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Effect of Blood Pressure on the lipids and Percentage of Fatty Acids of Blood Serum

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Abstract: This study included (50) samples of high blood pressure males and females with ages between between(80-19) years and (50) samples of healthy people who are not infected with any apparent disease males and females were considered a control group of the same categories Age above. In this study, blood samples were collected for healthy people in the case of fasting and control group period for fasting group then the serum was separated, where the serum divided into two parts .The biochemical parameters in part one glucose(Glu), total cholesterol(TC), high-density lipoprotein cholesterol(HDL), low-density lipoprotein cholesterol(LDL),very low-density lipoprotein cholesterol(VLDL), triglyceride(TG) and phospholipids was measured by using kits obtained from regional and international suppliers.the measurement of percentage of fatty acids in the three parts (CE, TG, PL) was performed by Capillary Gas Chromatography (CGC). The results showed that there was a significant increase in the percentage and level of saturated fatty acids (SFA), a significant decrease in monounsaturated fatty acids (MUFA) and a significant decrease in polyunsaturated fatty acids (PUFA), in the cholesterol ester (CE) part of serum lipids for the fasting group compared with the control group.Also, the results of this study showed that there was a significant increase in (SFA), a significant decrease in (MUFA), and a significant increase in (PUFA) in triglyceride (TG) part in serum of the fasting group compared to the control group.The results showed that there was a significant increase in (SFA), a significant decrease in (MUFA) and a significant decrease in (PUFA) in phospholipids (PL) part in the serum for the hypertension group compared with the control group.

Keywords: fatty acid , cholesterol ester, phospholipids, triglycerides, blood pressure

Introduction

High blood pressure is one of the main risk factors for the development of cardiovascular diseases and many other diseases(1), especially those related to cerebrovascular diseases(2). It is a major cause of diseases and deaths around the world(3). Food plays a major role, especially in mothers, children, infants, the fetus, and the elderly through its close association(4). High blood pressure Recent studies have shown a close correlation between consuming unsaturated fatty acids (omega 3) with low blood pressure rates, where studies have found that people with high blood pressure have a higher percentage of saturated fatty acids in their blood serum compared to mono and polyunsaturated fatty acids(5), Other studies that have continued for a long time indicated that people with high blood pressure in the United States of America are given a limited amount of polyunsaturated fatty acids (DHA,EPA).Where the patients were followed up and a significant benefit was observed for unsaturated fatty acids in

reducing the risk of cardiovascular disease and also led to low systolic and diastolic blood pressure, especially fatty acids in fish oil. Other recent studies have shown that it is possible to use unsaturated fatty acids (omega 3) in the treatment of high blood pressure and heart disease(6), where a clinical study showed that eating unsaturated fatty acids during (70) a clinical case led to a diastolic pressure drop (1) mm Hg while Systolic pressure decreased (1.5) mm Hg where the dose was 2 g / 24 hours, confirming the role of fats and fatty acids in general on the effect in patients with high blood pressure and other heart diseases(7).

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Materials and methods

1.Samples collection :-

In this study the blood samples were collected from patients in mosul city (Ibn Sena Hospital) after fasting period for (10-12)hours and (5)ml of blood from each subject was collected and serum was separated from it and then divided in to two parts : 1st part measurement of the following parameters glucose, total cholesterol(TC), high density lipoprotein cholesterol(HDL-C),triglyceride (TG),low density lipoprotein cholesterol (LDL-C) by enzymatic methods using kites(8,9), very low lipoprotein cholesterol(VLDL-C) was measurement theoretical(10) ,and phospholipids(PL) by colorimetric method (11).the 2nd part was stored at (-18)°c until measurement of fatty acids.

2. Extraction and Separation of lipids from serum :

Serum samples were treated with methanol and chloroform to extract lipids(10), lipids extract was separated into three parts cholesterol ester (CE),triglyceride(TG),phospholipids(PL)using thin layer chromatography (TLC).(11)

3. Transmethylation of fatty acids:

In this study analysis and esterfication of fatty acids by using tri-floro boron (BF_3) in Methanol(16%)(12).

