

Serum Lipid Profile of Patients with Ischaemic Stroke in A Tertiary Centre in Nigeria

* Onwuegbuzie Gerald A, RengRifkatu S

Department Of Medicine, University Of Abuja Teaching Hospital, Abuja, Nigeria

Abstract

Background: Stroke is a serious life threatening condition which continues to be a major public health problem leading to death and severe neurologic disability. Dyslipidaemia refers to the presence of abnormal levels of lipids or lipoproteins in the blood. Dyslipidaemia is a major risk factor for cerebral infarction. Therefore this study was designed to find out the patterns of dyslipidaemia in cases of acute ischaemic stroke and its relation to age and sex.

Methods: Lipid profile data for a total of 140 patients with Ischaemic Stroke were collected from patients admitted into the medical ward was determined. The lipid profile of the study sample was analysed according to the ATP III classification for identification of dyslipidaemia.

Results: In our study, we observe dyslipidaemia in 35.8% of the patients which constituting the risk factors in our ischaemic stroke. Furthermore the patterns of dyslipidaemia seen showed a high TC-31 %, LDL-13%, TG-43% and low HDL-33% among the patients. The overall mean age of patient is 59.9±13.1 years, but mean age for male is 58.9±11.6 years, while female is 61.0±14.7 years

Conclusion: This study showed that a significant proportion of patient with ischaemic stroke had dyslipidaemia. Most studies have shown high LDL as the major culprit in the pathophysiology of stroke, our study showed a significant proportion of patients with low HDL and high TG.

Keywords: Dyslipidemia , Lipids, Stroke, and Abuja

I. Background

Stroke is a serious life threatening condition which continues to be a major public health problem leading to death and severe neurologic disability. Stroke is the rapidly developing loss of brain functions due to a disturbance in the blood vessels supplying blood to the brain. In Nigeria study, Stroke constituted about 2.4% of all emergency admissions with cerebral infarction making up 49% of all cases.¹ There is a reasonably reliable evidence to suggest that 60-80% of all ischemic strokes can be attributed to these risk factors.² 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.

Dyslipidaemia refers to the presence of abnormal levels of lipids or lipoproteins in the blood. Dyslipidaemia is characterized by elevated total cholesterol (TC), elevated low density lipoprotein (LDL), elevated triglycerides (TG), or low high density lipoprotein (HDL)³. Brain synthesized its own cholesterol which is metabolized into 24S- hydroxycholesterol and released into circulation.

Dyslipidaemia is a major risk factor for cerebral infarction. The LDL targeting goal can significantly reduce the risk of cerebral infarction.⁴

There has been a number of publications on the role of lipid disorders and outcome in stroke.⁵⁻¹⁰ HDL is known to promote the transport of extra-hepatic cholesterol back to the liver hence reducing serum cholesterol thereby preventing Ischaemic stroke. It therefore shows that, HDL cholesterol level has an inverse correlation with the risk of stroke

Therefore this study was designed to find out the patterns of dyslipidaemia in cases of acute ischaemic stroke and its relation to age and sex

II. Methodology

Study location and data collection

The study was carried out at the University of Abuja Teaching Hospital, a tertiary health centre, from June 2012 and June 2015. It is a descriptive cross sectional study. A total of one hundred and forty patient records were accessed from the medical records of the Stroke unit of the neurology division of department of Medicine University of Abuja Teaching Hospital, Gwagwalada.

Ischaemic stroke was confirmed clinically using WHO criteria and radiologically by cranial computed tomography scan or MRI were included in this study. All patients had full clinical assessment and investigations. Lipid profile data for a total of 140 patients with Ischaemic Stroke were collected from patients

admitted into the medical ward. The lipid profile of the study sample was analyzed according to the ATP III classification for identification of dyslipidemia.

Inclusion Criteria

A hundred and forty patients between 30 to 100 years of age who were admitted by into the medical ward with stroke. All patients had full clinical assessment for Ischeamic stroke was screened clinically by WHO criteria and verified radiologically by cranial computer tomography scan from June 2012 to June 2015 were included in the study.

Exclusion Criteria

Patients who had hemorrhagic stroke, transient ischeamic attack, those with space occupying lesion with neurological deficits or metastatic disorder and those Human immunodeficiency Virus with neurological deficits were excluded from this study.

III. Data analysis

Statistical analysis of data collected was performed using Analyse-it v3.0 statistical software for Microsoft Excel. Data collected was analysed by frequency, mean, standard deviation and chi-square test. 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.

IV. Results

Age and sex

Table 1 show that of the 140 patient data collected, majority (77, 55%) was between 50 and 69 years of age and there were more male patients 75(53.6%) with Ischaemic stroke, than females 65(46.4%).

