Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

To evaluate the impact of dyslipidemia and hyperglycemia in stroke patients

Sunil Kumar Goel

Associate Professor, Department of General Medicine, Noida International Institute of Medical Sciences, Greater Noida, India

ABSTRACT:

Aim: The aim of the study to evaluate the impact of dyslipidemia and hyperglycemia among stroke patients. **Methods:** This was a cross-sectional study conducted in the Department of Medicine. During the study period, a total of 110 stroke patients were admitted out of them, 100 patients were participated in this cross-sectional study. Age, gender, and social status, past medical history (hypertension, diabetes, atrial fibrillation, ischemic heart disease, transient ischemic attack, and previous history of stroke), other risk factors (smoking, alcohol use, and obesity/BMI) and family history were obtained from all the patients. **Results:** Out of 110, 100 patients were participated in this cross-sectional study, giving a response rate of 90.91%. the patients had a mean age of 66.9 years with 77% of them aged above 50 years, and 67% of them were males. Regarding the lipid profile and hyperglycemia, it was found that, 29 patients (29%) had LDL greater than 130 mg/ dl, 19 patients (19%) had cholesterol equal or greater than 200 mg/dl, 17(17%) patients had TAG equal or greater than 200 mg/dl, 61(61%) patients had low HDL (Table 4). 52 patients (52%) had HbA1c levels equal or greater than 6.5% and 54 patients (54%) had FBG equal or greater than 126 mg/dl. The mean and standard deviation of the main variables in this study are shown in Table 5. The mean age of the patients was 66.9 years; the main BMI was 33.3 kg/m2. The mean level of cholesterol, LDL, HDL and TAG were 163.7, 116.4, 42.7, and 135.1mg/dl respectively. The mean of the HbA1c was 7.2%, while the mean of FBG was 157mg/dl. **Conclusion:** Most of the patients with stroke had low HDL levels, high levels of FBG and HbA1c. Hypertension, DM, smoking and family history of HTN and DM are significant risk factors for the incidence of stroke.

Received: 19 February, 2021 Accepted: 25 March, 2021

Corresponding author: Sunil Kumar Goel, Associate Professor, Department of General Medicine, Noida International Institute of Medical Sciences, Greater Noida, India

This article may be cited as: Goel SK. To evaluate the impact of dyslipidemia and hyperglycemia in stroke patients. J Adv Med Dent Scie Res 2021;9(4): 167-171.

INTRODUCTION

According to the 'World Health Organization' criteria, stroke events are defined as "rapidly developing signs of focal (or global) disturbance of cerebral function lasting >24 hours (unless interrupted by surgery or death) with no apparent nonvascular cause."[1] Stroke is estimated to be the second leading cause of death and a major cause of serious disability for adults worldwide.[2] In India, the prevalence of stroke is estimated as 203 per 100,000 above 20 years. In India, stroke incidence is 105 to 152/100,000 persons per year.[3] Ischemic stroke accounts for about 85% of cases, primary intracerebral hemorrhage (ICH) for 10% and subarachnoid hemorrhage (SAH) for the remaining 5%.[4] The role of lipid and lipoprotein biomarkers, such as of total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG), in risk prediction of ischemic heart disease is well established 1,2,4 but their value as independent predictors for ischemic stroke is less certain.[5] In most epidemiological cohorts, the relationship between lipids and stroke is complex and varies by stroke subtype, with associations strongest for atherosclerotic subtypes. Conversely, there is an increased risk of ICH at low cholesterol levels, and there is evidence that small vessel disease may share a similar profile of inverse association with lipid levels. The associations also depend on the specific lipid component considered, with the data strongest for TC and LDL-C.[6]

Hypertension, diabetes, and dyslipidemia are major modifiable risk factors for CVD. The prevalence of these risk factors has increased sustainably in China, and even worse, many middle-aged people have at least two chronic diseases.[7-9] The reason for disease

clustering is probably mutual risk factors, such as aging, obesity, and smoking. Nevertheless, few analyses focused on common risk factors for hypertension, diabetes, and dyslipidemia. In addition, previous studies have shown that the clustering of two risk factors increases the risk of CVDs.[10,11] However, limited evidence is available with regard to the relationship between multiple chronic diseases and CVDs. The severity of acute stroke is associated with the incidence and degree of hyperglycemia and the mortality was significantly increased in hyperglycemic patients.12 Undoubtedly, dyslipidemia and diabetes are two of the common disorders all over the world, and they are considered as risk factors for many diseases, while stroke is a clinical con- dition that directly and badly affects life and may result in death. Therefore, the aim of this study was to determine the impact of dyslipidemia and hyperglycemia in stroke patients and to assess the risk factors associated with stroke among these patients and this would influence the treatment course and prognosis of stroke per se.

