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Assessment of lipid profiles of young diabetic and non-diabetic stroke patients: A teaching hospital based study

Dr. Gautam Gupta
Associate Professor, Department of Medicine, Rama Medical College Hospital & Research Centre, Gironi, Uttar Pradesh, India

Corresponding Author: Dr. Gautam Gupta (gautamkumar181818@gmail.com)

Abstract
Background: Lipid profile in patients with cerebrovascular disease and to determine significant correlation between them. To ascertain the effect of age and sex on serum lipid profile.The diagnosis of diabetes in a stroke patient would change the initial management of that patient, specifically with respect to other risk factors like lipid and blood pressure management.
Aims and Objectives: To study lipid profile in diabetic and non-diabetic newly diagnosed young stroke patients.
Materials and Methods: A total of 138 patients were admitted during study period were selected by simple random sampling with acute stroke in the study. Fasting total cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C) were measured from venous blood samples.
Results and Observations: The mean HbA1c for group D and group ND were 9.04±1.02 and 4.85±0.45 respectively. This difference in HbA1c among patients in two groups was statistically significant. The mean values of LDL, VLDL, total cholesterol and triglycerides showed significant association between two groups. Levels of HDL were significantly lower in Group D as compared to Group ND.
Conclusion: The lipid profile of LDL, VLDL, total cholesterol and triglycerides showed significant higher range in diabetic patients as compared to non-diabetics while HDL was lower in diabetic patients as compared to non-diabetics.
Keywords: Young adults, diabetic, non-diabetic, lipid profile

Introduction

Reduction of the risk of recurrent ischemic stroke might be expected with statins if a correlation can be established between hyperlipidemia and ischemic stroke or some specific ischemic stroke/TIA subtypes. However, such correlation remains controversial, and more particularly with the etiologic stroke/TIA subtypes. Few studies have evaluated the plasma lipid profile in different ischemic stroke subtypes, and notably in lacunar infarctions and cardioembolic strokes. Diabetes mellitus remains an independent risk factor of stroke and coronary heart disease. The increased risk of recurrent stroke due to diabetes ranges from 2.1 to 5.6 times that of non-diabetic patients and is independent of glucose control during inter stroke period[1].

Approximately one-third of all patients with diabetes have undiagnosed diabetes (i.e. not recognized by their clinician) and usually present as complications like stroke, myocardial infarction and diabetic foot [2]. The under diagnosis of diabetes in the general population together with the strong association of diabetes with stroke suggest a rationale for screening all hyperglycemic stroke patients for diabetes. The diagnosis of diabetes in a stroke patient would change the initial management of that patient, specifically with respect to other risk factors like lipid and blood pressure management. It is thought that in young patients the common risk factors of stroke such as smoking, diabetes and hypertension are additive to coagulopathies, infectious causes of stroke and acquired and congenital heart diseases and therefore these patients may have a different clinical and metabolic profile. Since, there is a

paucity of local data regarding undiagnosed diabetes in young stroke patientsthe current study was conducted to study lipid profile in diabetic and non-diabetic newly diagnosed young stroke patients.

Materials and Methods

The present study was cross sectional study carried out at Rama Medical College Hospital & Research Centre Hapur,Uttar Pradesh, IndiaA Tertiary Care Institute to study lipid profile in diabetic and non-diabetic newly diagnosed young stroke patients. All diabetic and non-diabetic newly diagnosed young stroke cases admitted at tertiary care center during period of study were included. The study was conducted after obtaining clearance from the Ethical Committee of the institute and permission from the appropriate authority. Sample size A total of 138 patients were admitted during study period were selected by simple random sampling satisfying inclusion and exclusion criteria with acute stroke in the study.

Inclusion criteria

- Non-diabetic and diabetic newly diagnosed stroke patients above 12 years and less than 45 years of age.
- Patients of both sexes. Exclusion criteria • Stroke patients < 12 years and > 45 years.
- Stroke associated with trauma and tumors.
- Patients or relatives not willing to give consent.
- Known cases of Stroke under treatment.

Selected patients are subjected for the following investigations: FBS/PPBS/HbA1c, lipid profile, Serum electrolytes, ECG and ECHO cardiography (as required).CT Brain was done and MRI Brain (if CT brain showed normal study). Serum Homocysteine, Protein C and S, APLA tests were done as required.Data were collected through interview and review of medical records. Participant's age, sex, smoking status and physical activity were obtained through interview.

Anthropometric measurements: The height of each participant was measured without shoes using a mounted stadiometer to the nearest 0.1cm. The participants were weighed without heavy clothing to the nearest 0.1kg using a digital scale. Body mass index was then calculated as the ratio of weight in kilogram (kg) to height in meter squared (m2). Participants were defined as obese in accordance with world health organization criteria; The rest of the participants were classified as overweight (25.0-29.9 kg/m2), normal (18.5-24.9 kg/m^2) and underweight (<18.5 kg/m^2).WC was measured in the horizontal plane at the superior border of the right iliac crest. WC were measured to the nearest 0.1 cm at the end of a normal expiration. Before recording the measurement, it was ensured that the tape was snug but did not compress the skin and was parallel to the floor.

