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RESEARCH ARTICLE

LIPID PROFILE AND OXIDATIVE STRESS STATUS IN CEREBROVASCULAR ACCIDENT PATIENTS.

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Abstract

Stroke is a serious life threatening condition, which continues to be a major public health problem leading to death and severe neurologic disability, therefore the present study was aimed to study the lipid profile, oxidative stress and antioxidant enzymes in cerebrovascular accident (CVA) patients. The study was carried out in the Department of Medical Laboratory Technology in Southern Technical University. 5-7 ml of Blood was drawn into gel tube and was utilized for estimation of lipid profile parameters, oxidative stress marker concentration and antioxidant enzymes activities. The mean values of TC, TG, LDL-c, VLDL-c, SOD, GPx and CAT were significantly increased in CVA patients as compared to control group ($p < 0.05$) and HDL was decreased in CVA patients as compared to control group ($p < 0.05$). Serum MDA was significantly increase in CVA patients as compared to control group ($p < 0.05$), serum iron was significantly decreased, while copper levels showed insignificant changes in CVA patients as compared to control group ($p < 0.05$). The present study reveals the importance of determining the lipid profile, lipid peroxidation and antioxidant status in CVA patients to enable the formulation of specific therapies for early intervention and better management of disease.

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Introduction:-

Stroke or what is known medically as cerebrovascular accident (CVA) is the third cause of medically related mortality and the second leading cause of neurological morbidity (after Alzheimer disease) in the USA and Europe. It is the fourth most common cause of death in Singapore (Gutteridge and Halliwell, 2015). Stroke is the third most common cause of death in most western populations, after coronary heart disease (CHD) and cancer (CA), information on incidence, prevalence, morbidity and mortality of stroke is extremely important in the evaluation of priorities for dealing with this disease (Husain et al, 2014). During the past years, several observational studies and clinical trials have revealed the adverse effects of abnormal blood lipid and lipoprotein levels in the pathogenesis and progression of atherosclerosis and cardiovascular disease. Numerous population studies have shown an inverse correlation between plasma high-density lipoprotein (HDL) levels and risk of cerebrovascular disease (Mahato et al, 2016). Epidemiological studies have also shown that elevated concentrations of total cholesterol and low-density lipoprotein (LDL) in the blood are powerful risk factors for coronary disease (Ovbiagele and Nguyen, 2011). In view of the pathological role of increased lipid profile, Oxidative stress and decrease antioxidants status in the development and progression of cerebrovascular disease (CVD), Hence, the present study is designed to determine

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level of lipid profile, malondialdehyde, antioxidant enzymes (SOD, GPx and CAT) and trace elements (Iron and Copper) in CVA patients.

Materials and Methods:-

The study was carried out in the Department of Medical Laboratory Technology in Southern Technical University, Basra, Iraq. Cerebrovascular accident patients attending and admitted in neurology department during the period of November 2017 until the end of August 2018 to enrolled in this study. The diagnosis of cerebrovascular accident were based on CT and MRI.

Exclusion criteria:

1. Previous history of CVA.
2. Transient ischemic attack (TIA).
3. Intracranial hemorrhage.
4. History of infections and inflammatory disease.
5. Autoimmune or hematological disorder.
6. Use of lipid lowering drugs, immunosuppression or anti-inflammatory drugs in the previous 2 months.

Inclusion criteria:

All acute stroke patients.

Samples collection:

9-10 ml of fasting venous blood was drawn into vacutainers gel tube from the stroke patients and the control subjects. The sera was separated by centrifugation and was utilized for determination of lipid profile, MDA concentration, antioxidant enzymes (SOD, GPx and CAT) activities, iron and copper.

Biochemical Analysis:

A kit supplied by Biolabo Company, using fully automated clinical chemistry analyzer (Architect c4000, Abbott, Germany), measured serum lipid profile (TC, TG, LDL-c and HDL-c).

VLDL-C was calculated from the formula: $VLDL-C = \text{Triglyceride} / 5$. (Tietz, 2014).

Serum Malondialdehyde (MDA) concentration was estimated by a kit supplied by Elabscience, USA.

Serum Superoxide dismutase (SOD) activity was estimated by a kit supplied by Elabscience, USA.

Serum Glutathione peroxidase (GPx) activity was estimated by a kit supplied by Elabscience, USA.

Serum Catalase activity was estimated by a kit supplied by Bioassay, USA.

A kit supplied by Architect, Germany estimated serum iron levels.

A kit supplied by Architect, Germany estimated serum copper levels.

Statistical analysis:

Statistical analysis between stroke patients (both ischemic and hemorrhagic) and control group were done by using SPSS, t- test and the results were expressed as Mean (M), standard deviation (S.D.). Difference between the study group and control group were considered significant when the p value determined by t- test was less than 0.05 ($p < 0.05$).

Results and Discussion:

Table 1: Clinical characteristics of all studied groups

Parameters	Ischemic	Hemorrhagic	Control
Total (No.)	78	32	50
Sex	Male	17(18.3%)	25(26.9%)
	Female	27(40.3%)	25(37.3%)
Age (years)	62.02±15.29	61.87±12.07	55.88±13.12

Table 2: Comparison of serum lipid profile in control subjects and stroke patients.

Parameters	Control n=50	Stroke Patients		P value
		Ischemicn=78	Hemorrhagic n=32	
cholesterol mg/dl	121.34±32.2	176.7±51.15	182.9±61.2	0.001
Triglyceride mg/dl	103.4±30.29	140.6±73.91	143.28±60.18	0.002

Serum HDL mg/dl	41.95±6.82	37.45±12.97	38.3±20.36	0.171
Serum LDL mg/dl	88.8±23.35	112.6±46.4	107.84±49.63	0.007
SerumVLDL mg/dl	21.05±6.76	28.36±14.5	28.64±12.04	0.002

Table 3: Comparison of serum MDA, SOD, GPx, CAT, iron and copper levels in Control and stroke patients.