MATERIAL AND METHODS

This was a cross-sectional study conducted in the Department of Medicine, after taking the approval of the protocol review committee and institutional ethics committee. After taking informed consent detailed history was taken from the patient or the relatives. The technique, risks, benefits, results and associated complications of the procedure were discussed with all patients. Total 110 stroke patients with a confirmed CT scan were admitted to our hospital, out of them, 100 patients were participated in this study.

Patients without a confirmed CT scan, those suspected of having a transient ischemic attack or patients who refused to undergo the interview or give blood sample, were excluded. Age, gender, and social status, past medical history (hypertension, diabetes, atrial fibrillation, ischemic heart disease, transient ischemic attack, and previous history of stroke), other risk factors (smoking, alcohol use, and obesity/BMI) and family history were obtained from all the patients.

Fasting venous blood samples were collected from stroke patients to measure cholesterol, TAG, LDL, HDL, FBG, and HbA1c. Hyperlipidemia was defined as cholesterol equal or more than 200 mg/dl, TAG of equal or more than 200 mg/ dl, LDL of equal or more than 130 mg/dl, and HDL of less than 40 mg/dl in men and less than 50 mg/dl in women.13 Patients were diagnosed as diabetic if FBG level is equal or more than 126 mg/dl on more than one occasion or random blood glucose level more than 200 mg/dl on one occasion with symptoms of hyperglycemia or HbA1c equal or more than 6.5%.14 Patients who were normoglycemic at the time of presentation, but with a history of diabetes, taking insulin or oral hypoglycemic were also labelled as diabetics. A smoker was defined as a person who smoked at least one cigarette per day for the preceding 3 months or more, or use tobacco in any form.15 Obesity was defined as a person with a BMI of 30 kg/m2 or more.

RESULTS

Out of 110, 100 patients were participated in this cross-sectional study, giving a response rate of 90.91%. the patients had a mean age of 66.9 years with 77% of them aged above 50 years, and 67% of them were males. the demographic distribution of age and gender in the study is shown in Table 1. Studying the co-morbidity, 78(78%) patients had hypertension, 54(54%) patients had diabetes mellitus, and 11 (11%) patients had transient ischemic attack. 49 patients (49%) were smokers, the majority of the smokers were males , and 11(11%) patients were obese with a BMI above 30 kg/m2 with a mean of 33.3 kg/m2. The co-morbidities incidence rates are demonstrated in Table 2.

Table 1: Demographic distribution of age and gender

Gender	100	%
Male	67	67
Female	33	33
Age in years		
Below 50	23	23
Above 50	77	77

Table 2: Co-morbidities associated with stroke

Co-morbidities	Number of cases	%
HTN	78	78
DM	54	54
TIA	11	11
Smoker	49	49
BMI > 30	11	11

BMI: body mass index, TIA: transient ischemic attack, DM: diabetes mellitus, HTN: hypertension

Table 3: Distribution Of family history

Familial history	Number of cases	%
HTN	79	79
Stroke	52	52
DM	61	61

DM: diabetes mellitus, HTN: hypertension.

TABLE 4: Lipid profile and fasting blood glucose and Glycosylated Hemoglobin levels in stroke patients

Test	Number of cases	%
LDL≥130 mg/dl	29	29
Cholesterol≥200 mg/dl	19	19
Triglyceride≥200 mg/dl	17	17
Low levels of HDL	61	61
$Hb_{A1c} \geq 6.5\%$	52	52
FBG ≥ 126 mg/dl	54	54

FBG: fasting blood glucose, Hb_{A1c}: glycosylated hemoglobin

Table 3 shows that 79(79%) patients had a family history of hypertension, 52(52%) patients had a family history of stroke and 61(61%) patients had a family history of diabetes mellitus (Table 3).

Regarding the lipid profile and hyperglycemia, it was found that, 29 patients (29%) had LDL greater than 130 mg/ dl, 19 patients (19%) had cholesterol equal or greater than 200 mg/dl, 17(17%) patients had TAG equal or greater than 200 mg/dl, 61(61%) patients had low HDL (Table 4). 52 patients (52%) had HbA1c levels equal or greater than 6.5% and 54 patients (54%) had FBG equal or greater than 126 mg/dl.

