Lipid Profile and Fatty-Acid Composition of Human Serum in Cerebrovascular Accident Patients in Iben-Sena Hospital-Mosul

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Abstract

The aim of this study was designed to determine the effect of cerebral infarction(stroke) on the level of lipid fractions and percentage of fatty acids in serum .The study included (25) patients with cerebral infarction ,blood was taken within (2-8) days after infarction. The age of patients was between (60-80) year. Blood samples from (25) normal subject with the same age were collected as control .The patients samples collection were from the medical word in Ibn-Sena teaching hospital in Mosul city. A number of biochemical parameters were measured using enzymatic kits methods also the analysis and the measurement of percentage of fatty acids in fatty ,triglyceride) separated by component of serum (cholesterol ester, phospholipids thin laver chromatography(TLC) followed by transmethylation of fatty acids and measurement of fatty acids percentage using Capillary Gas Chromatography (CGC). The result of this study showed that there is a significant differences in the level of studied biochemical parameter and fatty acids percentage in cerebral infarction patients compared with the control group. The results of this study also showed that a significant increase in level of (TG) in serum of CVA patients. The result showed that a significant increase in percentage of (PUFA) in (PL) part.

Introduction

Stroke was the third most common cause of death in developed world after cancer and CVD, it was the most common cause for sever physical disability .

Stroke included episodes of focal brain dysfunction due to focal ischemia or hemorrhage. One half of stroke patients die within month and other half who survive left with physical disability(1)

A stroke occurred when an injury to a blood vessel supplying the brain causes it to burst, resulting in a hemorrhagic stroke, or becomes blocked, resulting in an ischemic stroke. In both cases, the injury deprived the brain of a constant blood supply carrying oxygen and nutrients; some of the cells of the brain die, possibly taking with them the ability to move, speak, feel, think, or even recognize people. In this way, a stroke threatens the very core of one's humanity, recovery after a stroke depends on how well healthy areas of the brain take over duties that had been performed by

the damaged brain tissue. To some extent, especially in children and young adults, recovery was possible because of the brain's ability to compensate for damage in one area by working harder in another by relying on alternate wiring for some functions or by rewiring around the injured site. In some cases, rehabilitation techniques can also facilitate functional recovery(2).

Fatty acid consumption was associated with the risk of stroke ,in general ,long-chain saturated fatty acids (14 or more) tend to increase risk for CVD and CVA , risk factor for stroke include age, hypertension, diabetes mellitus, and cigarette smoking , high serum cholesterol level is a risk factor for thrombotic stroke , dietary factors , such as fat consumption, may also influence the risk of stroke, although the consumption of animal fat has been reported to increase the risk of stroke(3).

Materials and Methods

1.Samples collection of blood :

In this study the blood samples were collected from CVA patients and control subjects over a period between (9/12/2008-23/2/2009) after fasting period for (10-12)hours. A (5)ml of blood from each subject was collected and then separated. Serum was divided into (2) parts: 1st part measurement of the following parameters total cholesterol(TC), high density lipoprotein cholesterol (HDL-C), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) by enzymatic methods using kites (4,5). Accept very low lipoprotein cholesterol (VLDL-C) was measurement theoretical (6). The 2nd part was stored at (-18)°c until measurement of fatty acids.

2. Extraction and Separation of serum main lipids: Serum samples were treated with methanol and chloroform to extract lipids (7). Lipids extract was separated into three parts (CE,TG,PL) by thin layer chromatography (TLC) (8)

3. Transmethylation of fatty acids:

In this study analysis and re-estarfication of fatty acids using triflouro boron in methanol (BF₃)(16%) (9) **4.Measurmeant of percentage of fatty acids:**

Measurement of fatty acids in the three lipid fraction was performed by Capillary Gas Chromatography (CGC) Shimadzo 2010,column type TR-WAX, and length 30m.

5-Statistical analysis:

Statistical analysis of results from biochemical parameter and percentage of fatty acids by using **T-test**, $p\leq 0.05$ was considered significant (10).

Results : 1-Lipid fraction:

The results in table (1) showed significant decrease in total cholesterol(TC) (p<0.05) ,(HDL-C) (p<0.05) and (LDL-C) (p<0.001) in CVA patients in comparison with control group. On the other hand the results showed

significant increase in (TG) (p<0.001) and (VLDL-C) (p<0.001) as show in table (1).

