International Journal of Advances in Medicine
Khalid TMA et al. Int J Adv Med. 2019 Jun;6(3):816-821
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20192245

Original Research Article

A study of the influence of lipid profile in diabetic patients on the incidence of cerebrovascular events

Taha Mahboob Ali Khalid[1], Rahul Gandhi G.[2]*

Department of General Medicine, Bhaskara Medical College, Yenkapally, Ranga Reddy, Telangana, India

Received: 05 March 2019
Accepted: 08 April 2019

***Correspondence:**
Dr. Rahul Gandhi G.,
E-mail: drrahulgandhigoud@gmail.com

ABSTRACT

Background: The relationship between elevated serum lipids and atherosclerosis is well established. Recent studies have demonstrated not only that the serum lipid concentration but also the distribution of TG and cholesterol within major lipoprotein classes are of importance for the development of atherosclerosis. Elevated plasma concentrations of LDL and decreased HDL are associated with increased risk of atherosclerosis. To study the influence of lipid profile in diabetic patients on the incidence of cerebrovascular events.
Methods: The study was based on 60 patients meeting the inclusion criteria from those who were admitted at Shadan Institute of Medical Sciences, Hyderabad, India from Feb 2013-May 2014. Detailed history was taken and thorough physical examination done pertaining to the involved condition. Patients who were conscious, slow progression of neurological deficit, rapid onset of lateralizing signs with variable blood pressure were considered to be suffering from infarction.
Results: The mean values of lipid profile were significantly different among the gender. There were more females with medium and high TC values as compared to females and this difference was found to be significant. Though the number of females with high HDL values was more than males, the difference was not found to be significant. The number of females with high LDL values was far more than males and this difference was found to be significant. Though the number of females was more with high TG values, the difference was not found to be significant.
Conclusions: In conclusion, our study gives evidence that poor glycemic control is a strong risk factor for stroke in patients with NIDDM.

Keywords: Evidence, Poor glycemic control, NIDDM

INTRODUCTION

Stroke is the third most common cause of death worldwide, after coronary artery disease and cancer. Asians have a lower rate of CHD and high prevalence of stroke.[1] Also among the Asians, the number who die from stroke are more than three times than that for CHD.[2,3] Indian data review found that strokes represented 1.2% of total deaths.[4]

The relationship between elevated serum lipids and atherosclerosis is well established. Recent studies have demonstrated not only that the serum lipid concentration but also the distribution of TG and cholesterol within major lipoprotein classes are of importance for the development of atherosclerosis. Elevated plasma concentrations of LDL and decreased HDL are associated with increased risk of atherosclerosis. Therefore, not only hyper lipoproteinemia but also dyslipoprotenemia may be of importance for the development of atherosclerosis.

Diabetes mellitus is a metabolic disorder not only of carbohydrate but also of lipid hyperlipidemia is a common problem in patients with poorly controlled DM II. Diabetes as a group tends to have higher plasma lipid levels than non-diabetics and this abnormality is exaggerated with poor glycemic control. Low Levels of HDL cholesterol and high levels of TG are associated with increased risk of stroke.[5] There is some evidence that low HDL cholesterol which is key component of dyslipedemia typically seen in type II DM is associated with increased risk of ischemic CVA.[6] The purpose of this dissertation is to study the lipid profile of type II diabetic patients presenting with non hemorrhagic ischemic cerebrovascular stroke.

METHODS

The study was based on 60 patients meeting the inclusion criteria from those who were admitted at Shadan Institute of Medical Sciences, Hyderabad from February 2013-May 2014.

Detailed history was taken and thorough physical examination done pertaining to the involved condition. Patients who were conscious, slow progression of neurological deficit, rapid onset of lateralizing signs with variable blood pressure were considered to be suffering from infarction.

Inclusion criteria

- Known cases of diabetes mellitus type II on treatment with clinical features of stroke and CT scan showing ischemic infarct and bleed.
- Hypertensive and non-hypertensive prior to CVE.
- Age range from 50 to 90years
- Ischemic heart disease

Exclusion criteria

- Patients with type one diabetes mellitus.
- Stroke after 3 days.
- Those patients started on dextrose at the time of presentation.
- Those on any anti-lipidemic drugs.

Investigations

CT-Scan

Patient should be supine within head rest, arms by the sides and the chins should be as far down as comfortably possible.

Lipid profile

In all cases total cholesterol, serum LDL cholesterol, serum HDL cholesterol and serum triglycerides were estimated. Overnight fasting (12hr) samples were used.

