

EFFECTS OF SEVERAL RISK FACTORS OF ATHEROSCLEROSIS ON THE BLOOD LIPID TRANSPORT SYSTEM

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Abstract:

In this report we present the results of the investigation of the effects of atherosclerotic risk factors on the blood lipid transport system in healthy young people, having risk factors of atherosclerosis development (a questionnaire to 1060 people at the age of 17-30 years) after studying the questionnaire's results, different groups have been formed. Fasting blood samples were taken. The researcher identified the levels of Total Cholesterol, Triacylglycerols, Low Density Lipoprotein Cholesterol, and High Density Lipoprotein Cholesterol. Additional analyses have been done. Our investigation has shown that the most widespread risk factors of ischemic heart disease were obesity, hereditary predisposition, changes in blood pressure. The most important parameters for prophylactic medical examination are atherogenicity index and high density lipoprotein cholesterol level. Changes in other vital predictors are found.

1. Introduction

Atherosclerosis along with its related diseases like Ischemic Heart Disease (IHD) and Myocardial Infarction (MI) is considered to be one of the important causes of invalidity and mortality which has increased recently especially in the developed countries. ⁽¹⁾

The tissue damage that occurs during a myocardial infarct or a cerebrovascular accident ("stroke") is caused by ischemia; a condition in there is inadequate blood flow. Heart attacks and strokes are usually caused by atherosclerosis accompanied by blood clot formation in an essential artery.

Atherosclerosis is a disease process in which soft masses of fatty material called plaques are deposited in the linings of blood vessels. ⁽²⁾

Cholesterol (C) and triacylglycerols (TG) are transported in body fluids in the form of lipoprotein particles. Each particle consists of a core of hydrophobic lipids surrounded by a shell of more polar lipids and proteins. The protein components of lipoproteins are called apolipoproteins or apoproteins (Apo).

The protein components of these macromolecular aggregates have two roles: they solubilize hydrophobic lipids and contain cell-targeting signals. ⁽³⁾

There are many kinds of apoproteins. Alaupovic P suggested that apoproteins should be given the first Latin Alphabets. ⁽⁴⁾

Lipoprotein particles are classified according to increasing density: Chylomicrons, Very low density lipoproteins (VLDL), Low-density lipoproteins (LDL), and High-density lipoproteins (HDL).

Chylomicrons, transport dietary triacylglycerols and cholesteryl esters (CE) from the intestine to the tissues.

VLDL, synthesized in the liver, are responsible for the transport of lipids to tissues. As VLDL are transported through the body, they become depleted of triacylglycerols, as well as some of apoproteins and phospholipids. Eventually, VLDL are converted to Low-density lipoproteins

(LDL). LDL carry cholesterol to tissues. LDL are engulfed by cells after binding to LDL receptors. ⁽⁵⁾

The role of HDL, also produced in the liver, appears to be the scavenging of cholesterol from cell membranes. In other words, high density lipoproteins have antiatherogenic function. ^(6,7)

There are a strong relationship between atherosclerosis and Dyslipoproteinemia. Dyslipoproteinemia is a disorder represented by a change in the content of lipoproteins in the serum (plasma) through their increasing, decreasing, complete disappearance, or even the appearance of pathological or abnormal lipoproteins. ⁽⁸⁾

The most of these disorders is Hyperlipoproteinemia where Gofman was the first to write about it. Then Fredrickson classified these disorders and World Health Organization (WHO) ratified this classification later. ⁽⁹⁻¹¹⁾

Most the above-mentioned disorders arise from Hypercholesterolemia which is regarded as one of the most important risk factor of Atherosclerosis ^(12,13). For that reason, determination of cholesterol level in blood is considered among the essential and necessary test adopted by lots of universal health and research programs. ^(14, 15)

Taking into consideration, a number of studies which deal with the effects of genetic factors on the appearance of such disorders has increase in the recent time. ⁽¹⁶⁾

Total cholesterol, cholesterol found in each kind of the lipoprotein types and the Triacylglycerols are usually level-determined. In addition, there are some research centers and laboratories which use what is called Index of Atherogenity (IA). Index of Atherogenity stands for the relationship between the Atherogenic Lipoproteins, represented by LDL and VLDL, and the Antiatherogenic Lipoproteins, represented by HDL. The value of this index usually equals 3 - 3.5 in healthy people. The more the value increases, the more the probabilities of appearance of Atherosclerosis. Thus, this index is used as a predictor of Atherosclerosis. ⁽⁸⁾

One of the most common reasons of the increase of blood cholesterol is the extrinsic Risk Factors such as type of food, environmental factors, effects of

drugs, etc. The spread of lipoproteins' disorders have increased in the last period in the youth. This creates a big medical and governmental challenge and it needs a deep and careful study.

