RELATIONSHIP OF LIPID PROFILE AND HYPERTENSION WITH BODY MASS INDEX (BMI) IN OBESE INDIVIDUALS OF FEDERAL URDU UNIVERSITY OF ARTS SCIENCE AND TECHNOLOGY (FUUAST) KARACHI

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خلاصہ

اس تحقیق کا معضد موٹاپے کے شکار لوگوں میں فشار خون (Blood Pressure) اور لپڈ پروفائل (Lipid Profile) لیول کا تجزیہ کرنا ہے۔ تحقیق میں شامل 150 لوگوں کے گروہ میں 75 مرد اور 75 عورتیں شامل تھیں۔ ان تمام لوگوں کا BMI، کمر کا ناپ (WHR) اور فون کے غونے لئے گئے۔ لپڈ پروفائل Enzymatic calorimetric طریقے سے معلوم کیا گیا۔ نتائج کی رو سے زیادہ وزن اور موٹاپے کا شکار لوگوں میں بلند فشار خون (High Blood Pressure) کے ساتھ ساتھ کولیٹرول کی ڈیادتی پائی گئی۔

Abstract

Lipid profile, systolic (SBP) and diastolic blood pressure (DBP) was investigated in a group of obese and overweight persons. The total number of 150 subjects both males and females were volunteered for the study. Among male group there were 50 obese, 10 overweight and 15 control individuals. Fifty obese, 10 overweight and 15 control females were included. Weight, height, waist and hip measurements were taken to calculate BMI and WHR. Blood pressure (BP) of each subject was recorded in sitting position; fasting venous blood sample was obtained for lipid profile. Lipid profile was estimated through enzymatic caloric metric method. In comparison of control and overweight males the significance values were found in "BMI (P<0.001), SBP (P<0.01), DBP (P<0.05), HDL-c (P<0.01) and TG (P <0.001)". While in comparison of control versus obese males the significant values were "BMI (P<0.001), WHR (P<0.01), SBP (P<0.001), DBP (P<0.01), TC (P <0.01), HDL-c (P <0.05), LDL-c (P <0.01) and TG (P <0.0001)". Control versus overweight females showed the significant values of "BMI (P<0.001), WHR (P<0.01), SBP (P<0.001), DBP (P<0.001), HDL-c (P<0.01) and TG (P<0.01)". When control were compared with obese females the significant values were "BMI (P<0.001), WHR (P<0.001), SBP (P<0.001), DBP (P<0.01), TC (P<0.05), HDL-c (P<0.01), LDL-c (P <0.05) and TG (P<0.001)". BMI, BP and lipid profile is higher in obese subjects. Risk of dyslipidemia and hypertension increases with BMI. Eating habits and Inactive life style with lack of exercise is responsible for obesity, dyslipidemia and high blood pressure.

Introduction

The raised total cholesterol, and low levels of HDL-c is called dyslipidemia (Brown *et al.*, 2000). BMI is linearly related to the total cholesterol, LDL-c and TG concentrations and is, however, inversely related with HDL-c, especially in non-smoking people. It has been found that most of the co-morbidities, which relates obesity to coronary artery disease, increases as BMI increases, and in this way they are associated to body fat distribution (Kannel, 2005).

Major cause of worldwide deaths is mainly attributed to Ischemic heart disease (IHD). Several studies proved that the mortality due to IHD in Pakistan is as high as in developed countries (Jafar *et al.*, 2007). Lipids and lipoproteins are significant cause of ischemic heart disease. Raised concentrations of TG, cholesterol and LDL-c are renowned as risk elements for atherogenesis (Nelson, 2013). LDL-c is when oxidized or acetylated become a major atherogenic element. LDL-c accumulates macrophages with cholesterol for plaque formation and can harmfully change coagulation pathways (Chen and Khismatullin, 2015). The blood level of HDL-c is inversely proportional to the risk of atherosclerosis and cardiovascular disease that is higher the level, smaller the risk (van-Capelleveen *et al.*, 2017).

Obesity increases the frequency of abnormal lipid profile. So many risk factors, like arteriosclerosis, ischemic coronary disease and type 2 diabetes are caused by obesity. Eating habits and inactive life style is driving force behind overweight and obesity (Panagiotakos *et al.*, 2004).

The current study is focused to define and assess association of lipid profile and blood pressure with BMI in obese and overweight adults in Karachi, city of Pakistan.

