Prevalence and Pattern of Dyslipidemia in Acute Cerebral Infarction in Medical Intensive Care in Egypt

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Abstract

Background: Stroke is a major public health problem that ranks in the top four causes of death in most countries. Dyslipidemia including High Lipoprotein (a) [LP (a)] in blood are the risk factor for coronary heart disease (CHD), cerebrovascular disease (CVD), atherosclerosis, thrombosis, and stroke. Therefore this study was designed to find out the prevalence and patterns of dyslipidemia in cases of acute ischemic stroke and its relation to age and sex and to study the effect of dyslipidemic patterns and other modifiable risk factors on mortality of ischemic stroke patients. **Subjects and methods:** 105 subjects with acute ischemic stroke were diagnose clinically and radiologically by brain CT scan or MRI, and were subjected to full history ,clinical examination , routine investigations and calculation of Glasgow coma scale (GCS) and APACHE II score, in addition to 12-14 hour fasting lipid profile and LP (a). **Results:** Dyslipidemia and LP (a) was highly prevalent among cases of acute ischemic stroke, with significantly higher prevalence in males than females. High LDL-C is the most prevalent pattern. TC was significantly more frequent in males than females. High TC/HDL & TG/HDL ratios showed a wide prevalence, even more frequent than each individual lipid pattern of dyslipidemia. Dyslipidemia, previous stroke, smoking, HTN, and DM increased relative risk of mortality of ischemic stroke patients by 2.8, 2.6, 1.5, 1.3, and 1.2 fold respectively. While, high TC, high LDL, high TG, low HDL, high LP (a), high TC/HDL, and high TG/HDL increased the relative risk of the mortality of ischemic stroke patients by: 3.9, 3.43, 1.96, 1.4, 1.46, 2.78, and 1.3 fold respectively. APACHE II score was positively correlated with dyslipidemia and high TC. **Conclusion:** Dyslipidemia is one of the major risk factors, which is widely frequent among cases of ischemic stroke. High LDL and LP (a) is more frequent than other patterns of dyslipidemia in ischemic stroke subjects. This emphasizes their role as risk factors of ischemic stroke. APACHE II score was the most significant predictor of mortality of ischemic stroke cases, followed by TC/HDL ratio and GCS.

Keywords: Stroke, Dyslipidemia, LP (a), ICU, mortality.

Introduction

Stroke continues to be a major public health problem that ranks in the top four causes of death in most countries and the most frequent neurological disorder. Stroke is more often disabling than fatal; it is the leading cause of severe neurologic disability and results in enormous costs and lost productivity [(1)]. Stroke is the rapidly developing loss of brain functions due to a disturbance in the blood vessels supplying blood to the brain. As a result, the affected area of the brain is unable to function, leading to inability to move one or more limbs on

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one side of the body, inability to understand or formulate speech or inability to see one side of the visual field. This can be due to ischemia caused by thrombosis or embolism or due to hemorrhage, 80% of strokes are due to ischemia, the remainder is due to hemorrhage[(2)].

Intracranial atherosclerotic stenosis of the major arteries (intracranial internal carotid artery, middle cerebral artery, vertebral artery, and basilar artery) is the most common proximate mechanism of ischemic stroke worldwide [(3).]

There are well established risk factors for stroke, such as increased blood pressure, increased blood cholesterol, cigarette smoking, carotid stenosis, diabetes mellitus, atrial fibrillation and valvular heart disease. There is a reasonably reliable evidence to suggest that 60-80% of all ischemic strokes can be attributed to these risk factors [(4)]. Dyslipidemia is the presence of abnormal levels of lipids or lipoproteins in the blood. Dyslipidemia is characterized by elevated total cholesterol (TC), elevated low density lipoprotein (LDL), elevated triglycerides (TG), or low high density lipoprotein (HDL) [(5).] Most (80%) lipid disorders are related to diet and lifestyle, although familial disorders (20%) are important as well [(6)]. Dyslipidemia is a major risk factor for cerebral infarction. The LDL-C targeting goal can significantly reduce the risk of cerebral infarction [(7)]. Elevated level of LDL-C plays an important role in leading to atherosclerosis, and is the independent factor leading to stroke. It is important in prevention and cure of stroke to decrease the elevated level of LDL-C [(8).]