4.Measurmeant of percentage of fatty acids:

Measurement of fatty acids in the three lipid fractions was performed by Capillary Gas Chromatography (CGC) Shimadzo 2014,column type TR-WAX, and length 50m.

5-Statistical analysis:

Results were analyzed statistically for biochemical parameters and the percentage of fatty acids using ***t***-test, $\boldsymbol{P}<0.05$ was considered statistically significant (13).

Results

fat part

The results in Table (1) showed a significant increase in total cholesterol (P <0.05), LDL-C (P <0.001) (TG) (P <0.001) and VLDL-C (p <0.001) In hypertensive patients compared with the control group. On the other hand, the results showed a significant reduction in HDL-C as shown in Table (1).

Table (1)

Serum lipids from patients and control

Lipid (mmol/l)	Blood pressure	Control	P value
TC	7.52± 0.83	3.98±1.30	P ≤0.001
HDL-C	0.92±0.21	0.99±0.20	P ≤0.5
LDL-C	5.34±0.11	3.12±0.51	P ≤0.01
TG	3.15±0.86	2.32±0.47	P ≤0.001
VLDL-C	2.08±0.03	1.04 ±0.08	P ≤0.001
PL	160 ± 11.54	118±9.87	P ≤0.001

Values :mean ±SD

The percentage of fatty acids was measured using CGC by comparing the results with the sample of the stand consisting of (12) fatty acids. As a result of the standard sample analysis of fatty acids and Table 2 showed retention time (Rt) of standard fatty acids.

Table (2)

Standard fatty acids

Standard fatty acids	**Retention time(min)**
C10:0	4.900
C12:0	5.138
C14:0	8.500
C16:0	10.08
C16:1	16.74
C18:0	19.09
C18:1	19.48
C18:2	20.12
C18:3	22.20
C20:4	23.46
C20:5	25.12
C22:6	26.68

The results showed that there was no significant increase in total saturated fatty acids (SFA), a significant increase in total monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) in hypertensive patients compared to the CE part

compared to control group .The results showed a significant reduction in total (SFA) and (MUFA), and a significant increase in total PUFA in hypertensive patients in the PL part compared to the control group. The result in Table (3) showed that there was a significant increase in total (SFA) and (MUFA) and significantly lower total (PUFA) in hypertensive patients TG part compared with the control group .

Table (3)

Fatty acids composition in patients and control

Fatty acid	**CE**		**PL**		**TG**	
	Control	**patients**	**Control**	**patients**	**Control**	**patients**
N	**10**	**10**	**10**	**10**	**10**	**10**
SFA						
10:0	1.3±0.29	8.80±0.05	0.00±0.00	0.75±0.08	0.10±0.04	0.3±0.10
12:0	1.3±0.31	4.79±0.22	1.5±0.03	5.35±1.50	2.00±0.30	6.0±0.15*
14:0	0.34±0.18	4.22±0.30	0.38±0.15	2.95±0.18*	4.0±0.65	5.24±0.38
16:0	21.00±0.29	24.4±1.83*	1.74±0.8	4.52±1.31*	25.0±2.60	24.0±3.34
18:0	1.8±0.29	5.35±0.85*	3.50±0.45	8.75±1.87	5.25±1.24	7.25±0.9*
Total	25.75±3.00	47.56±3.25*	7.12±1.43	22.32±4.94*	36.35±4.83	42.8±4.9*
MUFA						
16:1	1.70±0.29	2.24±0.87	2.30±0.66	8.60±0.87*	3.50±0.35	7.28±1.2*
18:1	15.0±1.90	5.33±0.63*	3.70±0.58	9.26±2.11*	20.24±1.24	18.9±1.8*
Total	16.70±2.00	7.57±0.15*	6.00±1.24	17.86±2.98*	23.74±1.59	26.18±3.*
PUFA						
18:2 n-6	1.03±0.40	5.31±0.46*	14.78±3.2	20.65±1.65	18.26±2.77	17.12±1.9
18:3 n-3	2.30±0.39	16.6±2.31*	2.10±0.98	8.74±2.43*	2.85±0.67	1.80±.55
20:4 n-6	8.50±1.29	10.96±1.83*	8.24±3.2	17.28±2.29*	4.85±0.55	3.24±.76
20:5 n-3	1.20±0.2	1.58±0.01	2.85±0.34	8.56±1.20*	2.90±0.54	2.68±.21
22:6 n-3	0.50±0.02	0.85±0.12	2.3±0.50	6.5±1.54*	6.65±0.88	2.56±1.3*
Total	16.65±3.1	33.21±6.2 *	30.98±6.2	58.16±6.7 *	33.2±3.57	25.2±1.9 *

