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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14843
DOI URL: http://dx.doi.org/10.21474/IJAR01/14843

RESEARCH ARTICLE

A STUDY ON FASTING LIPID PROFILE IN NON-DIABETIC STROKE PATIENTS

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Manuscript Info

Manuscript History
Received: 31 March 2022
Final Accepted: 30 April 2022
Published: May 2022

Abstract

Objectives: To study serum fasting lipid profile in patients with acute ischaemic stroke & to determine the significant correlation between them. To assess the role of aggressive control of dyslipidemia on recovery of stroke. Setting: Patients admitted with Ischemic stroke into the Acute Medical Care Unit and Medical Wards in the department of General Medicine, SAIMS Medical Indore, from December 2019 to November 2021, were taken for the study. Patients were subjected to a Fasting lipid profile at presentation and followed– up at 12 weeks and rechecked the fasting lipid profile and correlated with the recovery of stroke.

Participants: A total of 50 Ischaemic stroke patients- 33 males and 17 females, participated. All subjects were above 50 years. Patients with suspected emboli of cardiac origin, haemorrhagic stroke, diabetes and h/o of head injury/usage of anticoagulant drugs were excluded from the study. None of the patients was on diet (or) other modifications to lower plasma lipid levels.

Results: S.T.C was abnormal in 11 patients at onset and 8 pts after three months of statin therapy. TG was abnormal in 34 patients at the beginning and 35 pts after three months of treatment. LDL was abnormal in 32 patients at the beginning and 20 pts after three months of statin therapy. HDL was abnormal in 38 patients at onset and 35 pts after three months of treatment. VLDL was abnormal in 34 pts at the beginning & 35 pts after three months of statin therapy. After three months, the MRS score of most of the patients was 0 -1(21 pts), followed by a score of 0 (15 pts).

Correlation between mNIHSS score and lipid profile showed a significant clinical improvement with reduction in the LDL levels & the corresponding p- value is .000, which is highly effective. Correlation between MRS score and lipid profile showed a good clinical outcome with a reduction in LDL levels & the corresponding p-value is 0.26, which is substantial.

Conclusion: This study shows that higher levels of S.T.C, TG, LDL, VLDL is not the only significant risk factor for the occurrence of

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ischaemic CVD. A decrease in LDL levels shows significant improvement in clinical outcomes.

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Introduction:-

Stroke is a type of cerebrovascular disease that can be classified as either ischemic or hemorrhagic. They are responsible for 2 lakh fatalities and a large amount of impairment each year. A stroke is characterised by a sudden onset of neurologic impairment due to a specific vascular source. Reduced blood supply to the brain for more than a few seconds causes cerebral ischemia. Infractions or death of brain tissue occur when blood flow is interrupted for more than a few minutes[1]. The cumulative incidence of stroke ranged from 105 to 152/100,000 persons per year, and the crude prevalence of stroke ranged from 44.29 to 559/100,000 persons in different parts of the country during the past decade. These values were higher than those of high-income countries[2].

Stroke is notoriously difficult to treat. The risk factors of stroke include diabetes, hypertension, dyslipidemia, smoking, atherosclerosis, age and other causes[2]. There is evidence that modification of risk factors will reduce the risk of stroke[3].

Recent studies have shown that the distribution of triglycerides and cholesterol within major lipoprotein classes is essential for developing atherosclerosis, a precursor for stroke. Low-density lipoprotein (LDL) and high-density lipoprotein (HDL) concentrations in the blood are linked to an increased risk of atherosclerosis[4].

Lacunar stroke was found to be the most common subtype of stroke in our population in one study, owing to the high prevalence of untreated hypertension and diabetes[4]. As diabetic angiopathy is presumed to differ from atherosclerotic angiopathy, stroke experienced by diabetic versus non-diabetic individuals may vary[3].

Aims and Objective:-

To study serum fasting lipid profile in patients with acute ischemic stroke and to determine the significant correlation between them. To assess the role of aggressive control of dyslipidaemia on recovery of stroke.

Background:-

Stroke is the second largest cause of death and morbidity in developed countries[5]. In emerging countries like India, the stroke will be a major public health issue. The morbidity pattern demonstrated that strokes became more common as people became older and that ischemic strokes were the most common type[5]. Although however, blood lipids and lipoproteins are strongly related to coronary atherosclerosis, their association with cerebrovascular atherosclerosis is less clear.