Table(1):Serum	lipids from	ı CVA	patients	and	control
	sub	iects			

Lipid fraction	Control	CVA	P value	
(mmol/l)	n=25	n=25		
TC	4.81±0.31	3.21±0.80	P ≤0.05	
HDL-C	1.38 ± 0.10	0.80 ± 0.10	P ≤0.05	
LDL-C	2.88 ± 0.25	1.60±0.23	P ≤0.001	
TG	1.12 ± 0.10	3.00±0.46	P ≤0.001	
VLDL-C	0.23±0.03	1.10±0.35	P ≤0.001	

Values :mean ±SD

2-Percentage of fatty acids:

The percentage of fatty acids was measured using (CGC) through comparison of results with stander sample composed of (12) fatty acids. As shown in fig (1) result from analysis of standard sample of fatty acids and the table (2) showed the Retention time (Rt) of standard fatty acids.



Figure (1): The CGC chart of (12) standard fatty acids

Standard fatty acids	Symbol	Retention time(min)
Capric acid	C10:0	4.900
Lauric acid	C12:0	5.138
Myristic acid	C14:0	8.500
Palmitic acid	C16:0	10.08
Palmitoleic acid	C16:1	16.74
Stearic acid	C18:0	19.09
Oleic acid	C18:1	19.48
Linoleic acid	C18:2	20.12
Linolenic acid	C18:3	22.20
Arachidonic acid	C20:4	23.46
Eicosapentaenoic acid	C20:5	25.12
Docosahexaenoic acid	C22:6	26.68

Table (2): Standard fatty acids

The results showed that no significant increase in percentage of total saturated fatty acids (SFA), and significant increase in total percentage of monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids(PUFA) in CVA patients in comparison with control group in (CE) part. Fig(2).

Also the results showed that a significant decrease in total of (SFA) and (MUFA), and a significant increase in total of (PUFA) in CVA patients in comparison with control group in (PL) part. Fig (3).

The result in table (3) showed that a significant increase in total of (SFA) and (MUFA), and significant decrease in total of (PUFA) in CVA

patients in comparison with control group in (TG) part. Fig (4).

Table(3):Percentage of fatty acids composition of CE,PL,TG in CVA patients and control group

Fatty acid	(CE	PL		TG	
	Control	CVA	Control	CVA	Control	CVA
n	۱.	۱.	١.	۱.	1.	1.
SFA						
۱۰:۰	1.0±0.23	0.95 ± 0.05	0.50±0.01	0.30±0.08	0.25±0.01	0.3±0.08
17:0	.98±0.31•	1.02±0.02	1.0±0.02	1.25±0.05	0.98±0.20	2.0±0.5
١٤:٠	0.72±0.20	0.78±0.10	0.25±0.1	0.28±0.10	2.0±0.05	2.0±0.08
١٦:٠	11.45±1.5	11.51±1.0	26.5±1.5	22.5±1.89	25.5±0.60	27.0±1.8
۱۸:۰	1.35±0.27	1.56±0.35	15.8±1.2	12.8±1.52	6.80±0.24	8.0±0.63
Total	15.5±2.50	15.82±1.5	44.05±2.8	37.13±3.6 *	35.53±1.0	39.3±3.1 *
MUFA						
١٦:١	3.88±2.24	4.21±1.24 *	1.20±0.5	0.8±0.45 *	2.25±0.15	4.1±1.0 *
۱۸:۱	19.20±3.0	21.58±2.2 *	9.50±1.2	7.21±0.97 *	30.26±1.2	33.5±1.5 *
Total	23.08±5.2	25.79±3.5 *	10.7±1.70	8.01±1.42 *	32.5±1.36	37.6±2.5 *
PUFA						
18:2 n-6	40.0±1.0	45.23±4.2 *	22.0±1.8	26.02±3.2 *	18.0±2.0	14.0±.51 *
18:3 n-3	0.45±0.12	0.40±0.15	1.8±0.56	1.95±0.23	2.10±0.45	$2.89 \pm .90$
20:4 n-6	8.5±1.80	10.15±1.7 *	10.62±2.1	12.75±2.0 *	1.85 ± 0.05	2.06±.30 *
20:5 n-3	1.20±0.2	1.58 ± 0.01	1.56 ± 0.62	1.24±0.25	2.00 ± 0.12	1.05±.01 *
22:6 n-3	0.50 ± 0.02	0.85±0.12	4.0±1.10	6.2±1.10 *	3.25±0.95	1.20±.20 *
Total	50.65±3.1	58.21±6.2 *	39.98±6.2	48.16±6.7 *	27.2±3.57	21.2±1.9 *
n-3	2.15±0.34	2.83±0.28	7.36±2.28	9.39±1.58 *	7.35±1.52	5.14±1.1 *
n-6	48.5±2.80	55.38±5.9 *	32.6±3.90	38.77±5.2 *	19.85±2.0	16.06±.8 *