Table 1: Age and sex of patients with Ischaemic stroke

Age group (Yrs.)	Sex Number (%)		
	Female	Male	Total
30-39	4 (2.9)	2 (1.4)	6 (4.3)
40-49	9 (6.4)	12 (8.6)	21 (15.0)
50-59	22 (15.7)	27 (19.3)	49 (35.0)
60-69	9 (6.4)	19 (13.6)	28 (20.0)
70-79	9 (6.4)	9 (6.4)	18 (12.9)
80-89	10 (7.1)	5 (3.6)	15 (10.7)
>90	2 (1.4)	1 (0.7)	3 (2.1)
Total	65 (46.4)	75 (53.6)	140 (100.0)

Generally, the age distribution of patients were not normally distributed Shapiro-Wilks (W=0.97, p = 0.009). The overall mean age of patient is 59.9±13.1 years, but mean age for male is 58.9±11.6 years, while female is 61.0±14.7 years.

Lipid Profile

Figure 1 shows that the general distributions of lipid profile parameters are not normal (Shapiro-Wilks p < 0.05). The lipid profile parameters TC ranged between 2.0 and 9.8 mmol/L, LDL ranged between 0.29 and 5.10 mmol/L, HDL ranged between 0.21 and 3.6 mmol/L, and TRIG ranged between 0.2 and 7.0 mmol/L. The mean concentrations are TC=4.65±1.32mmol/L, LDL=1.54±0.95mmol/L, HDL=1.37±0.63mmol/L and TRIG=2.27±1.27mmol/L.

Figure 1: Lipid profile parameters in patients with Ischaemic stroke

TC = Total cholesterol, LDL = Low density lipid, HDL = High density lipid, TRIG = Triglyceride

Overall dyslipidaemia was seen in 35.8% of patients. Thirty-one percent of the patients had high TC, with more female patients (17%) contributing more than the male patients (14%). Forty three percent 43% of the total patients had elevated TG level, in which more male patients (24%) contributed than the female patients (21%). Thirty-three percent of the patients had low HDL and similarly, male patients (21%) contributed more than the female patients (12%).Thirteen percent of the patients had elevated LDL with 6.5% each of both male and female patients. (Figure 2)

Figure 2: Lipid profile parameters in patients with Ischaemic stroke

Table 2 shows the prevalence and patterns of dyslipidemia in males and females in comparison. We note that low HDL was more prevalent in male than in female while total cholesterol was higher in females than males. The difference in prevalence is significant in cases of dyslipidemia in general (P- 0.03). The table also shows the prevalence and patterns of dyslipidemia in age group ≤65years and in age group >65years in comparison. We note that some components are more prevalent in age group ≤65years than in age group >65years except in case of low HDL. The differences in prevalence were statistically significant for LDL (P - 0.01) and triglyceride (P - 0.04).

Table 2: shows the prevalence and patterns of dyslipidaemia

Variables	Whole Sample N (%)	Age		P	Gender		P
		≤65y (94) N (%)	≥65y (46) N (%)		Female (65) N (%)	Male (75) N (%)	
Dyslipidaemia	50 (36)	28 (30)	22 (48)	0.12	32 (30)	18 (48)	*0.03
TC >5.18 mmol/L	43 (31)	32 (34)	11 (24)	0.54	23 (35)	20 (27)	0.29
LDL >2.59 mmol/L	18 (13)	12 (13)	6 (13)	*0.01	9 (14)	9 (12)	0.07
HDL <1.04 mmol/L	46 (33)	25 (27)	21 (46)	0.24	17 (26)	29 (39)	0.25
TG > 2.26 mmol/L	62 (43)	47 (50)	15 (33)	*0.04	29 (45)	33 (44)	0.43

*P = Significant (P < .05), T-test

Table 3: Summary statistics of Ischaemic stroke patients within **normal** levels of lipid parameters.

Lipid Parameters	Sex	N	Minimum	Median	Maximum	Mean	SD	P-value (t-test)
LDL	Female	56	0.4	1.16	2.6	1.22	0.51	
	Male	66	0.3	1.22	2.5	1.30	0.54	0.380
	Overall	122	0.3	1.16	2.6	1.26	0.53	
HDL	Female	48	1.1	1.43	3.6	1.61	0.50	
	Male	46	1.1	1.40	3.5	1.69	0.65	0.510
	Overall	94	1.1	1.43	3.6	1.65	0.58	
TRIG	Female	20	0.4	1.23	1.5	1.12	0.32	
	Male	25	0.2	0.99	1.5	0.93	0.37	0.082
	Overall	45	0.2	1.23	1.5	1.02	0.35	
TC	Female	41	2.0	4.00	5.2	4.00	0.75	
	Male	55	2.2	3.99	5.1	3.92	0.81	0.633
	Overall	96	2.0	4.00	5.2	3.96	0.78	

Table 4: Summary statistics of Ischaemic stroke patients with **abnormal** levels of lipid parameters.