Lipoprotein (a) [LP (a)] structure is similar to plasminogen and t-PA and it competes with plasminogen for its binding site, leading to reduced fibrinolysis. Also because LP (a) stimulates secretion of plasminogen activator inhibitor-1 (PAI-1), it leads to thrombogenesis. In addition, because of LDL cholesterol content, LP (a) contributes in atherosclerosis [(9)].

Numerous epidemiologic studies have identified LP (a) as a risk factor for atherosclerotic diseases such as coronary heart disease and stroke [(10).] A meta-analysis tried to combine the data from the available literature in order to define the possible association of LP (a) with stroke. The data analysis from 31 studies with 56010 subjects and >4,609 stroke events concluded that LP (a) is a risk factor for cerebrovascular disease [(11).] Dyslipidemia and elevated lipoprotein (a) are associated with ischemic stroke in adults [(12).]

So this study was planned to find out the prevalence and pattern of dyslipidemia in cases of acute ischemic stroke and its relation to age and gender, secondly to elucidate the relative risk of dyslipidemia, its patterns and other modifiable risk factors on the mortality of acute ischemic stroke patients, and finely to study the correlation of dyslipidemia & its patterns versus the severity scoring systems Glasgow coma scale (GCS) and Acute Physiology and Chronic Health Evaluation (APACHE II score) in acute ischemic stroke.

Subjects and methods

This study was carried out in the stroke subunit of medical ICU, Faculty of Medicine, Zagazig University hospitals.

Subjects: out of 311 subjects who were admitted to stroke subunit of medical ICU within 6 months only. 105 subjects with acute ischemic stroke; which were confirmed clinically and radiologically by brain CT scan or MRI

were included in this study after exclusion of patients suffering from hemorrhagic stroke, transient ischemic attacks (TIAs), stroke of undetermined etiology, neurological deficits secondary to nonvascular causes e.g. space occupying lesions and patients with known underlying cause for ischemic stroke e.g. systemic malignancy, SLE, kidney transplants and subjects under estrogen and lipid lowering drugs and they followed by 4 weeks.

The ages of the subjects were ranged from 45 to 80 years old, with mean±S.D (63.35±7.25). The age of 67 subjects was ≤65 years, while the age of 38 subjects was >65 years. 48 subjects were females, while 57 subjects were males. Among the study subjects, 68 subjects (64%) were diabetic, 78 subjects were hypertensive, 56 subjects were smokers and 23 subjects had a history of previous ischemic stroke. After being informed on the purpose and procedures of the study, patients' relatives singed an informed consent form.

Methods: All patients were submitted to: Full clinical assessment including history taking, physical examination, neurological examination, severity assessment using GCS and APACHE II score. Routine laboratory investigations including: Complete blood count, random blood glucose level on admission followed by fasting and 2 hours post prandial blood glucose assessment, liver function tests, kidney function tests, arterial blood gases, serum sodium, serum potassium, PT, PC, INR and PTT. Other investigations including: Electrocardiography, imaging Chest X-ray (in cases of chest infection, cardiac troubles), Echocardiography: in cases of cardiac lesions, Cranial computed tomography (CCT) and /or MRI brain. Specific investigations: Lipid profile including: TC , TG , LDL and HDL were determined by standard laboratory techniques using enzymatic kits [(13),] Lipoprotein (a) [LP (a)] estimation by using the LP (a) turbilatex [(14).]

Statistical analysis

All data were tabulated and statistically analyzed using SPSS software package version 17. Methods included the Chi-square test and student t-test. P-value<0.05 was considered statistically significant. Relative risk of component of metabolic syndrome on mortality of patients was obtained using logistic regression analysis. For all statistical tests, the threshold of significance is fixed at 5%. P-value>0.05 indicates non- significant results. P-value<0.05 indicates significant results.

Results:

Table (1) shows the prevalence and patterns of dyslipidemia in the study sample as a whole and in relation to age and gender: The prevalence of dyslipidemia in general is 57.145, high TC/HDL ratio is 43.8%, high LP (a) is 48.6%, high TG/HDL ratio is 41%, high LDL is 33.3%, high TG is 31.4%, high TC is 30.5%, and low HDL is 29.5%. The table also shows the prevalence and patterns of dyslipidemia in males and females in comparison. We note that all components are more prevalent in males than in females. The difference in prevalence is significant in cases of dyslipidemia in general, high TC and high TC/HDL ratio. The table also shows the prevalence and patterns of dyslipidemia in age group ≤65years and in age group >65years in comparison. We note that all components are more prevalent in age group >65years than in age group ≤65years except in case of

low HDL; but the differences in prevalence are insignificant.