2. The Aim of the Research:

The aim of the research was the study of the effects of some risk factors of Atherosclerosis on the blood lipid transport system in the youth in order to take the preventive procedures required for decreasing the effects of these factors.

3. Materials and Methods:

The researcher has delivered forms of a questionnaire to 1060 person aged between 17 and 30 years. This form includes the inquiry of the most important risk factors which are: blood pressure disorders, obesity, smoking, hypodynamia, presence of relatives who are suffering from Ischemic Heart diseases and finally the suffering from diabetes.

After collecting and studying of the questionnaire's results, different groups have been formed to the researcher and they are distributed as follows:

- 1) First Group: Healthy group whose members suffer from none of these risk factors (284 people) and we have chosen 72 of them as a control group.
- 2) Second Group: whose members suffer from one of the mentioned risk factors (358 people)
- 3) Third Group: whose members have two risk factors (322 people)
- 4) Fourth Group: whose members have three risk factors (72 people)
- 5) Fifth Group: whose members have four risk factors (18 people)
- 6) Sixth Group: whose members have five risk factors (6 people)

The researcher has taken a fasting blood samples from all the members of the last three groups and also has taken samples from the control group mentioned above. Then serum has been obtained, separated and studied. After that, the researcher identified the levels of Total Cholesterol (TC), Triacylglycerols (TG), Low Density Lipoprotein Cholesterol (LDL-C) , and High Density Lipoprotein Cholesterol (HDL-C).⁽¹⁷⁾

Next, Index of Atherogenity was calculated for each group we have got. Besides, additional analyses have been done. These analyses are represented by identification of glucose, bilirubin, Creatine kinase(CK) and Aspartate amino transferase (AST) for each sample obtained. Reagents made by Spain Spinreact Company and Spectrophotometer were used. The researcher has used the statistical processes with the help of Statistika 5.5 system.^(18,19)

4. Results and Discussion:

After processing of the results, 27 % of those people included in the questionnaire were found to have none of the risk factors of Atherosclerosis. However, just one risk factor was found in 34 % and in 30 % two risk factors were found. Moreover, in 9 % there were three risk factors or more than three. It was noticed that the most common risk factors in the groups included by the research were obesity, genetic factors and blood pressure disorder and they are arranged

according to their ratio of spread in the groups included. Here below is a table that illustrates the obtained results:

Table(1): Biochemical indexes of healthy people, having 3 or more risk factors of atherosclerosis

Index	Persons with 3RF (n= 72) Mean \pm SD	Persons with 4 RF (n= 18) Mean \pm SD	Persons with 5RF (n= 6) Mean \pm SD	Control group (n= 72) Mean \pm SD
TG Mmol/L(0.51-1.8)	1.15 \pm 0.36	1.7 \pm 0.8	1.19	1.15 \pm 0.36
TC Mmol/l(3.65-5.2)	4.8 \pm 0.94	5.19 \pm 1.77	6.76	4.56 \pm 0.88
LDL-C Mmol/l(1.91-2.6)	3.96 \pm 1.7	4.24 \pm 1.3*	4.77	2.51 \pm 0.79
HDL-C Mmol/l(1.1-1.9)	1 \pm 0.35*	0.86 \pm 0.30	1.28	1.53 \pm 0.34
Index of Atherogenity (IA)	3.8*	5*	4.3	2
Glucose Mmol/l(4-5.5)	5.36 \pm 1.14	5.12 \pm 1.08	6.28	5 \pm 1.07
Bilirubin (total) Micromol/l(3-22)	15.25 \pm 3.4*	14.47 \pm 2.3*	13.2	9.53 \pm 3.13
Creatine kinase(CK) U/l (<150)	84 \pm 20	92 \pm 74	164	88 \pm 18
AST U/l (12-48)	26.85 \pm 52	27.15	27.15	21.56 \pm 5.28