Total cholesterol oxides (CHOD)-PAB method

Modified Roeschlaus methodology was used. Cholesterol in calculated by measuring the absorbance of sample with that of standard and multiplying it with the concentration of standard.

HDL cholesterol

Estimated by phosphotungstate acid method, Chylomicrons, LDL and VLDL are precipitated from serum by phosphotungstate in the presence of divalent cation. The supernatant fluid containing HDL fraction is then determined.

Serum triglycerides

Estimated by glycerol phosphate oxidase-trinder method
The intensity of chromogen formed in the reaction (quinoneimine) is proportional to the triglyceride concentration in sample when measured at (500-540mm).

The value of LDL cholesterol: calculated by Friedwald's equation.

LDL mg/dl = Total cholesterol-HDL-(TG/5)

Blood sugar level

Blood sugar level was calculated by GOD/POD method. Glucose is oxidized by the enzyme glucose oxidase (GOD) to give D-gluconic acid and hydrogen peroxide. Hydrogen peroxide in presence of the enzyme peroxidase (POD) oxidizes phenol which combines with 4 amino antipyrine to produce a red color Quinoneimine dye. The intensity of the color developed is proportional to glucose concentration in the sample.

Statistical analysis

The data was analyzed using proportions, mean values and standard deviation. P value less than 0.05 was taken as statistically significant.

RESULTS

Table 1 shows levels of cardiovascular risk factors in relation to gender. The mean values of lipid profile were significantly different among the gender. But other risk factors like age, systolic blood pressure, diastolic blood pressure, fasting blood sugar, post prandial blood sugar were not found to be significantly different. The total cholesterol was significantly more in females compared to males. The HDL was significantly more in females compared to males. The LDL was significantly less in females compared to males. The triglycerides were was significantly more in females compared to males.

Table 2 shows distribution of study subjects as per gender and other characteristics. There were 26 males and 34

females. The number of smokers was less i.e. 19 compared to the non smokers i.e. 41. The number of patients with hypertension was more i.e. 37 compared to normotensives i.e. 23. There were six patients with low TC value, 49 with medium TC value and only five with very high TC value. There were 31 patients with low HDL value, 18 with medium HDL value and 11 with very high HDL value. There were only three with low LDL values, 44 with medium LDL values and only three with very high LDL values. There was only one patient with low TG value, 28 with medium TG values and 31 with very high TG values.

Table 1: Levels of cardiovascular risk factors in relation to gender.

Cardiovascular risk factors	Male	Female	P value
Age	59.46±9.34	58.76±9.01	0.771
Systolic blood pressure	152.31±17.60	152.06±15.20	0.954
Diastolic blood pressure	85.54±11.37	87.64±6.43	0.406
Fasting blood sugar	140±41.57	153.42±37.37	0.198
Post prandial blood sugar	242.85±74.23	259.33±76.39	0.408
Total cholesterol	250±19.80	273.94±29.68	0.012
HDL	37.86±8.88	47.91±8.25	0.0003
LDL	169.83±16.51	134.85±21.13	0.0095
Triglycerides	211.53±44.64	245±52.02	0.000

Table 2: Distribution of study subjects as per gender and other characteristics.

Characteristics		Number	%
Gender	Male	26	43.3
	Female	34	56.7
Smoking	No	41	68.3
	Yes	19	31.7
Ischemic heart disease	No	40	66.7
	Yes	20	33.3
Hypertension	No	23	38.3
	Yes	37	61.7
Total cholesterol	Low (< 231)	6	10
	Medium (232-280)	49	81.66
	High (> 280)	5	8.33
High density lipoproteins	Low (< 39.7)	31	51.66
	Medium (39.7-51)	18	30
	High (> 51)	11	18.33
Low density lipoproteins	Low (< 140)	3	5
	Medium (140-190)	44	73.33
	High (> 190)	13	21.66
Triglycerides	Low (< 134.4)	1	1.66
	Medium (134-231)	28	46.66
	High (> 231)	31	51.7

Table 3 shows association between gender and total cholesterol. There were five males with low TC value as compared to only one female with low TC value. There were 20 males with medium TC value as compared to 29 females with medium TC value. There was only one male patient with high TC value as compared to four females with high TC value. Thus, it has been found that the there were more females with medium and high TC values as compared to females and this difference was found out to be statistically significant.