Lipid Parameters	Sex	N	Minimum	Median	Maximum	Mean	SD	P-value (t-test)
LDL	Female	9	2.7	3.80	5.1	3.78	0.89	
	Male	9	2.6	2.87	4.4	3.09	0.58	0.068
	Overall	18	2.6	3.80	5.1	3.44	0.75	
HDL	Female	17	0.4	0.88	1.0	0.85	0.19	
	Male	29	0.2	0.84	1.0	0.77	0.20	0.246
	Overall	46	0.2	0.88	1.0	0.81	0.20	
TRIG	Female	45	1.5	2.45	7.0	2.89	1.24	
	Male	49	1.5	2.70	5.1	2.84	0.95	0.838
	Overall	94	1.5	2.45	7.0	2.87	1.10	
TC	Female	23	5.3	6.10	9.8	6.34	1.08	
	Male	20	5.3	5.95	7.0	6.06	0.56	0.297
	Overall	43	5.3	6.10	9.8	6.20	0.87	

V. Discussion

Stroke is a serious life threatening condition which continues to be a major public health problem leading to death and severe neurologic disability. Nikolai Anichkov first proposed a link between cholesterol and atherosclerosis in 1912 by proving that obstructive pathophysiology in atherosclerosis occurs as a result of increased cholesterol levels.¹¹

Dyslipidemia is a major risk factor for cerebral infarction 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.^{12, 13}

Qizilbash et al. in their review of 10 studies concluded that there was a significant association after examining the relationship between serum total cholesterol and subsequent stroke, other studies were less conclusive.^{14, 15}

In our study, we observe that dyslipidemia in 35.8% of the patients constituting a risk factors for ischaemic stroke. These findings are keeping with works done in different areas of the world, with some differences. In a study done in Egypt by **Osama et al.** they found the prevalence of dyslipidemia in 57.1%.¹⁶ In Pakistan **Khan et al.** found prevalence of dyslipidemia in 32.7%.¹⁷ Dyslipidemia is the 3rd most common risk factor for ischaemic stroke in the study by Khan et al and Osama et al. In India **Cynthia et al.** reported among their patients with Ischaemic Stroke a prevalence 56% with hypercholesterolemia.¹⁸ Also in a study in Switzerland **Krassen et al.** found hypercholesterolemia in 55% of patients with ischaemic stroke.¹⁹

Our study show a preponderance of males among the study population thus reflecting an overall male sex predisposition to stroke. The total males under study were 53.6% while the females under study were 46.4%. The prevalence of both Stroke and dyslipidaemia were both more in age group 50-69 years.

Several studies reported that a combination of low level of high density lipoprotein-cholesterol (HDL-c) and high total cholesterol and low density lipoprotein-cholesterol (LDL-c) is, almost always, associated with risk of stroke.²² This phenomenon highlights the question of what type of lipid increases prior to stroke. HDL is known to promote the transport of extra-hepatic cholesterol back to the liver hence reducing serum cholesterol thereby preventing Ischaemic stroke. It therefore shows that, HDL cholesterol level has an inverse correlation with the risk of stroke.¹⁴ In our study the patterns of dyslipidemia show a high TC-31 %, LDL-13%, TG-43% and low HDL-33%. When this data was compared to the data obtained from other studies, surprisingly it showed a rather lower pattern of LDL which is usually implicated in atherosclerosis, which is the basic underlying pathophysiologic in ischaemic stroke. Low levels (> 0.9 mmol/L) of HDL-cholesterol, and high levels of total triglyceride (> 2.3 mmol/L), are associated with a doubling of the risk of stroke mortality and morbidity.²⁰ High titres of LDL-cholesterol are a predictor of stroke in the general population.²¹

Osama et al found high LDL-33.3%, TG-31.4%, and TC – 30.5% and low HDL-29.5%.¹⁶ In India **Cynthia et al** found high TC-40%, LDL-3%, TG-7%, and low HDL-28%.¹⁸ It is possible that the unique pattern in various studies may be attributable to the diversity in genetic patterns, cultures and environment which is buttressed by reports on studies done in Nigeria by **Ogunrin et al** and **Festus et al** who all found elevated triglyceride the most prevalent pattern in dyslipidemia.^{24, 25} In addition, **Laloux et al.** found that high TG is commonly found in patients with ischemic stroke whatever the etiologic subtype.²² **Holme et al.** reported that elevated TG and low HDL-c were associated with increased incidence of ischemic stroke in both genders.²³ The differences of lipids profile between women and men; presumably due to the different levels of circulating sex hormones, specifically estrogens and androgens.²⁶

The high TC pattern found in our study is similar to those found in other studies. Many studies proved that high TC levels have frequently been associated with risk of stroke²² while meta-analysis from previous clinical trials showed a protective of reducing TC for ischaemic strokes.²⁷

VI. Conclusion

Cerebral atherosclerosis with atheroma formation is the basic underlying patho-physiologic mechanism in ischaemic stroke. This study showed that a significant proportion of patient with ischaemic stroke had dyslipidaemia. Most studies have shown high LDL as the major culprit in the pathophysiology of stroke, our study showed a significant proportion of patients with low HDL and high TG. Periodic check of fasting lipid profile may be useful in reducing the burden of ischaemic stroke in our country.

Limitation of study

This study considered one of the risk factor for ischaemic stroke, therefore dyslipidaemia may reflect a cluster of other risk factors for stroke. It is a hospital based study, so the data may not represent the whole population. Some of the patients were from poor socio-economic background hence some of them couldn't afford CT scan investigation therefore affecting study duration.

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