Table (2) shows relative risk (RR) of other modifiable risk factors (HTN, DM, and smoking) on the patterns of dyslipidemia, TC/HDL, TG/HDL and LP (a) in ischemic stroke cases: The effect of DM is most obvious in cases of high TG & TG/HDL; where the relative risks are 3.9and 5.3 respectively. The effect of HTN is most obvious in cases of high TC, TG & TC/HDL; where the relative risks are 3.35, 3.42 and 2.31 respectively. The effect of smoking is most obvious in cases of high TC, LDL & TC/HDL; where the relative risks are 1.92, 1.68 and 1.64 respectively. **Table (3) shows relative risks of age, gender, dyslipidemia and other modifiable risk factors on the mortality of ischemic stroke patients:** There is increased relative risk of male gender (1.21 folds) on the mortality of ischemic stroke patients. There is increased relative risk of increasing age (1.59 folds) on the mortality of ischemic stroke patients. The table also shows the increased relative risk of dyslipidemia and other modifiable risk factors on the mortality of ischemic stroke patients, being 2.8 fold with dyslipidemia, 2.6 folds with previous stroke, 1.5 folds with smoking, 1.3 folds with HTN and 1.2 folds with hyperglycemia. **Table (4) shows relative risk of patterns of dyslipidemia, high LP (a), high TC/HDL &TG/HDL on mortality of ischemic stroke patients:** there is increased relative risk of all patterns of dyslipidemia on the mortality of ischemic stroke patients, being highest in cases of high TC (3.9 folds), high LDL (3.4 folds) and high TC/HDL (2.78 folds). **Table (5) shows backward stepwise logistic regression analysis of the risk factors predicting mortality of ischemic stroke patients:** APACHE II score was the most significant predictor of mortality of ischemic stroke cases, followed by TC/HDL ratio and GCS. **Table (6) shows correlation between; serum lipids, dyslipidemia, other modifiable risk factors, age, severity scoring systems; APACHE II score & GCS and mortality:** APACHE II scoring system was correlated with Dyslipidemia, TC, HTN, history of ischemic stroke, age and mortality. GCS is highly correlated with mortality. Mortality is correlated with APACHE II scoring system, GCS, dyslipidemia, TC, LDL, TC/HDL, and history of previous stroke.

Table (1): Prevalence and patterns of dyslipidemia and its patterns in the study sample as a whole, and in relation to age and gender.

Variables	Whole sample		Age					Gender				
			≤65y (67)		>65y (38)		P.	F (48)		M (57)		P.
	N	%	N	%	N	%		N	%	N	%	
Dyslipid.	60	**57.1**	36	**53.7**	24	**63.2**	0.08	21	**43.8**	39	**68.4**	0.011 S
TC >240mg/dl	32	**30.5**	19	**28.4**	13	**34.2**	0.51	10	**20.8**	22	**38.6**	0.049 S
TG >200mg/dl	33	**31.4**	18	**26.9**	15	**39.5**	0.18	13	**27.1**	20	**35.1**	0.37
LDL >160mg/dl	35	**33.3**	20	**29.8**	15	**39.5**	0.31	12	**25**	23	**40.4**	0.09
HDL >40mg/dl	31	**29.5**	22	**32.8**	9	**23.7**	0.32	10	**20.8**	21	**36.8**	0.07
HLP(a) >30mg/dl	51	**48.6**	28	**41.8**	23	**60.5**	0.06	21	**43.7**	30	**52.6**	0.36
TC/HDL >5	46	**43.8**	27	**40.3**	19	**50**	0.33	16	**33.3**	30	**52.6**	0.047 S
TG/HDL >4	43	**41**	24	**35.8**	19	**50**	0.16	16	**33.3**	27	**47.4**	0.14

Table (2): Relative risk (RR) of other modifiable risk factors (HTN, DM, and smoking) on the patterns of dyslipidemia, TC/HDL, TG/HDL and LP (a) in ischemic stroke cases.

