1: Demographic data of the subject included in the study

Variable	Mean ± SD	Min-Max
Age	37±7.6	20-55
Weight	64.3±10.85	43-90
BMI	25.3±5.65	17.2-39.6
Waist circumference	76.3±9.5	60-111

Also, comparison of lipid profiles and anthropometric parameters between two groups of low and high caloric diet showed no significant differences (Table 2 and Table 3).

Table 2: Comparison of lipid profiles between individuals with low caloric diet and high caloric diet

Lipid profile	Kcal < 1800 N=77	Kcal ≥ 1800 N=13	P
Cholestrol	193.4±33/2	182.07±23.07	0.24
Triglycerid	98.8±45.9	86.15±33	0.33
High density lipoprotein	46.08±8.26	44.07±6.2	0.30
Low density lipoprotein	127.5±26.8	120.8±21.05	0.071

P<0.05 was considered significant.

Table 3: Comparison of anthropometrical Index between individuals with low caloric diet and high caloric diet

Anthropometric parameter	Kcal < 1800 N=77	Kcal ≥ 1800 N=13	P
Weight	62.3 ±10.8	65.3±9.4	0.42
BMI	25.2±4.82	26.2±3.97	0.43
Waist Circumference	76.7±11	76.1±7.4	0.14
Waist to hip ratio (WHR)	0. 75±0.06	0.74±0.04	0.07

P<0.05 was considered significant.

In addition, there was no significant relation between BMI and TC (Pearson correlation coefficient=0.1, P=0.38), LDL (correlation coefficient=0.078, P=0.06), and HDL (Pearson correlation coefficient=-0.86, P=0.45), but there was direct association between BMI and log of TG (correlation coefficient=0.4, P=0.000). In addition, no association was seen between WC and TC, LDL and HDL. However, there was significant correlation between WC and log of TG (Pearson correlation coefficient=0.408, P=0.00). WHR was significantly correlated with TG (WHR=0.33, P=0.003), although no significant correlation was seen between WHR and TC, LDL and HDL. The adjustment of potential confounding factor (age, physical activity) was done using linear regression model. No significant correlation was found between age (P=0.23, r=0.018), physical activity (P=0.65, r=0.33).

DISCUSSION

Main finding of our study showed positive significant relation between BMI, WC, WHR and TG. Some studies have indicated a positive correlation between lipid levels and measures of adiposity,[15,16] whereas other studies haven't detected such a relationship.[17,18] In the present study, even though, BMI was correlated with TG levels, it was not correlated with elevated TC and LDL-C levels and decreased in HDL-C. This result is consistent with other studies.[19,20]

No significant association was seen between calorie intake, lipid profiles and anthropometrical measurements in our study. In the study of Siji matheu hypertensive subjects that had high caloric diet indicated an increase in blood pressure, serum lipids and BMI.[11] in addition, in the study of walker and et al, the result of study showed that excess calorie intake over a short time leads to increase in serum cholesterol and lipoprotein level although the diet was low in fat.[21]

Different result in our study may be because of low number of high caloric intake in comparison to low calorie intake, or may be because of the underreporting of subject thereby underestimating the calorie intake.

Regarding the fact that BMI is greatly used as an indicator of total adiposity, its dependence on race and age are the limitations clearly recognized (coexistence of large percentages of body fat and low BMI values in Asians).

As compared to BMI, WC and WHR have been used as substitute of central body fat. The strength of WHR and WC correlation with dyslipidaemia varies in different studies. In the present study, WHR was significantly correlated with triglyceride level. These findings is consistent with those of several previous studies.[22,23] In addition, there was significant association between WC and triglyceride level.

Various biological mechanisms can explain the relationship, but the most possible mechanism is the effect of obesity on insulin resistance which results in an increase in TG.[24]

About the correlation of anthropometric measurement and LDL-cholesterol, we didn't see any relationship between anthropometric measurement and LDL-C. Correlation between BMI and other anthropometric parameters and LDL-C in different study hasn't been strong.

Some investigators have proposed that the size of LDL particle, but not its level may be a more determinative of atherogenicity. Small experimental studies have shown that metabolic condition changes such as obesity influence predominantly LDL particle size more than LDL levels.[25,26] LDL particle size is under influence of insulin resistance, which is largely affected by obesity.[27-29]

We studied the correlation between anthropometric measurements and lipid profile in healthy women.