*: P value $\leq \overline{0.05}$



Figure (2): The CGC chart of fatty acids in CE part



Figure (3): The CGC chart of fatty acids in PL part



Figure (4): The CGC chart of fatty acids in TG part

Discussion

1-Lipid fractions:

The results of this study indicated that there was significant decreases in the level of total cholesterol (TC), high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C). The cause of that is might be due to some drugs or stains (simvastatin, pravastatin) which causes inhibitor of (HMG-CoA) reductase enzyme and leads to decrease the level of total cholesterol (11,12).Or to decrease in lipoprotein lipase activity in CVA patients which leads to decrease catabolism of (TG) into fatty acids and glycerol (13). Or to action of some drugs which causes increase the hepatic receptor (ApoB-100) which plays an important role in increase transport of LDL-C to hepatic tissue (14).

On the other hand the result of this study indicate that there is significant increase in the level of (TG) and the level of very low density lipoprotein cholesterol (VLDL-C) the cause of that is may be due to decrease in lipoprotein lipase activity in CVA patients which leads to decrease in TG clearance from blood (15).Or may be due to insulin resistance in CVA patients which causes abnormality in metabolism of lipids (16).

2.1-Percentage of fatty acids in (CE)part:

The result of this study indicate that there was no significant increase in the percentage of saturated fatty acids(SFA).the cause of this increase may be due to abnormality in metabolism of lipids in general and specially metabolism of fatty acids in CVA patient (17) .also in this study there was a significant increase in the total percentage of monounsaturated and polyunsaturated fatty acids (MUFA,PUFA) the cause of this may be due to defect on abnormality in action of lipoprotein lipase which lead to defect in metabolism of (TG) and lead to increase percentage of fatty acids (18).this result was showed in some research(3).

2.2- Percentage of fatty acids in (PL)part:

The results of this study showed that there was a significant decrease in the percentage of total (SFA),the causes of that may be due to increase ingestion of some type of food which leads to increase the risk factors from CVA patient in comparison with control group (19).also the results of this study showed that there was a significant decrease in percentage of total (MUFA),and a significant increase in percentage of total (PUFA),the cause of that is may be due to insulin resistance in **References**

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CVA patient and cardiac disease in general which leads to a big defect in enzymes action specially lipoprotein lipase and also defect in action for enzymes of desaturase and elongation and oxidation process of fatty acids (20).

2.3- Percentage of fatty acids in (TG)part:

The result of this study indicate that there is a significant increase in the percentage of total(SFA), the cause of this increase may be due to transport (Acetyl-CoA) from deferent metabolism pathway to pathway causes anabolism of (SFA) (21).

Also the results showed that there was a significant increase in percentage of total (MUFA), and a significant decrease in percentage of total (PUFA),the cause is may be due to defect in action for desaturation enzymes ($\Delta 9$),($\Delta 6$),($\Delta 5$) and elongation enzymes in stroke patients(22).

Conclusions

1.High level of triglyceride are linked to atherosclerosis .Condition in which cholesterol and other substances from plaque fragment or blood clots can bloke the flow of blood in an artery supplying the heart .Which could cause a heart attack, or an artery supplying the brain. Which could cause a stroke.