Variables		DM		RR.	HTN		RR.	Smoking		RR.
		+VE =68	-VE =37		+VE =78	-VE =27		+VE =56	- VE	
TC	>240 mg/dl	22	10	1.2	29	3	3.35	22	10	1.92
	≤240 mg/dl	46	27		49	24		34	39	
TG	>200 mg/dl	29	4	3.9	30	3	3.42	20	13	1.35
	≤200 mg/dl	39	33		48	24		36	36	
LDL	>160 mg/dl	23	12	1.04	30	5	2.1	23	12	1.68
	≤160 mg/dl	45	25		48	22		33	37	
HDL	<40 mg/dl	18	13	0.75	23	8	1.0	20	11	1.59
	≥40 mg/dl	50	24		55	19		36	38	
LP (a)	>30 mg/dl	31	20	0.84	44	7	2.18	30	21	1.25
	<30 mg/dl	37	17		34	20		26	28	
TC/ HDL	>5	37	9	2.24	40	6	2.31	30	16	1.64
	<5	31	28		38	21		26	33	
TG/ HDL	>4	39	4	5.3	34	9	1.31	26	17	1.34
	>4	29	33		44	18		30	32	

Table (3): Relative risks of age, gender, dyslipidemia and other modifiable risk factors on the mortality of ischemic stroke patients.

Variables		Deceased	Survived	Total	RR.
Gender	**Male**	12	45	57	1.44
	Female	7	41	48	
Age	>65y	9	29	38	1.59
	≤65y	10	57	67	
Dyslipidemia	+VE	15	45	60	2.8
	-VE	4	41	45	
Hyperglycemia	+VE	13	55	68	1.2
	-VE	6	31	37	
HTN	+VE	15	63	78	1.3
	-VE	4	23	27	
Previous stroke	+VE	8	15	23	2.6
	-VE	11	71	82	
Smoking	+VE	12	44	56	1.5
	-VE	7	42	49	

Table (4): Relative risk of patterns of dyslipidemia, high LP (a), high TC/HDL &TG/HDL on mortality of ischemic stroke patients.

Variables		Deceased	Survived	Total	RR.
TC	>240 mg/dl	12	20	32	3.9
	≤240 mg/dl	7	66	73	
TG	>200 mg/dl	9	24	33	1.96
	≤200 mg/dl	10	62	72	
LDL	>160 mg/dl	12	23	35	3.43
	≤160 mg/dl	7	63	70	
HDL	<40 mg/dl	7	24	31	1.4
	≥40 mg/dl	12	62	74	
LP (a)	>30 mg/dl	11	40	51	1.46
	<30 mg/dl	8	46	54	
TC/ HDL	>5	13	33	46	2.78
	<5	6	53	59	
TG/ HDL	>4	9	34	43	1.3
	>4	10	52	62	

Table (5): Backward stepwise logestic regression analysis of the risk factors predicting mortality of ischemic stroke patients.

Parameters	(B)	S.E.	Sig.	Exp(B)	95.0% C.I for exp (B)	
					Lower	Upper
Apache II score	4.247	0.984	0.000	69.916	10.153	481.471
TC/HDL	2.678	1.046	0.010	14.560	1.874	113.124
GCS	2.205	0.958	0.021	9.068	1.387	59.290
Constant	-6.125	1.438	0.000	0.002	---	---

Table (6): Correlation between; serum lipids, dyslipidemia, other modifiable risk factors, age, severity scoring systems; APACHE II score & GCS) and mortality.

Variables	APACHE II score		GCS		Mortality	
	r.	p.	r.	p.	r.	p.
TC	0.193*	0.049 S	0.035	0.720	0.232*	0.017 S
TG	0.162	0.098	0.006	0.954	0.066	0.503
LDL	0.166	0.090	0.053	0.593	0.239*	0.014 S
HDL	-0.018	0.852	0.110	0.263	-0.003	0.974
LP(a)	0.005	0.96	0.022	0.826	0.089	0.365
TC/HDL	0.172	0.079	0.094	0.340	0.213*	0.029 S
TG/HDL	0.149	0.129	0.049	0.622	0.063	0.523
Dyslipidemia	0.246*	0.011 S	-0.030	0.840	0.207*	0.034 S
HTN	0.285**	0.003 S	0.013	0.897	0.050	0.612
Prev. stroke	0.271**	0.005 S	-0.189	0.053	0.230*	0.018 S
Hyperglycemia	0.068	0.491	0.111	0.259	0.036	0.715
Smoking	0.144	0.142	-0.031	0.752	0.093	0.348
Age	0.339**	0.000 HS	-0.151	0.125	0.166	0.091
Mortality	0.646**	0.000HS	0.432**	0.000HS	1	----

Discussion

Stroke continues to be a major public health problem that ranks in the top four causes of death in most countries and the most frequent neurological disorder. Stroke is the leading cause of severe neurologic disability and results in enormous costs and lost productivity [(1)]. Stroke is classified by the pathology of the underlying focal brain injury into either infarction (ischemia) or hemorrhage [(15).]