Table 4 shows association between gender and high density lipoproteins (HDL). There were 14 males with low HDL values as compared to 17 females with low HDL values. There were nine male with medium HDL values as compared to same i.e. 9 females with medium HDL values. There were only three males with high HDL values as compared to eight females with high HDL values. Though the number of females with high HDL values was more than the males, the difference was not found out to be statistically significant.

Table 3: Association between gender and total cholesterol.

Total cholesterol	Gender				Total		P value
	Male		Female				
	Number	%	Number	%	Number	%	
Low (< 231)	5	19.2	1	3.03	6	10	0.0003
Medium (232-280)	20	76.9	29	87.9	49	81.66	
High (> 280)	1	3.8	4	12.1	5	8.3	
Total	26	100	34	100	60	100	

Table 4: Association between gender and high density lipoproteins (HDL)discussion.

HDL	Gender				Total		P value
	Male		Female				
	Number	%	Number	%	Number	%	
Low (< 39.7)	14	53.84	17	50	31	51.66	0.46685
Medium (39.7-51)	9	34.61	9	24.47	18	30	
High (> 51)	3	11.53	8	23.52	11	18.33	
Total	26	100	34	100	60	100	

Table 5 shows association between gender and low density lipoproteins (LDL). There were no males with low LDL values as compared to three females with low LDL values. There were 24 males with medium LDL values as compared to 20 females with medium LDL values. There were only two males with high LDL values as compared to 11 females with high LDL values. Thus the number of females with high LDL values was far more than the males and this difference therefore was found out to be statistically significant).

Table 6 shows association between gender and triglycerides. There was only one male with low TG value compared to no female with low TG values. There were 13 males with medium TG value compared to 15 females with medium TG values. There were 12 males with high TG value compared to 19 females with high TG values. Though the number of females was more with high TG values, the difference was not found out to be statistically significant.

Table 5: Association between gender and low density lipoproteins (LDL).

LDL	Gender				Total		P value
	Male		Female				
	Number	%	Number	%	Number	%	
Low (< 140)	0	0	3	8.82	3	5	0.0130
Medium (140-190)	24	92.3	20	58.82	44	73.33	
High (> 190)	2	7.76	11	32.35	13	21.66	
Total	26	100	34	100	60	100	

Table 6: Association between gender and triglycerides.

Triglycerides	Gender				Total		P value
	Male		Female				
	Number	%	Number	%	Number	%	
Low (< 134)	1	3.84	0	0	1	1.66	0.4302
Medium (134-231)	13	50	15	44.11	28	46.66	
High (> 231)	12	46.15	19	55.88	31	51.66	
Total	26	100	34	100	60	100	

DISCUSSION

In this study involving a total of 60 patients with type II diabetes mellitus presenting with ischemic

cerebrovascular stroke were evaluated. The incidence of stroke is higher in women which in this study was (57%). Whiles males accounted to 44%. This could be due to the reasons that more female population was included in the study. Arboix A et al in his study showed a male prevalence to 51%.[7]

Patients who presented with stroke in this study were also categorized according to their age. Mean age of presentation of males was 59.46 year with a SD of (9.3) and females was (58.76 years) with SD of (9). There was no significant difference in the ages of males and female presenting with ischemic stroke. Arboix A et al, also in his study found no significant difference in the ages of both males and females.[7]

Significant number of patients (60%) in this study was hypertensive. Arboix A et al, in their study (53.2%) and Safeer M et al, in their study (55%) showed hypertensive subjects.[7,8] Mean systolic and diastolic blood pressures in males and females was not significantly different.

The personal history in the present study showed that 32% of the population study had a history of smoking. The present study is consistent with the studies stated above.

These findings concur with other studies except the study conducted by Arboix A et al, where the incidence of IHD is low.[7] The probable explanation may be due to better medical care offered in the European counterpart. IHD in the present study showed a higher incidence in the female's population (35.3%) as compared to the male population. This might be due to reasons that females here have less willingness to medical care.[7]

Diabetes mellitus is associated with a dyslipidemic state. In our present study individual lipid parameters were assessed. The present study which was of 60 patients with 26 males and 34 females showed a significant difference in the level of total cholesterol, HDL, LDL and triglycerides among the males and females.