***: P value ≤ 0.05**

Discussion

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Fatty acids in (CE) part:

The results of this study indicate that there is no significant increase in the proportion of saturated fatty acids (SFA). This increase may be due to a defect in fat metabolism in general and especially fatty acid metabolism in hypertensive patients 16. Also in this study there was a significant increase in the total percentage of monounsaturated and unsaturated fatty acids (MUFA, PUFA) may be caused This is due to an abnormality in the lipid-lipase action that leads to metabolic dysfunction (TG) and leads to an increase in the proportion of fatty acids. (11) .

Fatty acids in (PL) part:

The results of this study showed that there was a significant reduction in the percentage of total (SFA), which may be due to increased intake of some types of food, leading to increased risk factors in patients with hypertension compared to control group.(12). The results of this study showed that There was a significant reduction in the percentage of the total (MUFA) and a significant increase in the percentage of the total (PUFA). The reason for this may be due to insulin resistance in hypertensive patients and heart disease in general which leads to a significant defect in the action of enzymes Especially adipose lipoproteins as well as dysfunction of the enzyme T. desaturase elongation and the process of oxidation of fatty acids .(13)

Fatty acids in (TG) part:

The result of this study suggests that there is a significant increase in the percentage of the total (SFA). This increase may be caused by transport (Acetyl-CoA) from the confirmed metabolic pathway to the anabolic pathway of SFA. (14) .

The results showed that there was a significant increase in the percentage of the total (MUFA) and a significant reduction in the percentage of the total (PUFA). This may be due to an imbalance in the work of saturation enzymes. And elongation enzymes in patients with stroke(15) .

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Fatty fractures:

The results showed a significant increase in total cholesterol (TC) in hypertensive patients compared with control group as shown in Table (1). This increase may be due to the increase in the synthesis of TC due to insulin resistance in patients. (16). The results showed that a significant decrease in HDL-C in patients compared with the

control group as shown in Table 1 may be due to the close relationship of activity High cholesterol (CETP) cholesterol, which promotes lipoprotein cholesterol from HDL to be transferred to other lipoprotein in patients (17). On the other hand, the results showed that a significant increase in LDL-C may be due to a defect in the receptor The liver (Apo B100) plays an important role in increasing LDL-C by reducing the transmission of LDL-C to liver tissue(18). In addition, the results of this study indicate that there is a significant increase in the level of TG and the level of low-density lipoprotein cholesterol (VLDL-C) which may be due to low lipid lipase activity in hypertensive patients resulting in a decrease in the removal TG of blood (19) or may be due to insulin resistance in patients with high blood pressure which causes an abnormality in fat metabolism.(20).

Conclusions

1-This study proved that fats and fatty acids of all kinds play a major role in significantly developing symptoms of high blood pressure.

2-The percentage of fatty acids in the three parts of blood serum is one of the important indicators of the possibility of the development of many diseases, especially heart disease and high blood pressure.

3-Food is an important factor for maintaining the level of blood pressure through its components of saturated and unsaturated fatty acids, depending on the food source, vegetable or animal.

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