Table 5: Mean and standard deviation of age, BMI, lipids, glycosylated hemoglobin and fasting blood sugar

Parameter	Mean (±SD)
Age (years)	66.9 (±9.5)
Obesity (BMI) (kg/m^2)	33.3 (±3.7)
Cholesterol (mg/dl)	163.7 (±39.4)
LDL (mg/dl)	116.4(±29.8)
HDL (mg/dl)	42.7 (±19.2)
Triglyceride (mg/dl)	135.1 (±61.4)
HbA1c (%)	7.2 (±1.5)
FBG (mg/dl)	157 (±71.4)

BMI: body mass index, FBG: fasting blood glucose, HbA1c: glycosylated haemoglobin

The mean and standard deviation of the main variables in this study are shown in Table 5. The mean age of the patients was 66.9 years; the main BMI was 33.3 kg/m2. The mean level of cholesterol, LDL, HDL and TAG were 163.7, 116.4, 42.7, and 135.1mg/dl respectively. The mean of the HbA1c was 7.2%, while the mean of FBG was 157mg/dl.

DISCUSSION

Stroke is classically characterized as a neurological deficit attributed to an acute focal injury of the central nervous system by a vascular cause, including cerebral infarction, intracerebral hemorrhage, and subarachnoid hemorrhage, and is a major cause of disability and death worldwide.[16] The presentation of stroke is variable, ranging from subtle to severe, depending on the area of brain involved and the nature of the attack.[17] The role of dyslipidemia in the pathogenesis of stroke is less clear. Studies have shown conflicting findings regarding the association between dyslipidemia and stroke.[18] In this study, the impact of dyslipidemia, hyperglycemia and other stroke risk factors were studied among stroke patients. the male to female ratio was almost 2.03: 1, similar to other studies.[19,20] the higher incidence of stroke among male may be attributed to high prevalence of smoking among bihar men and the consumption of more fatty food. In addition, the hormonal effects of estrogen also have a protective effect against stroke in females. Although a study from Oxford shire, showed that males are more affected than females by genetic factors, the family history are more likely to be found in females than in males.[21] Regarding the age distribution of stroke patients in the study, the mean age was 66.6 years (±9.5) which is similar to a result of a study in India and a study in Palestine 10 years ago that showed a mean age of 69 years.[20,22] The majority, 77(77%) patients, were above the age of 50 years. Again this result is almost similar to the study conducted in Palestinian that found 82% of patients were above the age of 60 years.[22] These results indicate that the incidence of stroke is higher for those who are above 50 years old. On the other hand, the mean BMI of stroke patients was 33.3 kg/m2 (±3.7)

with 11 (11%) patients above 30kg/m2 , and this is higher than a study carried in Japan.[23] Although obesity and higher BMI is established as a risk factor for coronary artery disease, its role as a risk factor for stroke remains controversial. Although there are many possible causes of human disease, family history is often one of the strongest risk factors for common disease complexes such as stroke, cancer, and diabetes. We found that a family history for HTN, stroke, or DM was associated with the increased incidence of stroke. Family history of HTN (79%) was found as the main cerebrovascular risk factor in stroke, followed by a family history of DM (61%) and stroke (52%).

therefore, family history is thought to be a good predictor of stroke risk because family members most closely represent the unique genomic and environmental interactions that an individual experiences.[24] The involvement of hypertension, diabetes, cigarette smoking, and others in the formation of stroke is widely established.[25-27] Hypertension (78%) was found to be the main stroke risk factor, followed by smoking (49%) and diabetes (54%). Moreover, the high incidence of hypertension increases the risk of stroke. Although our understanding of the benefits of treating high blood pressure, diabetes and smoking for the secondary prevention of strokes is evolving, we have identified a significant need for improvement in overcoming these risk factors. Stroke prevention clinics may need to be more actively involved in the management of these modifiable risk factors if we are to significantly impact the risk of recurrent stroke.[28] the lipid profile of stroke patients was studied and it was found that there were 19(19%) patients with cholesterol level≥200mg/dl and the mean total cholesterol was 163.7mg/ dl (±39.4), in agreement with other results which showed no significant correlation between cholesterol level and the risk of stroke.[29] Other studies showed an increased risk of stroke in patients with higher levels of cholesterol.[30,31] This may indicate that the role of high cholesterol levels as a risk factor for stroke is still unclear. High level of TAG (>200mg/dl) were found in 17patients (17%), and the mean TAG level was 135.1 mg/dl (±61.4).th-ese results are similar to several studies that showed the TAG level ranging from 127 to 154 mg/dl among stroke patients.[32] These observations may indicate that the relationship between elevated TAG levels and the risk of stroke is still lacking, and this is in agreement with previous studies showed that no clear relationship between elevated TAG levels and risk of stroke.[33,32] The mean LDL level was 116.4 mg/dl (±29.8), 29 patients had LDL above 130 mg/dl (29%). Conflicting results are reported in the literature about the relationship between elevated levels of LDL and risk of stroke.[34] Several studies showed similar findings and suggested that lower levels of HDL are associated with increased risk of stroke, while high levels of HDL are considered as a slight protective indicator against stroke.[35] On the other hand, a study conducted in Hawaii, showed no clear relationship between low levels of HDL and the risk of having stroke.[36]

