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The Relationship between Anthropometric Indices and Lipid Profiles In-OfficeEmployees

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Abstract: Purpose:The purpose of this study was to investigate the relationship between anthropometric indices and lipid profile in-office employees.Methods: This descriptive study was performed in Tehran, Iran. In total 294 office employees (166 males and 83 females) participated as samples study in this research. Blood samples (TC, TG, HDL-C, LDL-C and LDL-C to HDL-C ratio) were taken from the brachial vein in sitting position and fasting state. Then anthropometric indices includingbody mass index (BMI), waist circumferences (WC) and waist-hip ratio (WHR) were measured and recorded. All statistical analyses were conducted with "SPSS 21". Results: There was a positive and significant correlation between TG and LDL-C/HDL-C ratio with BMI, WC and WHR. There was also a direct and significant correlation between WHR and LDL-C. On the other hand, there was an inverse correlation between HDL with BMI, WC and WHR. Moreover, anthropometric indices (BMI, WC and WHR) were significantly higher in the older group than the younger group. Also, triglycerides, LDL-C and also, BMI, WC and WHR were significantly higher in men than women; but, HDL-C was significantly higher in women. Conclusion: Regarding the association of anthropometric indices with lipid profile and its significant differences across age and gender groups, these parameters can be used to evaluate and screen cardiovascular and metabolic disease-related risk factors.

Keywords: Cardiovascular disease, lipoprotein HDL, WHR, cholesterol, BMI, aging

1. Introduction

Cardiovascular disease (CVD) is the leading cause of premature death worldwide [1]. In2012, about 18 million people died due to CVDs. It is also anticipated that by 2030, more than 23 million people will die from CVDs around the globe[2, 3]. In addition, CVD is more prevalent in the eastern Mediterranean regions, especially in Iran[4, 5]. According to the previous reports of Global Burden of Diseases (GBDs) in 2010 and 2015, CVD was the first cause of death and accounted for about 22% of the burden of diseases in Iranian people[6, 7]. The CVD related risk factors are divided into two categories: modifiable and non-modifiable factors, of which dyslipidemia, sedentary lifestyle and obesity are the most important modifiable risk factors[8].

Reports have indicated lifestyle changes due to reduced levels of physical activity and longer working hours in developing countries lead to an increase in chronic diseases and a decrease in the quality of life of individuals[9-11]. It has well documented that, overweight and obesity lead to an increase in fat mass that causes changes in biochemical variables, including lipid profiles, liver enzymes and blood sugar[12]. In other words, changes in lipid profiles, such as increased triglycerides, cholesterol and LDL-C, and reduced HDL-C, are associated with a variety of CVD including atherosclerosis, heart attack, and heart failure[13].

In addition, high accumulated adipose tissue is correlated with CVD and its related mortality. Anthropometric indices including body mass index (BMI), waist circumference (WC), and waist-hip ratio (WHR), have been recognized as beneficial screening tools, due to easy access and cost-effectiveness. On the other hand, considering the limitations of the anthropometric index measurement to diagnose diseases, it is necessary to measure all the anthropometric indices[14]. For example, BMI

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indicates concise information about muscle mass and fat percentage indirectly, while WC and WHR are more reliable indices to detect fat distribution, especially the abdominal region[15]. Considering the importance of anthropometric indices, to identify disease-related risk factors, there are a few reports on the relationship between these parameters and lipid profiles in healthy subjects[16].

According to the vital role of lipid profiles in the diagnosis of cardiovascular and metabolic diseases, the utilization of safe, accessible and cost-effective tools can play an important role in identifying and preventing diseases as well as related lipid parameters. Therefore, the purpose of the current research was to investigate the relationship between anthropometric indices and lipid profile in-office employees.

2. Methods

2.1 Subjects and Study Design

Current research was a single centered, cross-sectionalstudy that accomplished in Tehran city, Iran. This study was conducted in Information Services Corporation (ISC) and 264 office employees (170 men, and 94 women) participated in the research project voluntarily. Then they completed a demographic and medical history questionnaire that included questions regarding personal characteristics, health and diseases history. Exclusion criteria included hypertension, diabetes, liver and cardiovascular disease or any other known medical conditions and the use of anorexic or prescribed medications. After screening, 15 employees were excluded due to the presence of one or more exclusion criteria by a detailed medical history questionnaire. Finally, 249 subjects (personnel of ISC) include 166 males and 83 females participated as samples study in this research. Informed consent was taken from all participants. Also, the researcher ensured that participants' identity and what they said or did during the research were maintained confidential. In addition, they were given a detailed explanation about the study's purpose and methods. The research protocol was approved by the Health Committee of the Information Services Corporation (Iran).