Epidemiology of stroke:-

Stroke has a global prevalence of 5 to 8 per 1000 people. The cumulative incidence of stroke ranged from 105 to 152/100,000 persons per year, and the crude prevalence of stroke ranged from 44.29 to 559/100,000 persons in different parts of the country during the past decade. These values were higher than those of high-income countries[2].

Subtypes of stroke:-

Ischemic and hemorrhagic strokes are the two types of stroke. Ischemic stroke is one of the basic forms of cerebrovascular disease. 80% of the strokes result due to cerebral infarction in developed countries.

TOAST Criteria of Ischemic Stroke[6]

Ischemic stroke can also be categorised into big artery atherosclerotic stroke, cardioembolism, small artery occlusion (lacunes), and stroke due to other identified and undetermined (cryptogenic) reasons using the TOAST (Trial of org 10172 in Acute Ischemic Stroke) criteria[6]. Features of cerebral cortical impairment (aphasia, neglect, restricted motor involvement) or brain stem or cerebella dysfunction and subcortical infarcts greater than 1.5 cm in diameter on CT or MRI brain are considered to be of potential large artery atherosclerosis origin. History of intermittent claudication, transient ischemic attacks (TIAs) in the same vascular territory, presence of a carotid bruit or diminished arterial pulsations supports the clinical diagnosis. Due to small artery occlusion, stroke patients have one of the classical lacunar syndromes (pure motor hemiparesis, pure sensory syndrome, sensory-motor paresis, ataxic hemiparesis, and dysarthria) clumsy hand syndrome) and absence of cortical dysfunction features. CT or MRI brain may be normal or relevant brains stem or subcortical infarct less than 1.5 cm in diameter may be present.

Diagnosis of stroke:-
The clinical diagnosis of stroke includes sudden onset of dysfunction of the brain, which can affect any level of neuro-axis, ranging from higher mental function, speech and language involvement, cranial nerves to the motor and sensory systems and sphincter involvement with or without associated impaired consciousness, headache or seizures. All the symptoms pertain to the territory of cerebral blood vessels. It may contribute to pointing out the mechanism of stroke. The earlier signs detected on CT scan of the brain in an ischemic stroke are loss of insular ribbon and corresponding lentiform nuclei, subtle effacement of sulci, loss of grey and white matter differentiation and compression of the adjacent ventricle. Doppler of neck vessels is useful to show atherosclerotic changes, vessel occlusion or thrombosis.

Outcome measures of stroke:-
Stroke scales enable the exact measurement of patients' severity, disability, and recovery over a given period. Having prescribed assessment procedures during a follow-up stroke investigation is critical. The ideal stroke scale should be valid scale, (mNIHSS)[7] is proposed to improve clinical stroke research.

Risk factors of stroke:-
A risk factor is a trait of an individual or a community that is linked to a higher risk of disease than those who do not have it. Cerebral infarction is linked to a number of risk factors that have been thoroughly investigated.

Hypertension:-
Stroke increases approximately threefold in patients with borderline hypertension and eightfold increases in patients with definite hypertension.

Diabetes Mellitus:-
Diabetics are known to have increased susceptibility to coronary, cerebral and femoral atherosclerosis. Increased glucose intolerance was associated with a higher risk of thromboembolic stroke, which was irrespective of any other risk factor. Evaluation of the impact of diabetes on stroke in a population-based cohort disclosed a relative risk of stroke that was 1.8 in men and 2.2 in women even after other relevant risk factors have been taken into account[8].

Lipids and Ischemic stroke:-
In circulation, lipids are carried by spherical macromolecular complexes with proteins called lipoproteins. Lipoproteins are traditionally classified according to their density, although other classifications are in use.

Cholesterol and Ischemic stroke:-
Framingham study[9] and Honolulu heart study didn't show an association between blood cholesterol levels and stroke risk. This lack of association has been observed, showing a positive association between blood pressure and stroke but no association between cholesterol and stroke.

Material and Methods:-
All patients older than 50 years present with features of stroke-like hemiparesis, hemianaesthesia, language dysfunction were enrolled in the study.

The study was performed on patients with ischemic stroke, admitted into Gen. Medicine ward and ICU, SAIMS Hospital Indore from December 2019 to November 2021.

Selected patients were subjected to the following protocol:

Detailed history, Detailed neurological examination, Blood sampling after 12 hours fasting for: Serum total cholesterol, Serum triglycerides, Serum HDL, Serum VLDL, Serum LDL, CT Scan (plain), Blood Sugar Levels (FBS/PPBS), Complete Blood Picture, ECG, 2D ECHO

Inclusion criteria:
All the patients with ischemic stroke. Age >50 Years. TIA patients. Both Sexes are included. Those who have given valid informed consent.