2. The results of this study showed that decrease percentage of total (SFA), (MUFA) and increases percentage of total (PUFA). This may indicate that there is increase in the lipids per oxidation in stroke patients. And increase the metabolism of (MUFA) to (PUFA) which considered a risk factor for CVA because increase free radical.

Table	(4):	list	of A	bbro	eviations
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CVA	Cerebrovascular Accident		
CVD	Cardiovasculer disease		
ТС	Total cholesterol		
TG	Triglyceride		
PL	Phospholipids		
PUFA	Polyunsaturated fatty acid		
MUFA	Monounsaturated fatty acid		
SFA	Saturated fatty acid		
CE	Cholesterol ester		
LDL-C	Low density lipoprotein cholesterol		
HDL-C	High density lipoprotein cholesterol		
VLDL-C	low density lipoprotein cholesterol Very		

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المكونات الدهنية وتركيب احماضها الدهنية في مصل الدم لمرضى الجلطة الدماغية في مستشفى ابن سينا – الموصل

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الملخص:

صممت هذه الدراسة للتعرف على تأثير الإصابة بالجلطة الدماغية على مستوى أنواع دهون الدم والنسبة المئوية للأحماض الدهنية في مصل الدم. شملت الدراسة (٢٥) عينة جمعت من المرضى المصابين بالجلطة الدماغية وبمدة إصابة تزاوحت مابين (2-٨) أيام ، تزاوحت أعمار المرضى مابين (٥–٨) سنة كما تم جمع (٢٥) عينة من أشخاص أصحاء وبنفس الفئات العمرية أعلاه. جمعت العينات من ردهات الباطنية في مستشفى ابن سينا التعليمي في مدينة الموصل و تم قياس عدد من المتغيرات الكيموحياتية في مصل الدم باستخدام الطرق الانزيمية،وكذلك في مستشفى ابن سينا التعليمي في مدينة الموصل و تم قياس عدد من المتغيرات الكيموحياتية في مصل الدم باستخدام الطرق الانزيمية،وكذلك في مستشفى ابن سينا التعليمي في مدينة الموصل و تم قياس عدد من المتغيرات الكيموحياتية في مصل الدم باستخدام الطرق الانزيمية،وكذلك وقياس النسبة المئوية للأحماض الدهنية في المكونات الدهنية لمصل الدم (استر الكوليستيرول ،الدهون الفوسفاتية والكليسيرايد الثلاثي)وذلك باستخدام تقنية كروموتوكرافيا الطبقة الرقيقة ومن ثم تمت إعادة أسترة الأحماض الدهنية،وكنال الدهوبية،وكذلك باستخدام تقنية كروموتوكرافيا الطبقة الرقيقة ومن ثم تمت إعادة أسترة الأحماض الدهنية،وقياس النسبة المئوية للأحماض الدهنية باستخدام جهاز باستخدام تقنية كروموتوكرافيا الطبقة الرقيقة ومن ثم تمت إعادة أسترة الأحماض الدهنية،وقياس النسبة المئوية للأحماض الدهنية باستخدام جهاز كروموتوكرافيا الطبقة الرقيقة ومن ثم تمت إعادة أسترة الأحماض الدهنية،وقياس النسبة المئوية للأحماض الدهنية باستخدام جهاز كروموتوكرافيا الغاز الشعري . أشارت نتائج الدراسة إلى وجود تأثير وفرق معنوي على مستوى المتغيرات الكيموحياتية والنسبة المئوية للأحماض الدهنية دروموتوكرافيا الغاز الشعري . أشارت نتائج الدراسة إلى وجود تأثير وفرق معنوي على مستوى المتغيرات الكيموحياتية والنسبة المؤومان الدم الدهنية،وقياس النسبة المئوية للأحماض الدومان الدهنية حماض الدهنية المئية المئوية مائر مان الدهنية بالتخدام جماز الدهنية دروموتوكرافيا الغاز الشعري . أشارت نتائج الدراسة إلى وجود تأثير وفرق معنوي على مستوى المتغيريات الكيموحياتية والنسبة المئية الدمان الدهنية معادوي ألكيسترايد الدهنية حماض الدهنية مادمانية معادوي ألكومان الدهنية عمان مائرة مع مجموعة السيطرة،كذلك أشارت نتائج مادون والوماني ويولمانية مادموس