Parameters	Control n=50	Ischemic	Hemorrhagic	P value
Serum MDA ng/ml	78.81±18.15	198.1±136.8	624.5±263.15	0.049
Serum SOD pg./ml	1848.2±870.7	2264.21±571.9	2314.52±607.2	0.001
Serum GPx pg./ml	82.21±24.58	495.28±384.55	442.03±353.95	0.001
Catalase pg./ml	1.77±1.01	10.92±23.69	15.33±24.09	0.006
Iron (µg/dl)	69.36±16.12	37.1±23.16	35.74±19.8	0.001
copper (µg/dl)	79.18±16.64	86.49±22.31	85.24±21.86	0.14

The total number was 160 subjects, and were categorized into two groups, first group consists of 110 patients with acute stroke and the second group consists of 50 apparently healthy control subjects. Table no.1: shows the clinical characteristics of all studied groups, 51(54.8%) males with ischemic stroke and 17(18.3%) males with hemorrhagic stroke, while 27 (40.3%) females with ischemic stroke and 15 (22.4%) with hemorrhagic stroke. The rest 50 subjects (25 males and 25 females) were considered as control. The age distribution of ischemic stroke patients were 62.02±15.29 and 61.87±12.07 for hemorrhagic stroke, while 55.88±13.12 for control group.

Table no.2: shows that the mean levels of lipid profile in control group were TC (121.34±32.2 mg/dl), TG (103.4±30.29 mg/dl), HDL-c (41.95±6.82 mg/dl), LDL-c (88.8±23.35 mg/dl) and VLDL-c (21.05±6.76 mg/dl). In ischemic stroke patients, the mean levels were TC (176.7±51.15 mg/dl), TG (140.6±73.91mg/dl), HDL-c (37.45±12.97 mg/dl), LDL-c (112.6±46.4 mg/dl) and VLDL-c (28.36±14.5 mg/dl). Hemorrhagic stroke patients the mean levels were TC (182.9±61.2 mg/dl), TG (143.28±60.18 mg/dl), HDL-c (38.3±20.36 mg/dl), LDL-c (107.84±49.63 mg/dl) and VLDL-c (28.64±12.04 mg/dl). We found, mean values of Total cholesterol, TG, LDL and VLDL-c were significantly increased in CVA patients as compared with control (p<0.05). The mean level of HDL-c in CVA patients were insignificantly decreased as compared to control group (p<0.05). Our results of lipid profile were agreement with the result of Laloux et al., 2004, Ebraheem, 2016, Jasim et al., 2011, Sreedhar et al., 2010 and Mahmood et al., 2010.

Table no.3: in the present study, serum MDA level in CVA patients (ischemic 198.1±136.8 ng/ml, hemorrhagic 624.5±263.15 ng/ml) were found to be significantly increased (p<0.05) as compared to control group (78.81±18.15). This result was concurrent with findings Jawalekar et al., 2011, Beg et al., 2005. The serum level of superoxide dismutase in CVA patients (ischemic 2264.21±571.9 pg./ml, hemorrhagic 2314.52±607.2 pg./ml) were found to be increase as compare to control group (1848.2±870.7 pg./ml). Our results of SOD are concurrent with the findings of Gokdemir, 2017, Sheikh et al., 2009 and Chen et al., 2001. The serum glutathione peroxidase activity in CVA patients (ischemic 495.28±384.55 pg./ml, hemorrhagic 442.03±353.95 pg./ml) was found to be increased as compared to control group (82.21±24.58 pg./ml). Our results of GPx are concurrent with findings of Ha et al., 2011, Gokdemir, 2017 and Zimmermann et al., 2003. The mean values of serum CAT activity in CVA patients (ischemic 10.92±23.69 pg./ml, hemorrhagic 15.33±24.09 pg./ml) was significantly increased as compared with control (1.77±1.01 pg./ml), our result were in agreement with the result of Sapojnikova et al., 2012 and Sheikh et al., 2009. The serum levels of iron was significantly decreased in CVA patients (ischemic 37.1±23.16 µg/dl), hemorrhagic 35.74±19.8µg/dl) as compared with control group (69.36±16.12 µg/dl), our result were in agreement with Moustafa, 2011, Mehta et al, 2012. While serum levels of copper was increased in CVA patients (ischemic 86.49±22.31µg/dl, hemorrhagic85.24±21.86 µg/dl) as compared with control group (79.18±16.64 µg/dl), our result were in agreement with Moemeni et al., 2018, Li and Zhang, 2012.

Conclusion:-

From the present study it was found that, the level of total cholesterol, triglyceride, low density lipoprotein and very low density lipoprotein in stroke patients were significantly higher as compared to control group ($p < 0.05$). Levels of high-density lipoprotein was insignificantly elevated as compared to control group ($p < 0.05$).

The marker of lipid peroxidation induced Malonaldehyde (MDA) was significantly higher in CVA patients as compared to control group ($p < 0.05$)

Levels of superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) was significantly increased in CVA patients as compared to control group ($p < 0.05$). The serum levels of iron was significantly decreased in stroke patients as compared with control group, while serum levels of copper shows insignificant increase in stroke patients as compared with control group. It appears that, both increase in lipid profile and MDA refers to, the stroke patients have considerable degree of oxidative stress.

The present study therefore reveals the importance of determining the lipid profile, oxidative stress and antioxidant status in CVA to enable the formulation of specific therapies for early intervention and better management of disease. The detection of risk factors in early stage and correction of disease condition will help the patients to improve, reduce further complications.

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