2.2 Anthropometric Indices Measurements

Weight was measured to the nearest 0.01 g by OMRON digital scanner. For height, the individuals were instructed to stand as straight as possible with their back against wall-sticker tape meter and feet were flat on the floor with shoes removed. BMI was calculated as weight/height squared (kg/m^2) and was classified into five categories: underweight (BMI < 18.5 kg/m^2), normal weight (BMI 18.5-24.9 kg/m^2), overweight (BMI 25.0-29.9 kg/m^2) and obese (BMI ≥ 30.0 kg/m^2).

Circumferences were measured to the nearest millimeter using a tape meter. WC was measured from the front in standing position at the end of normal expiration, with the measuring tape positioned at the narrowest point between the lower rib and iliac crest. Men with a waist circumference of < 94, 94-101.9 and ≥ 102 cm were classified as normal weight, overweight and obese, respectively, while women were classified in the same obesity categories based on WC < 80, 80-87.9 and ≥ 88 cm. The hip circumference was measured from the side at the maximum point of gluteal muscles.

WHR was calculated as WC (cm) divided by hip circumference (cm). Men with WHR < 0.90, 0.90-0.99 and ≥ 1.0 were classified as normal weight, overweight or obese, respectively, while women were classified in the same categories based on WHR of < 0.80, 0.80-0.84 and ≥ 0.85.

2.3 Biochemical Variable Measurements

Blood tests were taken from all study participants after 12 h of overnight fasting by certified medical personnel in the morning (8:00 AM). Blood samples (3mL) were collected from the brachial vein in the sitting position. Then blood samples were placed at room temperature for 10 minutes, then the blood clot was made and, the serum was separated from the clot by centrifugation and stored in the icebox at -20 ℃. Lipid profile parameters including triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) were measured using an enzyme-calorimeter (GPO-PAP) by RA-100 device.

2.4 Statistical Analyses

Data were presented as mean ± SD in Table1. All statistical analyses were conducted with "SPSS 21". In addition, Pearson correlation coefficient and independent *t*-test were used for the correlation and differences between variables at the significance level of $p<0.05$.

3. Results

The mean and standard deviation of age, anthropometric indices and lipid profile are presented in Table 1. In the present study, there was a positive and significant correlation between TG and LDL-C/HDL-C ratio with BMI, WC and WHR. There was also a direct and significant correlation between WHR and LDL-C. On the other hand, there was an inverse correlation between HDL with BMI, WC and WHR (Table2). Mean concentrations of triglycerides, LDL-C and also, BMI, WC and WHR were significantly higher in men than women; while, mean concentrations of HDL-C were significantly higher in women than men (Table3). On the other hand, anthropometric indices (BMI, WC and WHR) in the older group were significantly higher than the younger group, but there was no significant difference in lipid profile between the two groups (Table4).

Table 1 Demographic, anthropometric and lipid profile indices of the subjects.

Variables	Mean ±SD
Age (Year)	40.42 ±7.05
Height (cm)	170.71 ±8.97
Weight (kg)	75.92 ±12.6
Chol (mg/dL)	193.62 ±35.16
TG (mg/dL)	152.57 ±87.52
HDL (mg/dL)	46.23 ±12.03
LDL (mg/dL)	103.15 ±27.57
LDL/HDL	2.39 ±0.88
BMI (kg/m^2)	26.05 ±3.38
WC (cm)	83.55 ±10.22
WHR	0.84 ±0.08

Chol: cholesterol; TG: triglyceride; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: body mass index; WC: waist circumference; WHR: waist-to-hip ratio.

Table 2 Correlation between anthropometric indices and lipid profile variable of the subjects.

Variables		Chol	TG	HDL	LDL	LDL/HDL
BMI	P	0.645	0.001**	0.000**	0.075	0.000**
	R	0.029	0.207	-0.338	0.113	0.285
WC	P	0.309	0.000**	0.000**	0.010*	0.000**
	R	0.065	0.271	-0.440	0.163	0.362
WHR	P	0.154	0.000**	0.000**	0.001**	0.000**
	R	0.091	0.344	-0.513	0.202	0.442

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Chol: cholesterol; TG: triglyceride; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: body mass index; WC: waist circumference; WHR: waist-to-hip ratio.

Table 3 Anthropometric indices and lipid profile variable differences between women and men.

Variables	Women (83)	Men (166)	*p*
Chol	189.76	195.55	0.221
TG	112.40	172.66	0.000**
HDL	54.94	42.03	0.000**
LDL	95.98	106.73	0.002**
LDL/HDL	1.84	2.66	0.308
BMI	24.94	26.60	0.000**
WC	76.53	87.06	0.000**
WHR	0.77	0.87	0.000**

** Correlation is significant at the 0.01 level (2-tailed).

Chol: cholesterol; TG: triglyceride; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: body mass index; WC: waist circumference; WHR: waist-to-hip ratio.