Prior to this study one Iranian studies has investigated the correlation between BMI and lipid profile in asthmatic patients.[30] The results indicated that total cholesterol had significant correlation with abdominal circumference. Even though a liner relation was seen between the other lipid profile parameters and anthropometrical indexes, and these relations weren't significant. According to this study apart from the fact that abdominal obesity is the best predictor of lipid profile in asthmatic patients, anthropometrical measurements are not a suitable prognosticator of lipid profile in asthma patients. These results are partly in conformity with our study in which no strong associations were seen between anthropometric parameters and lipid profile parameters.

The limitations to our study were the size of the study significantly smaller than epidemiologic studies. A small correlation between BMI and LDL may have been evident in a larger sample analysis. Furthermore, we didn't analyze the dietary macro and micro nutrients. Therefore, we didn't have any information about percentage of macronutrients. So, we only discussed about calorie intake

In summary, the common belief that increasing calorie intake and increasing BMI, WC, WHR lead to substantially higher TC and LDL may not extend to healthy people. The effect of obesity on insulin resistance followed by increasing in TG is clear. However, the effect on LDL level and particle size is not well established. Subsequent study is warranted to assess these correlations between calorie intake, obesity and lipid particles.

CONCLUSION

Higher calorie intake was not significantly correlated with cardiovascular risk factor including Higher BMI, WC, WHR and abnormal serum lipids, but higher BMI, WC, WHR were directly associated with TG in healthy people. Although the association between these parameters and TG may be explained by insulin resistance, the lack of a significant association between anthropometric measurements and LDL in healthy people and limited studies in relation to net calorie and these variables remains an unexpected finding requiring further investigation.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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REFERENCES

1. World Health Organization. Obesity: Preventing and managing the global epidemic. Report of a WHO consultation on Obesity, Geneva, 3-5 June 1997. WHO/NUT/NCD/ 98.1. WHO: Geneva; 1998.

2. Group ToHPCR. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure: The trials hypertension prevention, phase II. Arch Intern Med. 1997; 157: 657-67.

3. Fujimoto WY. Overview of non-insulin-dependent diabetes mellitus (NIDDM) in different population groups. Diabet Med. 1996; 13(9): S7-10.

4. Rexrode KM, Manson JE, Hennekens CH. Obesity and cardiovascular disease. Curr Opin Cardiol. 1996; 11(5): 490-5.
5. Ding YA, Chu NF, Wang TW, Lin CC. Anthropometry and lipoproteins-related characteristics of young adult males in Taiwan. Int J Obes Relat Metab Disord. 1995; 19(6): 392-6.
6. Krauss RM, Winston M, Fletcher RN, Grundy SM. Obesity: Impact of cardiovascular disease. Circulation. 1998; 98(14): 1472-6.
7. Despres JP, Moorjani S, Tremblay A, Ferland M, Lupien PJ, Nadeau A, et al. Relation of high plasma triglyceride levels associated with obesity and regional adipose tissue distribution to plasma lipoprotein-lipid composition in premenopausal women. Clin Invest Med. 1989; 12(6): 374-80.
8. Denke MA, Sempos CT, Grundy SM. Excess body weight. An under-recognized contributor to dyslipidemia in white American women. Arch Intern Med. 1994; 154(4): 401-10.
9. Nicholls SJ, Tuzcu EM, Sipahi I, Schoenhagen P, Hazen SL, Ntanios F, et al. Effects of obesity on lipid-lowering, anti-inflammatory, and antiatherosclerotic benefits of atorvastatin or pravastatin in patients with coronary artery disease (from the reversal Study). Am J Cardiol. 2006; 97(11): 1553-7.
10. Manson JE, Ridker PM, Gaziano J. Prevention of myocardial infarction. New York: Oxford University Press; 1996: 241-273.
11. Mathew S, Chary TM. Association of dietary caloric intake with blood pressure, serum lipids and anthropometric indices in patients with hypertension. Indian J Biochem Biophys. 2013; 50(5): 467-73.
12. Misra A, Wasir JS, Vikram NK. Waist circumference criteria for the diagnosis of abdominal obesity are not applicable uniformly to all populations and ethnic groups. Nutrition. 2005; 21(9): 969-76.
13. Fang J, Wylie-Rosett J, Cohen HW, Kaplan RC, Alderman MH. Exercise, body mass index, caloric intake, and cardiovascular mortality. Am Prev Med. 2003; 25(4): 283-9.
14. Esmaillzadeh A, Azadbakht L. Food intake patterns may explain the high prevalence of cardiovascular risk factors among Iranian women. J nutr. 2008; 138(8): 1469-75.
15. Misra A, Luthra K, Vikram NK. Dyslipidemia in Asian Indians: Determinants and significance. J Assoc Physicians India. 2004; 52: 137-42.
16. Hu D, Hannah J, Gray RS, Jablonski KA, Henderson JA, Robbins DC, et al. Effects of obesity and body fat distribution on lipids and lipoproteins in nondiabetic American Indians: The Strong Heart Study. Obes Res. 2000; 8(6): 411-21.
17. Walton C, Lees B, Crook D, Worthington M, Godsland IF, Stevenson JC. Body fat distribution, rather than overall adiposity, influences serum lipids and lipoproteins in healthy men independently of age. Am J Med. 1995; 99(5): 459-64.
18. Chumlea WC, Baumgartner RN, Garry PJ, Rhyne RL, Nicholson C, Wayne S. Fat distribution and blood lipids in a sample of healthy elderly people. Int J Obes Relat Metab Disord. 1992; 16(2): 125-33.
19. Sandhu HS, Koley SH, Singh Sandhu K.A Study of Correlation between Lipid Profile and Body Mass Index (BMI) in Patients with Diabetes Mellitus J. Hum. Ecol 2008; 24(3): 227-229.
20. Febrianti EZ, Farlina L, Lestari R, Cahyohadi S, Rini EA. Correlation between lipid profiles and body mass index of adolescents obesity in Padang. Int J Pediatr Endocrinol. 2013; 2013(S1): P87.
21. Popper H. Liver disease-morphologic considerations. Am J Med. 1954; 16(1): 98-117.