There are well established risk factors for stroke, such as increased blood pressure, increased blood cholesterol, cigarette smoking, carotid stenosis, diabetes mellitus, atrial fibrillation and valvular heart disease. There is a reasonably reliable evidence to suggest that 60-80% of all ischemic strokes can be attributed to this risk factor [(4)]. Dyslipidemia is a major risk factor for cerebral infarction [(7).] Dyslipidemia is the presence of abnormal levels of lipids in the blood, characterized by an elevation of the serum level of TC , LDL , and TG , and a decrease in the serum level of HDL [(5).]. Recent epidemiologic studies have provided that LP (a) plays a causal role in the pathogenesis of atherosclerosis and cardiovascular disease (CVD) [(16).]

In our study, we observe that hypertension is the most frequent risk factor(74.3%) followed by hyperglycemia(64%) then dyslipidemia (57.1%) then smoking (53.3%); constituting the major risk factors in our ischemic stroke patients. These findings are more or less accordant with many findings in different areas of the world, with some minor differences. For instances, **Mirghani & Zein** found the following risk factors frequencies in ischemic stroke patients in Emarates: (76.0%) were hypertensive, (65.5%) had hypercholesterolemia, (52.8%) were diabetic, (23.4%) had past history of stroke/TIA, twenty two patients (12.9%) were heavy smokers [(17)]. **Khan et al.,** found the following risk factors prevalence in Pakistan: hypertension (65%), dyslipidemia (32.7%), diabetes mellitus (36.3%) and smoking (32%) [(18)]. **Krassen et al.** in Switzerland, reported that: Hypertension was the most prevalent vascular risk factor (64%), followed by hypercholesterolemia (55%), current cigarette smoking (32%) and diabetes mellitus (14%) [(19)].

We clearly observe the unique order of the prevalence of the major four risk factors, as same as in our study, with some differences in the ratios which may be attributed to the differences in genetic patterns, cultures, life styles and dietary habits between different countries.

We found that the prevalence of dyslipidemia in our study sample as a whole was 57.1%. Prevalence of dyslipidemia in males was 68.4%, which was significantly higher than in females (43.8%). Prevalence of dyslipidemia was more in the age group>65 years (63.2%) than in the age group≤ 65 years (53.7%), but this difference was not significant**. Mirghani & Zein,** found that prevalence of dyslipidemia in ischemic stroke patients in Emarates was 65.5% which is slightly higher than our finding [(17)]. **Khan et al.** found that the prevalence of dyslipidemia in ischemic stroke in Pakistan was 32.7% which is clearly less than our finding [(18)]. These minor differences in the prevalence of dyslipidemia in different places may be attributed to the differences in genetic patterns, cultures, life styles and dietary habits.

The wide prevalence of dyslipidemia in our study can be attributed to the possibility of insulin resistance in our subjects; especially that most of our subjects were diabetics (64%), and hypertensive (74.3%). It is believed that insulin resistance is associated with dyslipidemia as a direct consequence of increased VLDL secretion by the liver [(20)]**.** Diabetic persons were found to have an increased susceptibility to increased prevalence of pro atherogenic risk factors, notably hypertension and abnormal blood lipids, moreover ischemic stroke patients with diabetes were found to be more likely to have hypertension, and high cholesterol than patients without diabetes [(21)]**.** The relationship between insulin resistance and hypertension had been established and relates to several mechanisms [(22).] Another important cause for the widely prevalent dyslipidemia in our study is smoking, as 53.3% of our subjects were smokers, all of them are males. It was found that; when comparing other factors that influence blood lipids, such as alcohol intake, body mass index, and age; smoking had the greatest influence and was shown to be an independent risk factor for dyslipidemia [(23).]