Laboratory assays: Fasting total cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C) were measured from venous blood samples. Following overnight fast (> 8 hours without food), venous blood sample was drawn by the attending clinician in a private consulting room from the brachial vein into gel separator tubes. Blood samples were kept at room temperature for 2 hours before centrifuging for 5 minutes at 3000 rpm to separate serum from cellular elements. Serum was collected into microeppendorfftubes and stored at -80°C until processed. The fully automated Cobas1 C501/502 (Roche) system was used for determining serum lipid profiles.

Statistical analysis: The statistical analyses performed using the Statistical Package for Social Science (SPSS) version 21 for Windows. Data were expressed as mean values ± standard deviations (SD) for continuous variables. Frequency and proportions were reported for categorical variables. The p-value of < 0.05 was considered statistically significant.

Results and Observations: It was observed that majority of patients in Group D were in age group 36-45 years. 21 (46.66%), similarly patients in Group ND were in age group 36-45 years (58.06%). As explainedin Table 1,2,3 and in Figure 1. The mean age in group D was 34.06 ±8.35years and group ND was 37.44 ±8.55 years. There was significant difference in age distribution in all two groups. (p0.05). Out of total 130 patients, 93 were males while 45 were females. There were 33 (73.33%) and 60 (64.52%) male patients in Group D and Group ND respectively. There were 12 (26.67%) and 33 (35.48%) females in Group D and Group ND respectively. There was no gender difference when two groups were compared statistically (p>0.05).

Table 1: Distribution according to anthropometric characteristics

Anthropometry	Group D	Group ND	Total
Waist Circumference (>90cm Males, >80cm Females)	26	58	84
Overweight/ Obesity BMI (>25 kg/m2)	22	46	68
Mean WC (cm)	90.96 ±9.60	87.34 ±7.24	0.02*
Mean BMI (kg/m2)	26.87 ±4.50	24.67 ±3.66	0.002*

(P values by t test; P<0.05 statistically significant).

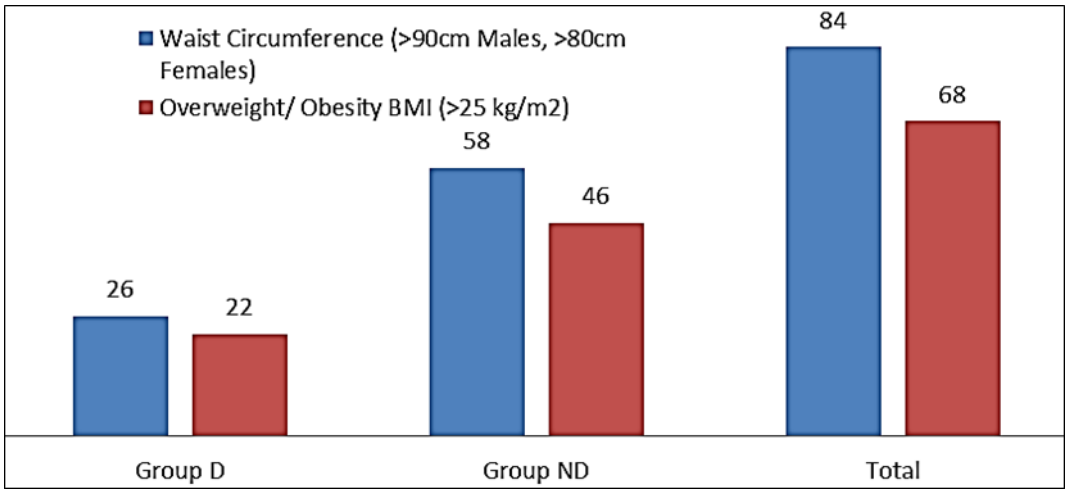

Fig 1: Distribution according to anthropometric characteristics

It was observed that 26 (57.77%) and 58 (62.36%) patients had Waist Circumference (>90cm males, >80cm females) in Group D and Group ND respectively. Overweight and obesity (BMI >25 kg/m2) was observed in 22 (48.89%) and 46 (49.46%) patients in Group D and Group ND respectively. The mean waist circumference in Group D and Group ND was 90.96±9.60 and 87.34±7.24 cm respectively with statistically significant difference in waist circumference distribution in two groups. (p0.05).