Table-1. Lipid Profile and blood pressure according to three BMI groups of Male Subjects

Parameters	Control Males (n=12)	Overweight (n=7) Obese (n=20)	(Means±SD)	P values*
Age (Years)	22.20 ± 1.05	Overweight Obese	28.82 ±3.09 31.16 ±1.65	P<0.05 P<0.01
BMI (Kg/m^2)	20.62±0.42	Overweight Obese	24.99±0.24 32.06±0.57	P<0.001 P<0.001
WHR	0.84±0.03	Overweight Obese	0.90±0.009 0.93±0.01	P >0.05 P<0.01
SBP (mmHg)	107.67±2.27	Overweight Obese	121.59±1.68 123.45±4.48	P<0.01 P<0.001
DBP (mmHg)	70.80±1.46	Overweight Obese	79.49±1.6 80.45±3.69	P<0.05 P<0.01
TC (mg/dL)	180.0±16	Overweight Obese	195.9±19 215.5±11	P >0.05 P <0.01
HDL-c (mg/dL)	38.83±3.9	Overweight Obese	32.9±2.8 28.87±1.6	P<0.01 P <0.05
LDL-c (mg/dL)	88.5±16	Overweight Obese	117.8±17 130.9±10	P>0.05 P <0.01
TG (mg/dL)	82.50±9.11	Overweight Obese	133±7.11 164.1±9.3	P <0.001 P <0.0001

*P-value calculated by paired t-test comparing the means of the variables for the three BMI groups

Table-2. Lipid Profile and blood pressure according to three BMI groups of Female Subjects

Parameters	Control Females (n=12)	Overweight (n=7) Obese (n=20)	(Means±SD)	P values*
Age (Years)	21.26 ± 0.60	Overweight Obese	21.22 ±0.76 30.80 ±1.71	P>0.05 P<0.01
BMI (Kg/m^2)	21.28± 0.40	Overweight Obese	24.73±0.31 30.86±0.53	P<0.001 P<0.001
WHR	0.76±0.02	Overweight Obese	0.89±0.01 0.94±0.04	P<0.01 P<0.001
SBP (mmHg)	99.07±2.33	Overweight Obese	119.58±1.66 122.33±3.18	P<0.001 P<0.001
DBP (mmHg)	68.53±1.15	Overweight Obese	77.88±1.54 81.78±2.68	P<0.001 P<0.01
TC (mg/dL)	167.00±15.0	Overweight Obese	186.9±9.0 194.3±17	P >0.05 P <0.05
HDL-c (mg/dL)	40.17±2.5	Overweight Obese	35.0±3.9 31.10±2.1	P <0.01 P <0.01
LDL-c (mg/dL)	89.8±8.0	Overweight Obese	100.9±8.1 110.9±15	P>0.05 P <0.05
TG (mg/dL)	78.3±11	Overweight Obese	110.0±4.0 130.9±20	P<0.01 P <0.001

*P-value calculated by paired t-test comparing the means of the variables for the three BMI groups

Materials and Methods

This experiment was performed at Federal Urdu University of Arts, Science and Technology (FUUAST) Karachi, Pakistan, from March 2013 – March 2014. Data was collected through a questionnaire. The Study sample consisted of 150 subjects including adult of both the genders aged between 18-40 years. All the volunteers selected from FUUAST were mostly students, teachers and also the non-teaching employees. Participants were categorized as obese (≥ 25 kg/m^2), overweight (23– 24.9kg/m^2) and control /normal weight

(18.5-22.9 kg/m^2) according to BMI criteria for Asians (Low *et al*., 2009). Their height, weight, waist and hip size were obtained to calculate BMI and WHR (waist hip ratio), BMI was calculated by using their weight (kg) divided by square of their height in meters (m^2). Blood pressure of each subject was recorded in sitting position through sphygmomanometer (CERTEZA, Germany). Fasting venous blood (5 ml) sample was drawn into EDTA tubes, and then centrifuged for serum separation. Serum is kept in sterile vials and stored at - 40°C. Serum total cholesterol (TC), triglycerides (TG) and high-density lipoprotein cholesterol (HDL-c) were estimated through enzymatic calorimetric method using spectrophotometer (OPTIMA, SP- 300). The low-density lipoprotein cholesterol (LDL-c) values were derived through *Friedewald formula* from the following equation (Friedewald *et al*., 1972).

$$LDL\text{-}c = TC - HDL\text{-}c - (TG/5)$$

Data analysis was achieved with SPSS statistical software (IBM, version 23). The paired t-test was utilized to find the statistical differences of lipid concentrations between the groups (control, overweight and obese). All P values below 0.05 were accepted as statistically significant.