As regard to patterns of dyslipidemia in our study; High LDL-C is the most prevalent pattern in our study (33.3%), followed by high TG (31.4%), high TC

(30.5%), then low HDL-C (29.5%); but the variations in frequencies of patterns of dyslipidemia are very close. This goes with **Zhang et al.** who found that high LDL-c was the common risk factor for ischemic stroke[24]. Many studies proved that high TC levels have frequently been associated with risk of stroke [25].

A meta-analysis of data from many clinical trials also showed a protective effect of reducing TC for ischemic strokes [26]. Low levels of HDL-cholesterol have been associated with an increased risk of ischemic stroke as reported by APCSC [27] and by several other studies [28] who found an inverse association of HDL cholesterol with ischemic stroke risks in both genders.

Rodríguez-Sanz et al. found an HDL cholesterol level ≥38.5 mg/dl was independently associated with lower risk for developing infectious complications in acute ischemic stroke patients[29]. **Laloux et al.** found that high TG is commonly found in patients with ischemic stroke whatever the etiologic subtype [30]. **Holme et al.** reported that elevated TG and low HDL-c were associated with increased incidence of ischemic stroke in both genders [31].

However, according to gender; all patterns of dyslipidemia were more frequent in males than in females, but the difference in frequency was significant only in case of high TC level. The differences of lipids profile between women and men; presumably due to the different levels of circulating sex hormones, specifically estrogens and androgens [32].

Also, smoking can be an important cause for the difference of lipids state in relation to gender in our study; as we found that all smokers in our study were males, while no female smokers were reported. A comprehensive meta-analysis by **Craig et al.** examined published data from 1966 to 1987 and estimated the excess risk posed by smoking on CVD, with particular emphasis on lipid and lipoprotein involvement. They found that compared with non-smokers, cigarettes smokers had significantly higher TC, TG, and LDL, and lower concentrations of HDL [33].

Regarding TC/HDL & TG/HDL ratios; on the level of the whole study sample; high TC/HDL ratio was (43.8%), and high TG/HDL ratio was (41%). A prospective cohort study found that TC/HDL ratio was significantly associated with increased risk of ischemic stroke [34]. **Zhang et al.** found a positive association of high TC/HDL ratio with chemic stroke risks in both genders [28]. **Holme et al.** reported that elevated TC/HDL-C ratio is associated with increased incidence of ischemic stroke in both genders [31]. **Kang et al.,** found that TG/HDL ratio is more highly associated with the intracranial steno-occlusive disease than any standard lipid measure [35]. According to age; no significant difference in frequency of high TG/HDL & high TC/HDL ratios were found between age group >65 years and age group ≤65years (50% Vs 35.8% and 50% Vs 40.3%) respectively. According to gender; high TG/HDL was more frequent in males than females (47.4% Vs 33.3%); though not significant. However, high TC/HDL was significantly more frequent in males than in females; 52.6% VS 33.3%. This can be attributed to the significantly higher frequency of high TC in males than females, and as mentioned before; this difference can be explained by the effect of different in levels of sex hormones (especially estrogen and androgens)

between males and female [32] and the effect of smoking on TC and HDL [23].

Regarding high LP (a) ; several cross sectional studies provided contradictory findings regarding LP (a) as a predictor of ischemic stroke [36].

In our study sample we found that the prevalence of high LP (a) was 48.6%. We also found that; high LP (a) frequency was 52.6% in males VS 43.7% in females, and 60.5% in group >65 years VS 41.8% in age group ≤65years, but the differences in high LP (A) frequency in relation to age and sex were not significant; This may be because LP (a) is genetically determined[37]. **Kooten et al.** found that the prevalence of increased LP (a) levels was (35%) in patients with ischemic stroke but, they found no relationship between LP (a) levels and the prognosis or ischemic stroke severity [38]. Despite significant achievements in the acute management and treatment of stroke, it remains the third leading cause of death in industrialized countries [39] .Regarding the mortality in our study; we found (18.1%) 30-day post ischemic stroke mortality. **Krassen et al.** reported 13% 30-days mortality after acute ischemic stroke [19].

According to gender; we observed a higher mortality rate in males 21.1% versus 14.6% in female. And the male gender increased the relative risk of mortality by 1.44 fold than female gender. This agrees with the finding of **James et al.** -in Scotland- who reported a lower 30-day mortality rates in women aged 55 to 84 years than men [40]. While**, Gall et al.** in Australia, reported higher 28-day mortality rate in women than men (32% versus 21%)[41] and **Krassen et al.** reported 13% 30-days mortality for men versus 15% for women[19].