Exclusion criteria:
Haemorrhagic strokes. Embolic strokes. Past/Present Diabetes mellitus. Patients who have had a head injury or who are taking anticoagulant medications. Patients who were not willing to give a valid written consent.

Results:-

As a part of this prospective study conducted over two years in SAIMS Medical College Indore, a total of 50 patients of Non-Diabetic ischemic stroke patients were evaluated. All the patients' fasting lipid profile were availed and they did fulfill the inclusion criteria. The majority of the patients were inpatients in wards and the remaining patients were evaluated at the AMCU. In all cases, fasting lipid profile was done within 24 hours of admission. CT scan reports were available in all cases. mNIHS scale was assessed on the day of admission. The functional outcome of a patient was assessed by modified ranking scale after 3 months of stroke.

Table 1:- Total number of patients in relation to sex.

Sex	Frequency	Percent
Male	33	66.0
Female	17	34.0
Total	50	100.0

Stroke in non-diabetic patients having male-female sex distribution out of 50 patients is 33:17 i.e., 66% male and female 34%. And having a positive family history of stroke in 1 patient i.e., 2% of the non-diabetic stroke patients have a family history. The previous history of IHD is noted in 8 patients i.e., 16% of patients.

Table 2:- With Previous history of TIA/ ischemic stroke are 7 patients i.e., 14%of patients.

H/o Previous stroke or TIA	Frequency	Percent
Yes	7	14.0
No	43	86.0
Total	50	100.0

Lipid profile:-

Lipid level was estimated in ischemic stroke patients at the onset of stroke & after 3 months.

The minimum serum Total Cholesterol at onset is 145 mg/dl. And maximum is 440 mg/dl. And mean serum Total Cholesterol is 195.8mg/dl. ± 50.8mg/dl. The minimum S. Total cholesterol after 3 months is 140mg/dl. And maximum is 380mg/dl. And mean is 182.6 mg/dl ± 38.8mg/dl.

Table 3:- Serum Total cholesterol at onset.

Serum Total cholesterol at onset	Frequency	Percent
Normal	39	78.0
Abnormal	11	22.0
Total	50	100.0

Age Group:-

The minimum age is 50 yrs and the maximum is 89 yrs and the mean is 62.3yrs ± 9.15 yrs in this study. Most of the pts are in the age group of 50 to 55yrs i.e., 14 pts (28%) and followed by age group of 60 to 65 yrs i.e., 11 pts (22%)

Pts in the age group between 55 to 60 yrs are 9 pts (18%) Pts in the age group between 65 to 70 yrs are 8 pts (16%) Pts in the age group between 70 to 75 yrs are 3pts (6%) Pts in age group more than 75 yrs are 5 pts (10%)

Table 4:- Age group.

Age group	Frequency	Percent
50 – 55	14	28.0
55 - 60	9	18.0
60 – 65	11	22.0
65 – 70	8	16.0
70 – 75	3	6.0
>=75	5	10.0
Total	50	100.0

In between 50 to 55 yrs males are more than females i.e., 10 pts male (71.4%) and 4 pts are females (28.6%). In between 55 to 60 yrs males are 5 pts (55.6%) and 4 pts are females (44.4%). In between 60 to 65 yrs males are 6 pts (54.5%) and 5 pts are females (45.5%). In between 65 to 70 yrs males are 6 pts (75%) and 2 pts are females (25%). In between 70 to 75 yrs males are 2 pts (66.7%) and 1 pts are females (33.3%) In age more than 75 yrs males are 4 pts (80%) and 1 pts are females (20%). In males age 65 to 70yrs and more than 75 yrs are 75% and 80% respectively.

Table 5:- Correlating Age group& Gender.

Age group		Male	Female	Total
50-55	Count	10	4	14
	%	71.4%	28.6%	100%
55-60	Count	5	4	9
	%	55.6%	44.4%	100%
60-65	Count	6	5	11
	%	54.5%	45.5%	100%
65-70	Count	6	2	8
	%	75%	25%	100%
70-75	Count	2	1	3
	%	66.7%	33.3%	100%
>75	Count	4	1	5
	%	80%	20%	100%
Total		33	17	50
	%	66%	34%	100%

The study depicted a significant clinical improvement with a reduction in the LDL levels and the corresponding P-value is .000 which is highly significant.