Results

Total numbers of 150 individuals were volunteered for the experiment and divided gender wise into a group of 75 males and 75 females. Among male group there were obese (n=50), overweight (n=10) and control (n=15). Among females group there were obese (n=50), overweight (n=10) and control females (n=15). Overweight "(P<0.001)" and obese "(P<0.001)" males have greater mean BMI than control males. WHR of obese males were greater than control, and statistically significant "(P<0.01)". Raised SBP and DBP were noticed in overweight (P<0.01; P<0.05) male subjects. Similarly, SBP "(P<0.001)" and DBP "(P<0.01)" of obese males also exhibited significant elevation. Lipid profile parameters of overweight males exhibited significant reduction in HDL-c "(P<0.01)" while elevated TG "(P <0.001)". When lipid profiles of control versus obese males were compared a pronounced increase was noted in TC "(P <0.01)", LDL-c "(P <0.01)" and TG "(P <0.0001)" however, decrease in HDL-c "(P <0.05)" (Table 1).

Significantly higher values of BMI were observed in both overweight and obese females "(P<0.001; P<0.001)". Mean WHR values of overweight and obese females were significantly higher than control female "(P<0.01; P<0.001)". SBP and DBP of overweight females were significantly higher than non-obese/ control females "(P<0.001; P<0.001)". Similar pattern of SBP and DBP values were seen in obese females "(P<0.001 and P<0.01)". Statistically significant lower serum HDL-c "(P<0.01)" and higher level of TG "(P<0.01)" was observed in overweight females. While in comparison of control versus obese females the significant increase was detected in serum T-CH "(P <0.05), LDL-c (P <0.05) and TG (P<0.001)" while decrease concentration of serum HDL-c (P<0.01) (Table 2).

Discussion

In present research difference between BMI groups (control, overweight and obese) were noticed for lipid profile and blood pressure. Overweight and obesity leads to various health issues, including type 2 diabetes, abnormal lipid profile and high BP. It is normal that as the BMI exceeds, then these risk factors will also increase. Average serum cholesterol and BMI in our study groups presented a positive relation. Our findings were parallel with the former studies, which verified that obesity is sound parameters related with abnormal lipid profile and CVDs in many nations (Kragelund *et al*., 2005; Flegal *et al*., 2005). These results were equivalent with the outcomes from other research studies on western population (WHO, 2006; Pucarin-Evetkovil *et al*., 2006). Same patterns of lipid profile were also demonstrated by few studies on Asian population (Costa *et al*., 2009). Various studies conducted in adjacent countries also verified greater BMI and massive pervasiveness of obesity (Aghasadeghi *et al*., 2008; Azizi *et al*., 2002).

Serum TG concentrations are linearly related to BMI while HDL is inversely related to BMI in our study in both the genders. These results are in harmony with past study by Shamai *et al.,* (2011). Febrianti *et al.,* (2013) also demonstrated a linear relation between body mass index and TG in both the genders. Rapidly growing obesity prevalence require weight controlling to be a main concern for the avoidance and cure of chronic diseases.

When lipid profile parameters were compared between groups, males had a higher TC, LDL and TG while lower HDL-C. Similar findings were observed in study by Bertsias *et al*., (2003) Owing to the presence of hormone estrogen, normally HDL cholesterol levels would be higher in females (Neovius *et al*., 2005). Li *et al*., (1996) also found higher values of serum HDL-C in women with lower values of BMI, TG, TC/HDL ratio than do men (Li *et al*., 1996). Gender affects the lipid profile of individuals, but this influence is exempted of menopausal status and age of females (Tremollieres *et al*., 1999). Presumably these differences are because of the difference in flowing concentration of estrogens and androgens in women as compared to men. Women were

observed with increased synthesis of the major HDL apoprotein, the apoA-I than men. Additionally production rates of apoA-I and levels of apoA-I can be raised with estrogen injection (Schaefer *et al*., 1983).

In contrast to above statement, no gender differences in HDL levels were observed by Habib *et al*., (2005). Also, no significant change was found in any other lipid profile parameters across gender in the past study.

Blood pressure (both SBP and DBP) is higher in overweight and obese males and females than control groups. Our outcomes were in accordance with former studies by Aziz *et al*., (2003). Also, males had significantly higher SBP and DBP levels in present study. These findings are in line with the previous research conducted by Reckelhoff, (2001), author demonstrated higher Blood pressure in normotensive men as compared to normotensive premenopausal females (Reckelhoff, 2001). In addition, several other studies showed that males having higher BP than females. (Tatchum *et al*., 2005). This gender difference in terms of BP may be attributed to hormone testosterone in male individuals.

Conclusion

BMI, BP and abnormal lipid profile are higher in obese individuals. Eating habits and Inactive life style with lack of exercise is an imperative factor in terms of weight gain and other health issues. Therefore monitoring blood pressure and lipid profile examination is not enough for identifying obesity, but healthy eating along with a regular exercise plan should be implemented in daily life.

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