Table 2: Distribution according to lipid profile

Lipid Profile	DG	NDG	P Value
LDL	163.20 ±26.70	142.68 ±13.03	<0.0001
VLDL	46.82 ±14.21	39.94 ±13.99	0.008
HDL	38.91 ±4.32	40.76 ±4.80	0.03
Total Cholesterol	212.78 ±24.91	189.13 ±15.89	<0.0001
Triglycerides	187.67 ±17.01	161.56 ±16.32	<0.0001

(P values by t test; P<0.05 statistically significant)

It was observed that mean values of LDL, VLDL, total cholesterol and triglycerides showed significant association between two group ps. (p<0.05).

Table 3: Distribution according to blood glucose levels

Blood Glucose	Group D	Group ND	P Value
Fasting	163.18±15.60	92.06 ±10.51	<0.0001*
Postprandial	301.37±53.14	164.13 ±15.89	<0.0001*
HbA1c	9.04±1.02	4.85±0.45	<0.0001*

(P<0.001 statistically highly Significant by t-test)

The mean fasting blood glucose levels in patients in Group D was 163.18 ±15.60 and in Group ND was 92.06±10.51. This difference in fasting blood glucose amongpatients in two groups was statistically significant. (P<0.05).The mean postprandial blood glucose level in patients in Group D was 301.37±53.14 and in Group ND was 164.13±15.89. This difference in postprandial blood glucose among patients in two groups was statisticallysignificant. (P<0.05). The mean HbA1c for group D and group ND were 9.04±1.02 and 4.85±0.45 respectively. This difference in HbA1c among patients in two groupswas statistically significant. (P<0.05).

Discussion

Although the objectives of thisstudy was to correlate the lipid profiles with stroke patientswhile most of the studies are commenting upon (1) which cholesterol fractions is associated with large vessel disease (LVD), small vessel disease (SVD) and cardioembolic disease (CED); (2) whether hypertriglyceridemia is related more to any particular stroke subtype; and (3) whether the lipid profile is different between LVD and SVD which are both responsible for atherothrombotic cerebral ischemia. In our study the mean waist circumference in Group D and Group ND was 90.96±9.60 and 87.34±7.24 cm respectively with statistically significant difference in waist circumference distribution in two groups (p<0.05) The mean BMI in Group D and Group ND was 26.87±4.50 and 24.67 ±3.66 kg/m2 respectively with statistically significantdifference in BMI distribution in two groups. (p<0.05).

Bosnar-Puretić M *et al*.[3] assessed the presence of obesity among other risk factors for stroke in younger adult patients with ischemic stroke. It was a pilot studyperformed in ischemic stroke patients aged 18-55. Themean waist circumference was 94.9 +/- 5.8 cm in the control group and 102.6 +/- 9.8 cm in the male stroke group. There was significant difference in waistcircumference between the control and patient groups. In younger males, waist circumference could be considered as an important risk factor for stroke. These values were based on western population. Mitchell *et al*.[4] in a population-based case-control study investigated the relationship of obesity and young-onset ischemic stroke. Stroke cases were between the ages of 15 and 49. In analyses adjusted for age, sex, and ethnicity, obesity (BMI> 30 kg/m2) was associated with an increased stroke risk (odds ratio, 1.57, 95% C.I. = 1.28–1.94) These results indicate that obesity is a risk factor for young onset ischemic stroke. Jood K *et al*.[5] in a populationbased prospective study over 28 years, increased BMI in mid-life was found to be associated with an increased risk for ischemic and unspecified stroke, but not with hemorrhagic

stroke. The result supports the role of midlife BMI as a risk factor for stroke in later life and suggests a differentiated effect on stroke subtypes. High BMI has been found to be a risk factor for both ischemic and hemorrhagic stroke in people of 40 to 64 years by another prospective study by Song YM *et al*. [6].The distribution of patients according to type of stroke showed that 36 (80%) and 72 (77.42%) patients had ischemic stroke in Group D and Group ND respectively. Hemorrhagic stroke was observed in 9 (20%) and 21 (22.58%) patients in Group D and Group ND respectively. It was observed that major cause of ischemic stroke was small artery occlusion 10 (27.78%) in diabetes group and hypertension for hemorrhagic type 7(77.78%) Cardio aortic embolism was major ischemic type for Group ND 18 (25%) Eclampsia case showed hemorrhagic stroke while peripartum/postpartum/OC pill user patients all had venous sinus thrombosis and venous infarct. Jadhav *et al*.[7] studied the clinical profile and risk factors associated with the stroke in young adults between 15-45