22. Leenen R, van der Kooy K, Droop A, Seidell JC, Deurenberg P, Weststrate JA, et al. Visceral fat loss measured by magnetic resonance imaging in relation to changes in serum lipid levels of obese men and women. Arterioscler Thromb. 1993; 13(4): 487-94.
23. Chandalia M, Abate N, Garg A, Stray-Gundersen J, Grundy SM. Relationship between generalized and upper body obesity to insulin resistance in Asian Indian men. J Clin Endocrinol Metab. 1999; 84(7): 2329-35.
24. Chadha D, Singh G, Kharbanda P, Vasdev V, Ganjoo R. Anthropometry Correlation of Lipid Profile in Healthy Aviators. Ind J Aerospace Med. 2006; 50(2): 32-6.
25. Drapeau V, Lemieux I, Richard D, Bergeron J, Tremblay A, Biron S, et al. Metabolic profile in severely obese women is less deteriorated than expected when compared to moderately obese women. Obesity Surgery. 2006; 16(4): 501-9.
26. Rainwater DL, Mitchell BD, Comuzzie AG, Haffner SM. Relationship of low-density lipoprotein particle size and measures of adiposity. Int J Obes Relat Metab Disord. 1999; 23(2): 180-9.
27. Barakat HA, Carpenter JW, McLendon VD, Khazanie P, Leggett N, Heath J, et al. Influence of obesity, impaired glucose tolerance, and NIDDM on LDL structure and composition. Possible link between hyperinsulinemia and atherosclerosis. Diabetes. 1990; 39(12): 1527-33.
28. Goff DC, Jr., D'Agostino RB, Jr., Haffner SM, Otvos JD. Insulin resistance and adiposity influence lipoprotein size and subclass concentrations. Results from the insulin resistance atherosclerosis study. Metabolism. 2005; 54(2): 264-70.
29. Voruganti VS, Cai G, Cole SA, Freeland-Graves JH, Laston S, Wenger CR, et al. Common set of genes regulates low-density lipoprotein size and obesity-related factors in Alaskan Eskimos: Results from the Gocadan study. Am J Hum Biol. 2006; 18(4): 525-31.
30. Mojtaba E, Pezhman A, Mokhtar NF, Mohsen T. Anthropometrical parameters are not related with lipid profile in mild to moderate asthma. Int J Biosci. 2011; 1: 67-71.

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