* Significantly (P < 0.05) different from its control

Figure (1)

Lipid profile average of young persons having atherosclerotic risk factors

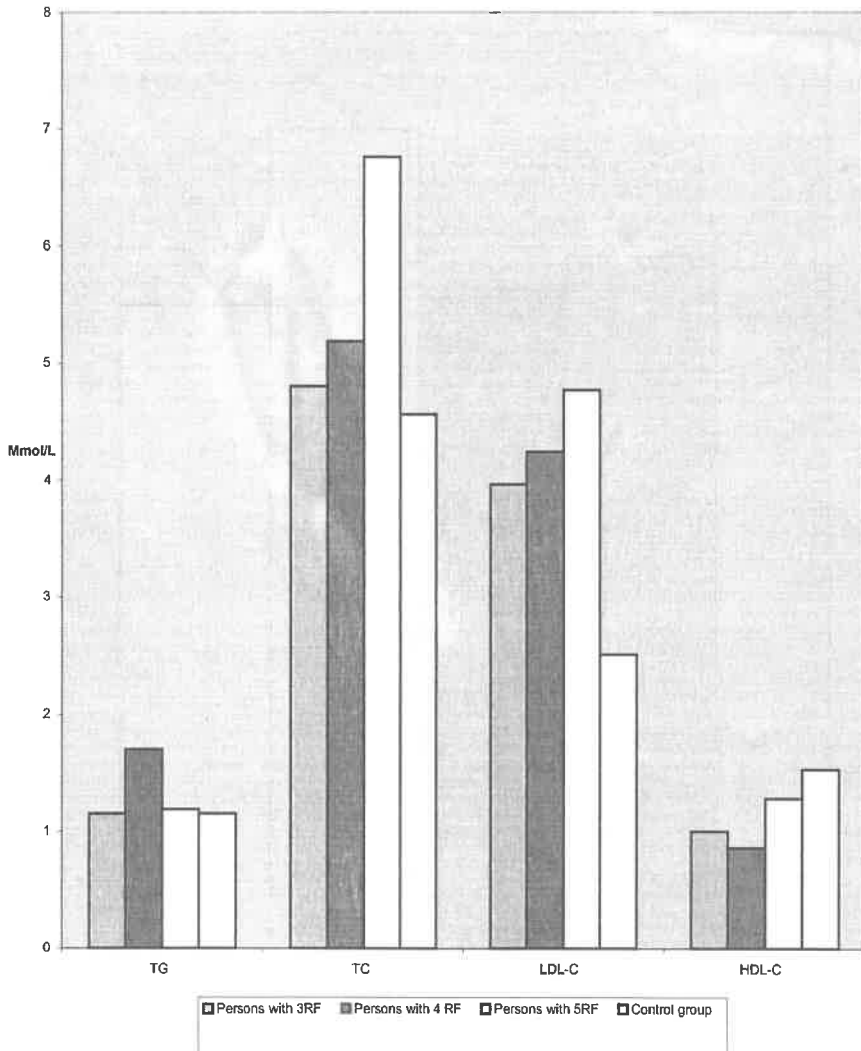


Figure (2)