years. Out of 40 patients 12 (30%) reported embolic stroke while 8 (20%) reported stroke with CVST. Thrombotic and haemorrhagic stroke were observed in 10 (25%) patients each. Harsha Kumar *et al*. 100 in retrospective, record-based study of patients of stroke in the age group of 15-45 years observed out of the 109 cases of stroke, 61 (56%) were ischemic stroke, 25 (22.9%) were hemorrhagic stroke and 23 (21.1%) were embolic stroke. In a study in young stroke patients by Nayak SD *et al*.[8] thrombotic stroke and cardio-embolic stroke occurred in 24% and 17% patients respectively. Overall, there is a male preponderance of stroke. Studies performed on ischemic stroke among the 15-45 years age group from India also reported a male preponderance. In several studies, females outnumbered men among those under 30 [9-11]. Zafar *et al*. [12] studied pattern of stroke in type 2 diabetic subjects versus non diabetic subjects observed out of 50 diabetic patients, 44 (88.0%) had ischemic stroke and 6 (12.0%) had intracerebral haemorrhage. In non- diabetics, 29 (58.0%) had ischemic stroke while 21 (42.0%) had intracerebral haemorrhage. On further analysis of ischemic stroke, cortical infarcts (CI) was found in 22, sub cortical infarcts (SCI) in 14, brainstem in 5 and cerebellar in 2 diabetic patients. CI was also the commonest subtype of ischemic stroke in nondiabetics. Singh *et al*.[13] studied clinical profile of stroke in relation to glycaemic status of patients and observed 75% of cases of strokes in the euglycemic group presented as ischemia (15 out of 20) and five cases in the same group occurred as haemorrhage (5 out of 15). All stress hyperglycaemic strokes were haemorrhagic (100%) and also all the strokes occurred in the new diabetic group were haemorrhagic strokes (100%). 85.71% of stroke in the known diabetic group were haemorrhagic strokes (12 out of 14). This shows that haemorrhagic strokes occurred in the hyperglycaemic patients, maximum being in the stress hyperglycaemia and new diabetics. It was observed that LDL, VLDL, HDL, total cholesterol and triglycerides showed significant association between two groups. Mean levels of LDL, VLDL triglycerides and total cholesterol were significantly greater in group D as compared to Group ND. The mean HDL values of group D was significantly lower than that in Group ND. ($P<0.05$). Mishra *et al*.[14] in a cross sectional study performed on 64 stoke patients after dividing in to group 1 (age<40 years) and group 2 (>40 years) on clinical profile and risk factors stroke with special reference to lipid profile observed group 1 and Group 2, raised cholesterol, raised triglyceride, raised LDL and low HDL was recorded in 30% versus 42.55%, 30% versus 31.48%, 40% versus 68.45% and 60% versus 27.75% of patients respectively. Bhaskar *et al*.[15] also studied the association between serum lipid level in patients with stoke and reported a strong association between LDL-C and atherosclerosis development. Rai *et al*.[16] studied serum lipid profile in stroke patients in Northern India and observed that mean TC and LDL-C levels were significantly much higher in the ischemic stroke patients when compared to patientswith controls (183.7±34.5 versus 148.5±30.6 and 118.7±26.7 versus 81.4±22.0). This was similar to the present study results. Sreedhar *et al*.[17] in a study on lipid profile in Non-Diabetic Stroke observed positive correlation between serum Total cholesterol, Triglycerides, LDL levels and risk of stroke. The mean fasting blood glucose levels in patients in Group D was 163.18 ± 15.60 and in Group ND was 92.06±10.51. This difference in fasting blood glucose among patients in two groups was statistically significant. ($P<0.05$). The mean

postprandial blood glucose level in patients in Group D was 301.37±53.14 and in Group ND was 164.13±15.89. This difference in postprandial blood glucose among patients in two groups was statistically significant. ($P<0.05$). The mean HbA1c for group D and group ND were 9.04±1.02 and 4.85±0.45 respectively. This difference in HbA1c among patients in two groups was statistically significant. ($P<0.05$).Hyperglycemia is common in patients with acute stroke, occurring in upto 60% of patients and is believed to aggravate cerebral ischemia. It leads to intracellular acidosis, accumulation of extra cellular Glutamate, cerebral oedema, blood-brain barrier disruptionand tendency for haemorrhagic transformation. It is observed that between 20-40% of patients admitted with ischemic stroke are hyperglycemic, often without a pre-existing diagnosis of diabetes, which can be due to stress hyperglycemia or undiagnosed diabetes exposed during an acute incident. HbA1c was done in all patients to rule out stress hyperglycemia. Zahra *et al*.[18] determine the frequency of newly diagnosed

diabetes mellitus in acute ischemic stroke patients and observed average fasting blood sugar in diabetic subjects was 148±10 mg/dl which was significantly high as compared to non-diabetic patients.

Conclusion

Our Study concludes the positive correlation between serum Total cholesterol, Triglycerides, LDL levels and the risk of stroke.The lipid profile of LDL, VLDL, total cholesterol and triglycerides showed significant higher range in diabetic patients as compared to non-diabetics while HDL was lower in diabetic patients as compared to non-diabetics.

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Conflict of Interest: None Declared.

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