In our study we can attribute the higher mortality in males than females to the higher frequency of other risk factors in males than females such as smoking (53.3% of our subjects are smokers, all of them are males), dyslipidemia (68.4% Vs 43.8%), and history of previous stroke (24.6% Vs 18.7%) and HTN (78.9% Vs 68.7%).

According to age; we observed a higher mortality rate in age group >65years than in age group ≤65years (23.7% VS 14.9%). Also we found that age group >65years increased the relative risk of mortality by 1.59 folds than age group ≤65years. This agrees for some extent with a study by **Zuliani et al.** who reported 27.7% mortality rate within 30 days after stroke of old age[42].

On the level of modifiable risk factors; we found that dyslipidemia, previous stroke, smoking, HTN, and DM increase the relative risk of mortality by 2.8, 2.6, 1.5, 1.3, and 1.2 fold respectively. As regard patterns of dyslipidemia; there was an increased relative risk of all patterns of dyslipidemia on the mortality of ischemia stroke patients; being 3.9 fold with high TC, 3.43 fold with high LDL, 1.96 fold with high TG, and 1.4 fold with low HDL. As regard to TC/HDL & TG/HDL ratios; there were an increased relative risk of high TC/HDL & TG/HDL on mortality of ischemia stroke patients, being 2.78 fold with high TC/HDL and 1.3 folds with high TG/HDL. While LP (a), increased the relative risk of mortality of ischemia stroke patients by 1.46 fold.

As regard the correlations between severity scoring system and each of dyslipidemia and its patterns and other modifiable risk factors; we found that: APACHE II score is positively correlated with; dyslipidemia, high TC,

HTN, previous stroke and highly positively correlated with age. While GCS, not correlated with any of them. However mortality is positively correlated with dyslipidemia, high TC, high LDL, high TC/HDL, and previous stroke.

From all of the above we had a list of factor determining or affecting the outcome of patients with ischemic stroke as: age, sex, GCS, APACHE II score, dyslipidemia in general, high TC, high TG, high LDL, low HDL, high LP (a), high TC/HDL, high TG/HDL, HTN, DM, history of previous stroke and smoking. We tried to know which of those factors carried more risk to those patients and so, can be used as a predictor of mortality. By using back word step wise regression analysis of these factors, we found that: higher APACHE II score followed by high TC/HDL, then higher GCS; carried more risk and can be used as predictor of mortality of ischemic stroke patients.

We can conclude that dyslipidemia in general is widely prevalent among cases of acute ischemic stroke, with a significantly higher prevalence in males than females, while no significant difference in prevalence was found in relation to age. High LDL-C is the most prevalent pattern of dyslipidemia, followed by high TG, high TC, then low HDL, with no significant differences found in the frequencies of the patterns of dyslipidemia in relation to age and gender except in case of high TC which is significantly more frequent in males than females. High TC/HDL & TG/HDL ratios showed a wide prevalence, with no significant differences in relation to age or gender except in case of high TC/HDL which is significantly more frequent in males than females. Also, high LP (a) is widely prevalent in our study, but no significant age or gender differences were found.

As regard mortality, it was found that: dyslipidemia, previous stroke, smoking, HTN, and DM increased relative risk of mortality of ischemic stroke patients. While, high TC, high LDL and high TG, low HDL, high LP (a), high TC/HDL, and high TG/HDL increased the relative risk of the mortality of ischemic stroke patients. And finally, higher APACHE II score, higher GCS and high TC/HDL can be used as predictors for mortality of ischemic stroke patients.

Recommendations

Giving more attention to serum lipids, hoping for primary and secondary prevention of ischemic stroke, this requires periodic check of fasting lipid profile. Enriching the people culture about hazards of dyslipidemia, and how to keep a good lipid state. Also, we have to take in consideration lipids ratios as an important component of the lipid profile.