Table 5:- Co-relation between NIHSS score and Lipid profile.

NIHSS	Serum cholesterol at onset	Triglycerides at onset	LDL at onset	HDL at onset	VLDL at onset
R	.126	.129	.490	-.173	.076
P	.383	.371	.000	.230	.601
N	50	50	50	50	50

Correlation is significant at the 0.01 level (2-tailed).

Discussion:-

Patients with raised lipid levels have a higher risk of atherothrombotic brain infarction than those with normal values, according to epidemiological research, and this is especially true of early ischemic cerebrovascular illness. Although serum lipids have been linked to the development of atherosclerosis, little is known about the possible interplay between aberrant serum lipid levels and the development of vascular problems. The fact that the lipid content of the intima of the arteries matches that of serum contributed to the belief in the existence of such connection. Hence Dyslipidemia has emerged as an important risk factor linked to a higher risk of atherosclerosis.[10] Observed elevated levels of plasma triglycerides in cerebrovascular disease below the age of 55 years, which is not significant in the present study. In the present study age group range was from 50 to 89 years, with a peak incidence of ischaemic cerebrovascular disease in the age group of 50-55 years which contributes to 28%.[11] in their study of ischaemic cerebrovascular disease, found the mean age group to be 49.5±13.45, with a maximum number of cases in the 5th and 6th decades. In the Framingham study, the incidence of atherothrombotic brain infarction in both sex was found to be 45% in persons younger than 65 years which is significant in the present study (68%) with more predominance in the male group[12].

blood lipids in relation to age and sex

In normal healthy individuals, the serum triglycerides and cholesterol levels were known to increase with age. In the ischaemic cerebrovascular disease of this study, the triglycerides values in both men and women do not show any definite

relationship with age. Total cholesterol levels were increased more in males in comparison to females.[13]in their study of risk factors in non-embolic cerebrovascular disease, observed that cholesterol and Triglycerides levels are not altered significantly in any age group.

Lipid profile:-

Cholesterol:

The findings of the study, which were published in 2004 by the Prospective Studies Collaboration;[14], found no link between cholesterol levels and stroke risk. In this study, the cholesterol levels after three months of statins showed a significant fall with no significant clinical improvement.[15], Had found a positive correlation between serum cholesterol and stroke incidence, which is not co-related in the present study.[16], found that serum cholesterol levels are not related to the risk of death from a stroke which co-relates with this study.

Triglycerides:

Several studies such as[17], indicated a high incidence of ischaemic stroke with hypertriglyceridemia, which is contradicted in the present study. After statin treatment, the study revealed a significant fall in the triglyceride level but was not significant in the clinical scenario in accordance with the MRS scale.[18], the study states hypertriglyceridemia is weekly associated with ischaemic stroke in women but not in men, which is not seen in the present study.

LDL:

According to[19], a significant amount of cholesterol in the LDL fraction is atherogenic, while the HDL fraction is protective. Patients with high LDL levels at the time of onset have a greater risk of stroke, according to the mNIHSS. LDL levels decreased after starting statins in the current trial, and the clinical result improved significantly (p value=0.026). Few research, such as [20], discovered that patients with thrombotic stroke had high LDL levels, which is not statistically significant and does not co-relate in the current study, but does show significance with[21], who discovered that patients with high LDL levels at the onset have a high risk of thrombotic stroke.

Cardiac evaluation:

Known cases of Ischemic heart disease patients (8 pts) underwent 2D ECHO, which showed old changes and ruled out Atrial fibrillation /Arrhythmias.

Conclusion:-

When dyslipidemia is treated with statins, a number of clinical studies have shown that stroke incidence and mortality are reduced. It can be seen that higher levels of S.T.C, triglycerides, LDL, HDL, VLDL wouldn't be the only risk factor for the occurrence of ischemic cerebrovascular disease. In this study, there is a significant change in biochemical values of lipid profile after treating with statins for a duration of 3 months. A decrease in LDL levels showed significant improvement in clinical outcomes. So it can be concluded that measures to reduce serum LDL levels will be useful in the secondary prevention of thrombotic stroke.

However, we feel that it is too premature to draw a definite conclusion in view of 3rd month-end follow up. This may need a larger duration of a prospective study to draw a more definite conclusion and also help us in the prevention and treatment of dyslipidemia, which goes a long way in stroke management.

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