Table 4 Anthropometric indices and lipid profile variable differences between younger and older group.

Variables	Age ≤ 40 years (150)	Age > 40 years (99)	*p*-value
Chol	193.00	194.57	0.732
TG	149.88	156.65	0.552
HDL	46.83	45.58	0.421
LDL	102.62	103.95	0.710
LDL/HDL	2.34	2.46	0.308
BMI	25.55	26.81	0.004**
WC	80.94	87.5	0.000**
WHR	0.81	0.87	0.000**

** Correlation is significant at the 0.01 level (2-tailed).

Chol: cholesterol; TG: triglyceride; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: body mass index; WC: waist circumference; WHR: waist-to-hip ratio.

4. Discussion

The current research investigated the relationship between anthropometric indices and lipid profile in-office employees.

In the current study, there was a positive and significant correlation between BMI with TG and LDL to HDL ratio and the inverse correlation with HDL. Our results are consistent with the reports of Shamai and Zerf et al. [17], and Manjereeka et al. [11] in the current study, there was a positive and significant correlation between WC with TG and LDL/HDL ratio, and the inverse correlation with HDI. Our results are in line with the finding of Shirley [18], Nayera[19]and Manjereeka et al. [11]. In the current study, there was a positive and significant correlation between WHR with TG, LDL-C and the LDL to HDL ratio, and the inverse correlation with HDI. Our results are in line with the finding of Rocha[20]and Malick et al. [21] and yet in contrast to Yalamanchali et al. [22]. It seems that the contradiction of our reports with some previous ones was due to the variety in race, subjects' health conditions, number of study samples and physical activity levels. On the other hand, overweight and obesity lead to an increase in fat mass and lipid profiles changes[12],therefore, a positive relationship between lipid profiles with anthropometric indices is predictable, because both variables (anthropometric indices and lipid profiles parameter) are largely influenced by weight gain.

A growing body of evidence indicates that exercise training can decrease body weight through increasing energy while it has been confirmed that energy metabolism continues to increase for many hours following exercise training. Mohmmadi et al.[23] examined the effect of different modes of exercise on middle-aged men and a significant decrease was observed in body weight in aerobic and combined training.

In the present research, there was a significant difference in anthropometric indices (BMI, WC and WHR) between two genders. Our results are in line with many reports[24, 25]. In the present research, there was a significant difference in lipid profile (TG, LDL-C and HDL) between women and men. Our findings are consistent with Palmisano et al. [26] and Manjareeka et al. [11]. It seems that the diversity in anatomy, physiology, metabolism and sex hormones is the most important cause of differences in anthropometric indices and lipid profiles among men and women[24].

It has been proven that during the exercise, TG is consumed by muscle tissue and lipoprotein lipase (LPL) increases, which leads to a higher hydrolysis of TG. Our previous study indicated that moderate-intensity exerciseinduced favorable changes in TG[27]. Also, a study byHalverstadt et al.[28] showed significant improvement in plasma lipoprotein and lipid profiles following endurance exercise training among middle-aged sedentary healthy subjects.

Several studies have shown that age is one of the most important risk factors for CVD[29-31]. Meanwhile, endothelial dysfunction and its related complications usually get prevalent after 40 years old [32]. So, according to the literature, we divided the subjects into two age groups (with a cut-off value of age 40 years). Our results showed that, there was no significant difference in lipid profile variable between two age groups (younger and older adult). Our results are incontinent with Manjareeka et al. [11] and Zhao et al. [33]. The contradiction in our findings with other studies is probably due to:(1) the small sample size compared to other studies, (2) most of the subjects who participated in this study, were nearly 40 years old (men40 ±7, women39 ±5). On the other hand, our results showed that, there was a significant difference in anthropometric indices between two age groups (younger and older adults). Our results are supported by Manjareeka et al. [11] and Zhao et al. [33]. The difference in anthropometric indices between two age groups is probably due to the fat mass increment related to aging. Fat accumulation increases with age, especially in the abdominal part. As mentioned in the literature, the increase of trunk fat mass is associated with cardiovascular and metabolic diseases[34, 35].

Evidences support that exercise training can reduce the risk of coronary heart disease by lowering triglyceride, cholesterol levels[27, 36]. Also, other results suggest that aerobic exercise improves lipid and lipoprotein levels which potentially decrease the risk of cardiovascular diseases[37, 38].

5. Conclusion

Regarding the association of anthropometric indices with lipid profile and their significant differences across age and gender groups, these parameters can be used to evaluate and screen cardiovascular and metabolic disease-related risk factors. Also, it should be used as a monitoring plan for exercise training among sedentary and office people.

6. Limitation

Our study had the following limitation: the number of subjects was relatively small. Second, subjects with limited age range were recruited. Third, the study was cross-sectional and could not indicate cause and effect.

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