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الملخص العربي

مدى شيوع ونمط اختلال مستويات دهون الدم في السكته الدماغيه الاحتشائيه الحاده في مرضى الحالات الحرجه

المقدمه : ما زالت السكته الماغيه الحاده احد اخطر المشكلات الصحيه واحد اهم اسباب الوفاه الاربع في معظم دول العالم .وتؤكد الكثير من الدراسات على ان اختلال مستويات دهون الدم له دور مهم في السكتات الدماغيه الاحتشائيه وذلك نظرا لدوره المهم في تصلب الشرايين.ويعتبر الليبوبروتين (أ) من عوامل الخطوره الهامه في السكته الدماغيه .

الهدف من البحث: يهدف البحث الى دراسه مدى شيوع ونمط اختلال دهون الدم في عينه من مرضى السكته الدماغيه الاحتشائيه الحاده و دراسه تاثير العمر والجنس على ذلك كما يهدف البحث لدراسه تاثير اختلال دهون الدم على معدل الوفيات و دراسه العلاقه بين كل من (مقياس اباتشى - مقياس جلاسكو للغيبوبه) ونمط اختلال دهون الدم وعوامل الخطوره الاخرى في عينه من مرضى السكته الدماغيه الاحتشائيه الحاده.

المرضى وطرق البحث : شملت هذه الدراسه 105 مريض بالسكته الدماغيه الاحتشائيه الحاده وقد تم اخذ التاريخ المرضي المفصل وعمل فحص اكلينيكي كامل للمريض مع تقييم خطوره الحاله بمقياس اباتشى و مقياس جلاسكو للغيبوبه. وقد تم عمل اشعه مقطعيه او اشعه رنين مغناطيسى على المخ - قياس مستوى السكر بالدم – صوره دم كامله – غازات الدم الشريانى – وظائف كبد وكلى – رسم قلب كهربائى- قياس مستويات دهون الدم و الليبوبروتين (أ).

نتائج البحث: معدل انتشار اختلال مستويات دهون الدم فى مرضى السكتة الدماغية الاحتشائية الحادة هو 57.3 % وهو مايؤكد على ان اختلال دهون الدم من عوامل الخطورة الهامة والاساسية فى مرضى السكتة الدماغية الاحتشائيه. وقد وجد ان معدل انتشاراختلال دهون الدم فى مرضى السكتة الدماغية الاحتشائيه اعلى فى الذكور عن الاناث بشكل مؤثر احصائيا . الى نمط اختلال مستويات دهون الدم فى مرضى السكتة الدماغية الاحتشائيه الحاده , فقد وجد ان ارتفاع مستوى الليبوبروتين منخفض الكثافة هو الاكثر انتشارا , يتبعة الدهون الثلاثية ثم الكوليستيرول الكلى ثم انخفاض مستوى الليبوبروتين عالى الكثافة , و قد كان معدل انتشار ارتفاع مستوى الكوليستيرول الكلى اعلى فى الذكور عن الاناث بشكل مؤثر احصائيا , كما لاحظنا ارتفاع معدل انتشار زيادة نسبة الكوليستيرول الكلى الى الليبوبروتين منخفض الكثافة , و نسبة الدهون الثلاثية الى الليبوبروتين منخفض الكثافة المرتفعة. وذلك يوضح اهمية تلك النسب فى الاشارة الى اختلال دهون الدم , وايضا يشير الى اهمية تلك النسب كعوامل خطورة فى السكتة الدماغية الاحتشائية , وفضلا عن ذلك فقد وجدنا معدل انتشار مرتفع بالنسبة الى الليبوبروتين (أ) , وذلك يؤكد على اهميتة كعامل خطورة مهم فى السكتة الدماغية الاحتشائية . وجدنا ايضا ان اختلال دهون الدم يزيد احتمالية الوفاة فى مرضى السكتة الدماغية الاحتشائية الحادة بمقدار 2.8 مرة ,كما وجدنا ان عوامل الخطورة الاخرى وهى التعرض السابق للسكتة الدماغية الاحتشائية , والتدخين , وضغط الدم المرتفع , ومرض السكرى تزيد احتمالات الوفاة بمقدار : 2.6 , 1.5 ,1.3 , 1.2 مرة بالترتيب . واخيرا فقد وجدنا ان مقياس الاباتشى ومقياس جلاسكو للغيبوبة ونسبة الكوليستيرول الكلى الى اليبوبروتين منخفض الكثافة , يمكن الاعتماد عليهم لتوقع مصير حالات السكتة الدماغية الاحتشائية , وان كان مقياس الاباتشى هو الاكثر دقة .