the results of HbA1c showed that 52 patients (52%) had HbA1c ≥ 6.5% with a mean of 7.2% (±1.5). the FBG≥126mg/ dl was found in 54(54%) patients with a mean of 157mg/ dl (±71.4). the results about HbA1c and FBG were similar to other studies that showed a relationship between hyperglycemia and high HbA1c, and the risk of developing stroke.[37] In diabetic patients, several mechanisms suggest that the prolonged hyperglycemia leads to stroke. these include vascular endothelial dysfunction, increased early-age arterial stiffness, systemic inflammation and thickening of the capillary basal membrane.

CONCLUSIONS

Most of the patients with stroke had low HDL levels, high levels of FBG and HbA1c. Hypertension, DM, smoking and family history of HTN and DM are significant risk factors for the incidence of stroke. Less patients had high LDL, high cholesterol and high TAG, making the effect of these parameters on the incidence of stroke is still controversial.

REFERENCE

1. Hatano S. Experience from a multicentre stroke register: a preliminary report. Bull World Health Organ 1976;54:541–3.
2. Kim AS, Cahill E, Cheng NT. Global stroke belt: geographic variation in stroke burden worldwide. Stroke 2015;46:3564–70.
3. Kamalakannan S, Gudlavalleti ASV, Gudlavalleti VSM, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. Ind J Med Res. 2017;146(2):175-185.
4. Smith NM, Pathansali R, Bath PMW. Vascular Medicine. 1999;25(2):50-5
5. Pikula A, Beiser AS, Wang J, Himali JJ, Kelly- Hayes M, Kase CS, et al. Lipid and lipoprotein measurements and the risk of ischemic vascular events: Framingham Study. Neurol. 2015;84(5): 472–9.
6. Yaghi S, Elkind MSV. Lipids and Cerebrovascular Disease: Research and Practice. Strok. 2015;46(11): 3322–8.
7. Liu LS. 2018 Chinese guidelines for the management of hypertension. Beijing: People's Medical Publishing House (China), 2018.
8. Zhang DD, Tang X, Jin DY, et al. Prevalence of diabetes in Chinese adults: a Meta-analysis. Zhonghua Liu Xing Bing Xue Za Zhi 2018;39:852-7.
9. Joint Committee for Developing Chinese Guidelines on Prevention and Treatment of Dyslipidemia in Adults. 2016 Chinese guidelines on prevention and treatment of dyslipidemia in adults. Zhonghua Xin Xue Guan Bing Za Zhi 2016;44:833-53.
10. Bloomgarden ZT. Insulin resistance, dyslipidemia, and cardiovascular disease. Diabetes Care 2007;30:2164-70.
11. Sehestedt T, Hansen TW, Li Y, et al. Are blood pressure and diabetes additive or synergistic risk factors? Outcome in 8494 subjects randomly recruited from 10 populations. Hypertens Res 2011;34:714-21