Glucose profile average of young persons having atherosclerotic risk factors

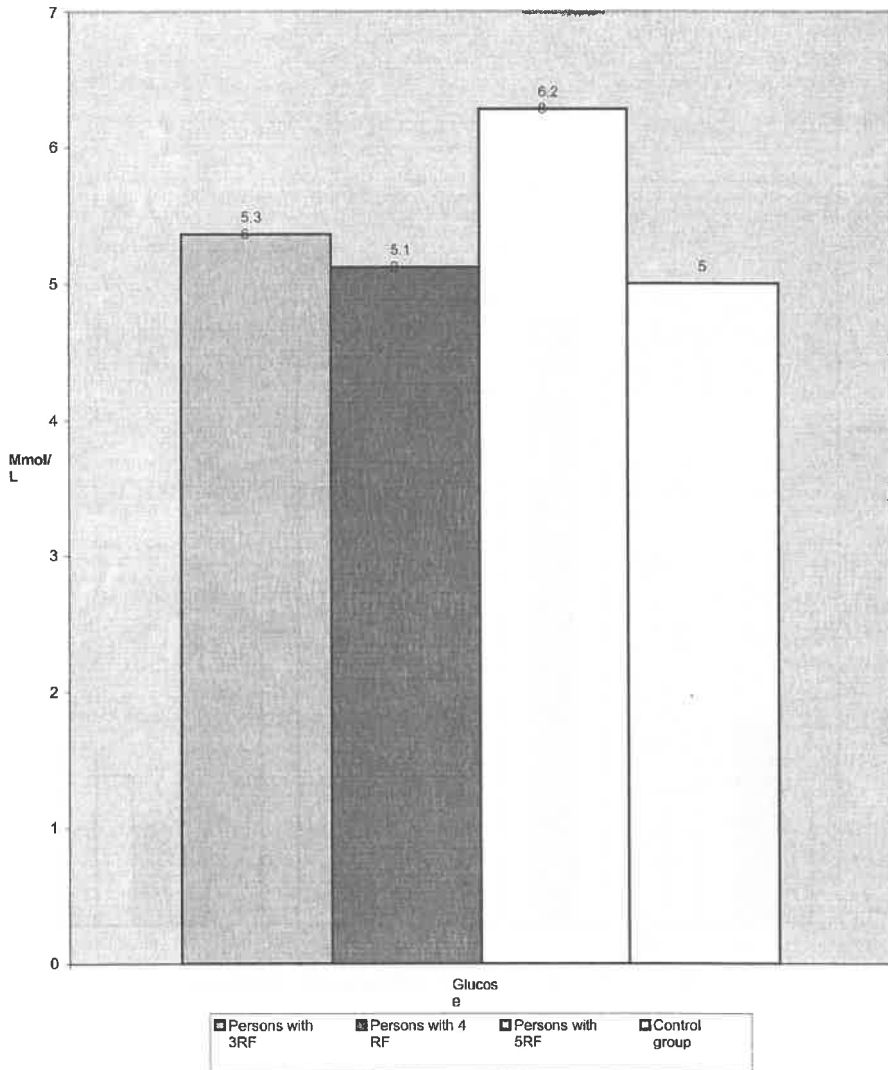
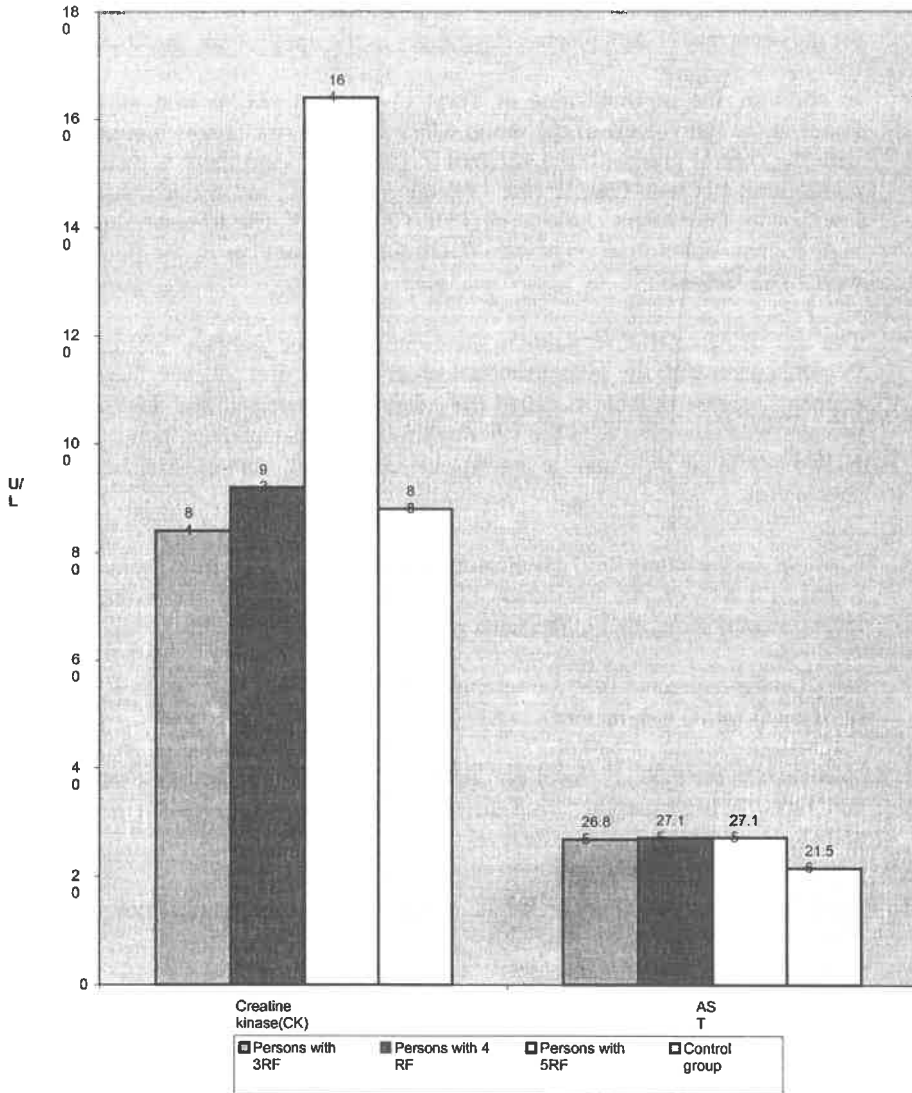