The present study is consistent with the study done by Lehto S et al which showed an increased level of TC in both the sexes.[9] The present study is consistent with the study done by Lehto S et al, which showed a decrease in level of HDL in males and females. Low HDL levels are a risk factor for cerebrovascular stroke.[9]

The present study is consistent with the study done by Malati T et al, which showed a high increase in level of LDL in males and a slight increase in females.[10]

Hypertriglyceredemia is an important lipid abnormality associated with diabetes. Lehto S et al, observed higher TG values than the present study. [9]

Lehto S et al, in his study categorized TC, HDL and TG into 3 categories which are as follows.[9]

There are 43% male and 57% female in this study. Only 31% of the sample was smoking. Majority of the patients (almost 62% had hypertension). Small percentage (33%) had IHD. Majority in the present study (81.7%) had total cholesterol in the middle range i.e., in between (232-280mg/dl). In this range the percentage of females was 88% compared to males which were 76%. This subset of middle range of cholesterol is more for females than males which is consistent with the observation made by Lehto S et al. [9]

Lehto S et al, observed the majority of the patient in his study group landed in the middle range of cholesterol levels.[9] The present study showed 30% of patient had HDL in the middle order in between 39.7-51.09 mg/dl. In this middle range of HDL cholesterol 34% males and 24% females were present in the present study.[9]

Majority of patients in the study had low HDL levels consistent with Lehto S et al, hence it can be a risk factor for diabetes patients in any cerebrovascular event.[9]

Almost 52% of the study fell in the high category of triglycerides that > 231mg/dl. More than 90% of females had middle to high triglyceride levels. This association between gender and triglyceride levels was found to be statistically significant (P<0.1) by Lehto S et al.[9]

CONCLUSION

In conclusion, our study gives evidence that poor glycemic control is a strong risk factor for stroke in patients with NIDDM. Furthermore, hypertension, high cholesterol, high triglycerides, and low HDL cholesterol are important predictors of future risk of stroke in patients with NIDDM. Our results imply that effective treatment of hyperglycaemia, hypertension, and dyslipedemia may help to prevent stroke in patients with NIDDM.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Li SC, Schoenberg BS, Wang CC, Cheng XM, Bolis CL, Wang KJ. Cerebrovascular disease in the People's Republic of China: epidemiologic and clinical features. Neurol. 1985 Dec 1;35(12):1708.
2. Wu Z, Yao C, Zhao D, Wu G, Wang W, Liu J, et al. Sino-MONICA project: a collaborative study on trends and determinants in cardiovascular diseases in China, Part i: morbidity and mortality monitoring. Circulation. 2001 Jan 23;103(3):462-8.
3. Sacco RL, Benson RT, Kargman DE, Boden-Albala B, Tuck C, Lin IF, et al. High-density lipoprotein cholesterol and ischemic stroke in the elderly: the

Northern Manhattan Stroke Study. JAMA. 2001 Jun 6;285(21):2729-35.
4. Amarenco P, Labreuche J, Touboul PJ. High-density lipoprotein-cholesterol and risk of stroke and carotid atherosclerosis: a systematic review. Atherosclerosis. 2008 Feb 1;196(2):489-96.
5. Dalal PM. Ischemic strokes: management in first six hours. Neurology India. 2001;49:104-115.
6. Mahley RW, Innerarity TL, Rall SC, Weisgraber KH. Plasma lipoproteins: apolipoprotein structure and function. J Lipid Res. 1984 Dec 1;25(12):1277-94.
7. Arboix A, Rivas A, García-Eroles L, de Marcos L, Massons J, Oliveres M. Cerebral infarction in diabetes: clinical pattern, stroke subtypes, and predictors of in-hospital mortality. BMC Neurol. 2005 Dec;5(1):9.
8. Safeer M, Tariq M, Rehman U. Frequency of risk factors of cerebral infarction in stroke patients. A study of 100 cases in Naseer Teaching Hospital, Peshawar. Pak J Med Sci. 2008;24(1):109-113.
9. Lehto S, Rönnemaa T, Pyörälä K, Laakso M. Predictors of stroke in middle-aged patients with non-insulin-dependent diabetes. Stroke. 1996 Jan;27(1):63-8.
10. Malati T, Mahesh MR. Reference intervals for serum total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, Lp (a), apolipoprotein AI, A-II, B, C-II, C-III, and E in healthy South Indians from Andhra Pradesh. Indian J Clin Biochem. 2009 Oct 1;24(4):343-55.

Cite this article as: Khalid TMA, Gandhi GR. A study of the influence of lipid profile in diabetic patients on the incidence of cerebrovascular events. Int J Adv Med 2019;6:816-21.