12. Melamed E, "Reactive hyperglycaemia in patients with acute stroke," *J Neurol Sci.1976;* 29(2–4): 267–275.
13. Fletcher B, Berra K, Ades P. "Managing abnormal blood lipids," *Circulation*, 2005;112 (20):3184–3209.
14. Marathe P H, Gao H X, and Close K L."American diabetes association standards of medical care in diabetes 2017," *J Diabetes*.2017; 9(4): 320–324.
15. You R, McNeil J J, O'Malley H M, Davis S M, and Donnan G A, "Risk factors for lacunar infarction syndromes," *Neurology*.1995;45(8):1483–1487.
16. Sacco R L, Kasner S E, Broderick J P."An updated definition of stroke for the 21st century," Stroke.2013;44(7): 2064–2089.
17. Victor M, Ropper A H, and Adams R D, Adams and Victor's principles ofneurology, McGraw Hill, New York, USA, 2001.
18. Goldstein L B. "the complex relationship between cholesterol and brain hemorrhage," Circulation.2009; 119(16): 2131–2133.
19. Qari F A, "Profile of stroke in a teaching university hospital in the western region," Saudi Medical Journal.2000; 21(11):1030–1033.
20. Marwat M A, Usman M, and Hussain M. "Stroke and its relationship to risk factors," Gomal Journal of Medical Sciences.2009;7(1):17–21.
21. Touze E and Rothwell P M, "Sex differences in heritability of ischemic stroke: a systematic review and meta-analysis," Stroke.2008; 39(1):16–23.
22. Sweileh W M, Sawalha A F, Al-Aqad S M, Zyoud S H, and Al-Jabi S W." epidemiology of stroke in Northern Palestine: a 1-year, hospital-based study," Journal of Stroke and Cerebrovascular Diseases.2008;17(6):406–411.
23. Kawase S, Kowa H, Suto Y. "Association between body mass index and outcome in Japanese ischemic stroke patients," Geriatrics & Gerontology International.2017;17(3):369–374.
24. Kardia S L, Modell S M, and Peyser P A."Family-centered approaches to understanding and preventing coronary heart disease," American Journal of Preventive Medicine.2003; 24(2):143–151.
25. Gilmore R M and Stead L G. "The role of hyperglycemia in acute ischemic stroke," Neurocrit Care.2006;5(2):153–158.
26. Arboix A and Martí-Vilalta JL."New concepts in lacunar stroke etiology: the constellation of small-vessel arterial disease," Cerebrovascular Diseases. 2003;17(1): 58–62.
27. Lou H, Dong Z, Zhang P et al. "Joint effect of smoking and diabetes on stroke," Zhonghua Liu Xing Bing Xue Za Zhi.2017; 38(9):1274–1277.
28. Mouradian M S, Majumdar S R, Senthilselvan A, Khan K, and Shuaib A. "How well are hypertension, hyperlipidemia, diabetes, and smoking managed after a stroke or transient ischemic attack?," Stroke.2002;33(6):1656–1659.
29. Castilla-Guerra L, Fernández-Moreno M D C, and Álvarez-Suero J, "Secondary stroke prevention in the elderly: New evidence in hypertension and hyperlipidemia," European Journal of Internal Medicine.2009;20(6): 586– 590.
30. Zhang X, Patel A, Horibe H et al., "Cholesterol, coronary heart disease, and stroke in the Asia Pacific region," International Journal of Epidemiology2003; 32(4): 563–572.
31. Lindenstrom E, Boysen G, and Nyboe J, "Influence of total cholesterol, high density lipoprotein cholesterol, and triglycerides on risk of cerebrovascular disease: the Copenhagen city heart study," BMJ.1994;309(6946):11–15.
32. Goff D C, A. Bertoni A G, Kramer H et al. "Dyslipidemia prevalence, treatment, and control in the multi-ethnic study of atherosclerosis (MESA): gender, ethnicity, and coronary artery calcium," Circulation.2006;113(5): 647–656.
33. Tziomalos K, Athryros V G, Karagiannis A, and Mikhalidis D P, "Dyslipidemia as a risk factor for ischemic stroke," Current Topics in Medicinal Chemistry.2009; 9(14): 1291–1297.
34. Zhang Y, Tuomilehto J, Jousilahti P, Wang Y, Antikainen R, and Hu G, "Total and high-density lipoprotein cholesterol and stroke risk," Stroke.2012;43(7): 1768–1774.
35. Basharat Z, Mumtaz S, Rashid F et al., "Prevalence of risk factors of ischemic stroke in a local Pakistani population. Highdensity lipoproteins, an emerging risk factor," Neurosciences (Riyadh).2012:17(4): 357–362.
36. Iemolo F, Beghi E, Cavestro C, Micheli A, Giordano A, and Caggia E, "Incidence, risk factors and short-term mortality of stroke in Vittoria, southern Italy," Neurological Sciences.2002;23(1):15–21.
37. Wei J W, Heeley E L, Wang J W et al."Comparison of recovery patterns and prognostic indicators for ischemic and hemorrhagic stroke in China," Stroke.2010; 41(9):1877–1883.