Figure (3)

Creatine kinase & AST profile average of young persons having atherosclerotic risk factors



The results shown in the table (1) , indicate that in all the groups which have risk factors , there is a Hypoalphalipoprotienemia (HDL-C is low) (HDL-C < 1.1mmol/l) and the Index of Atherogenity for the persons of these groups and in the smoking individuals is more than 3.

- It is also noticeable from the table that the TG levels are almost close in all the groups and it is well known that the TG level is considered one of the secondary risk factors. However, it is noticed that Index of Atherogenity is different for each group. This proves the possibility of its use as a predictor for the occurring of Atherosclerotic changes in the lipoproteins spectrum.
- In addition, the highest value of Total Cholesterol (TC=6.76mmol/l) is found in the individuals of the group which has five risk factors compared with the control group (TC=4.56mmol/l). [fig: (1)]. And there is a strong relationship between the increase of total cholesterol and the increase of low density lipoprotein cholesterol (LDL-C).[fig:(1)]. The lowest value of high density lipoprotein cholesterol(HDL-C=0.86mmol/l)is in the persons with 4 risk factors.
- The increasing of HDL-C value in the group with five risk factors [fig:(1)] in comparison with the other groups is observed and it is believed that this happens because of what is called the Adaptation system of the body as a resistance against effects of the atherosclerotic factors since the increase of HDL-C falls under what is known as the useful, anti-atherosclerotic cholesterol.
- Changes in the other vital predicators are found . Hyperbilirubinemia is found in 8.2 % of the individuals of the fourth risk group and in 2.1 % Hyperuricaemia is found in the same group.
- Hypocholesterolemia (TC< 3.6 mmol/l) is remarked in 5.8 % in the group of patients with 3 risk factors.
- As shown in the table(1), level of bilirubin is high in the individuals with 3 and 4 risk factors compared with the control group at approximately 6.1 % and slight increase occurs in the level of TG.
- Glucoseemia (blood glucose = 6.8 mmol/l) is found in the group of persons with 5 risk factors. [fig:(2)]
- The level of Creatine kinase is high (CK=164U/l) in the persons with 5 risk factors [fig:(3)] .

Thus, we have noticed that the presence of risk factors of atherosclerosis in the individuals included by the research {obesity (excess weight), blood pressure

disorders, genetic disorders, and smoking} all have lead to what is called Atherogenic Dyslipoproteinemia. This is symbolized by the decrease of HDL 's cholesterol which is more obvious with the increasing of atherosclerotic factors. The index of atherogenity value is high among the smoking group.

5. Conclusions:

- 1- The importance of periodical and regular checkup of lipids Transport system represented by the identification of the levels of LDL-C, HDL-C and TG.
- 2- The importance of using the Index of Atherogenity as a predictor of the atherosclerotic developments in the clinical tests.
- 3- The necessity of focusing on the and High Density Lipoprotein Cholesterol level.
- 4- Among the most common factors of atherosclerosis are obesity and smoking. For this reason, edification campaigns must be carried out in order to educate and inform the youth and the rest of the society groups about the importance of practicing exercises and necessity of giving up of smoking.

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