

Correlation between plasma fibrinogen and acute stroke

V S Sai Lakshmi¹, Ragiri Niveditha^{2*}

^{1,2} Associate Professor, Department of General Medicine, Siddartha Medical College, Vijayawada, A.P.

Email: niveditharagiri@gmail.com

Abstract

Background: Stroke is a major global health problem caused by the interruption of blood supply to the brain because a blood vessel may burst or get blocked by a clot which cuts off the supply of oxygen and nutrients to brain causing brain tissue damage. Worldwide, stroke is the second leading cause of mortality and the third leading cause of disability.¹ Over the past twenty years, crude stroke prevalence ranged from 44.29 to 559/100,000 persons in different parts of India. In India, the cumulative incidence of stroke ranged from 105 per lakh to 152 per lakh persons per year during the past twenty years in various regions of the country. **Aim and Objectives:** To detect plasma fibrinogen levels in patients with acute stroke. To compare and correlate the significance of plasma fibrinogen levels in patients with acute stroke with that of age, sex and risk factors matched controls. **Material and Methods:** A hospital-based, analytical case-control study was conducted in New Government General Hospital, Vijayawada among fifty consecutive patients who were admitted with acute stroke. Patients who presented with acute stroke within 24 hours of onset of symptoms and among whom CT scan shows cerebral infarct or hemorrhage were included. The study was conducted between November 2016 and April 2018 and compared with 50 controls not suffering from a stroke with matched age, sex and risk factors (controls). A detailed history was taken to identify the risk factors such as hypertension, diabetes, smoking and alcohol consumption. November 2017 American Heart Association (AHA) guidelines criteria were used to diagnose Hypertension. Diabetes was diagnosed by the American Diabetes Association guidelines and smoking recorded in terms of number of cigarette pack-years smoked. The data obtained was entered in Microsoft Excel and analyzed in SPSS version-22 trial. The comparison of data was made by “t-Test Two-Sample Assuming Equal Variances”. A p-value of less than 0.05 was considered significant. **Results:** Out of the total of 50 patients, 42 had an ischemic stroke, and 8 had a hemorrhagic stroke. Mean plasma fibrinogen level amongst cases was in cases under study was 637.4 ± 174.505 mg% and the mean plasma fibrinogen in controls under the present study was 292.72 ± 86.0944 mg% **Conclusion:** Plasma fibrinogen levels are significantly elevated in patients with strokes when compared to age, sex and risk factor matched controls. This study has demonstrated increased plasma fibrinogen levels in patients with acute stroke as compared to controls. Plasma fibrinogen levels found elevated in both ischemic and hemorrhagic strokes. Plasma fibrinogen levels rise as age advances. Hypertension and smoking do influence plasma fibrinogen levels.

Keywords: Fibrinogen, stroke.

*Address for Correspondence:

Dr. Ragiri Niveditha, Associate Professor, Department of General Medicine, Siddartha Medical College, Vijayawada, A.P.

Email: niveditharagiri@gmail.com

Received Date: 21/08/2019 Revised Date: 19/09/2019 Accepted Date: 28/10/2019

DOI: <https://doi.org/10.26611/10211221>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:

01 November 2019

INTRODUCTION

Stroke is a major global health problem caused by the interruption of blood supply to the brain because a blood vessel may burst or get blocked by a clot which cuts off the supply of oxygen and nutrients to brain causing brain tissue damage. Worldwide, stroke is the second leading cause of mortality and the third leading cause of disability.¹ Over the past twenty years, crude stroke prevalence ranged from 44.29 to 559/100,000 persons in different parts of India. In India, the cumulative incidence of stroke ranged from 105 per lakh to 152 per lakh persons per year during the past twenty years in various regions of the country.² India and other developing

countries are facing a dual burden of both non-communicable and communicable diseases. In India, one among the leading causes of morbidity, disability and mortality is a stroke. Stroke is becoming a significant cause of premature death and disability in low-middle income countries like India, driven by demographic changes and enhanced by the increasing prevalence of modifiable risk factors. Among risk factors for stroke assessed by a case-control study, hypertension was the most significant risk factor.³ Age, sex, race/ethnicity are non-modifiable risk factors, while hypertension, smoking, diet, physical inactivity, change in hematology like increased fibrinogen can cause a stroke. More recently inflammatory disorders, infection, pollution, cardiac atrial disorders independent of atrial fibrillation have shown rising incidence.⁴ Fibrinogen is a soluble glycoprotein in plasma and is coagulation factor with 380 kD weight composed of three polypeptide chains with two halves and three disulphide bonds. In the first phase of clot formation soluble fibrinogen is converted into insoluble fibrin which polymerizes to form a clot which continues as a cycle to form a clot.⁵

AIM and OBJECTIVES

1. To detect plasma fibrinogen levels in patients with acute stroke.
2. To compare and correlate the significance of plasma fibrinogen levels in patients with acute stroke with that of age, sex and risk factors matched controls.

MATERIAL AND METHODS

A hospital-based, analytical case-control study was conducted with plasma fibrinogen of fifty consecutive patients who presented with acute stroke and got admitted in New Government General Hospital, Vijayawada between November 2016 and April 2018 were measured and compared with fifty controls not suffering from a stroke with matched age, sex and risk factors (controls). A detailed history was taken to identify the risk factors such as hypertension, diabetes, smoking and alcohol consumption. November 2017 AHA guidelines criteria were used to diagnose Hypertension. Diabetes was diagnosed by the American Diabetes Association and smoking recorded in terms of number of cigarette pack-years smoked. Thorough general and systemic examination would be carried out with a focus on

neurological examination. Routine investigations, as per standard protocol in the evaluation of a stroke patient, fasting plasma fibrinogen level was estimated and compared to age, sex and risk factors matched controls. Follow-up of the patient until discharged from the hospital. Controls taken were not suffering from stroke and age, sex and risk factor matched. Patients who presented with acute stroke within 24 hours of onset of symptoms and among whom CT scan shows cerebral infarct or hemorrhage were included. Patients with evidence of uremia, infection, active hepatic disease, myocardial infarction in last three months, underwent surgery in the last three months. There was no ethical violation. Permission was taken from the institutional ethics committee in prior. The data obtained was entered in Microsoft Excel and analyzed in SPSS version-22 trial. The comparison of data was made by “t-Test Two-Sample Assuming Equal Variances”. A *p*-value of less than 0.05 was considered significant.

RESULTS

The present study included analysis of 50 cases and 50 controls which were age, sex, risk factor matched. After excluding the exclusion criteria, the data was analyzed for the relation between the fasting fibrinogen levels was studied with its correlation and preponderance and as a risk factor for causing cerebrovascular disease. The mean plasma fibrinogen in cases under study was 637.4 ± 174.505 mg/dl and the mean plasma fibrinogen in controls under this study was 292.72 ± 86.0944 mg/dl, there was a statistically significant correlation between the data analyzed when compared to other studies as the *p*-value was <0.01 (Table-1, figure-1). The mean age in the present study series was 58.36 years and in controls were 58.36 years. The youngest age under the study was 28 years, and the oldest was 80 years. Maximum age group under study was between 60-69 years which included 20 cases and 20 controls. In the present study, a comparison of the cases and controls in various parameters which were in relation to age, gender, hypertension, diabetes and diastolic blood pressure, alcoholism was done for statistical significance by “t-Test Two-Sample Assuming Equal Variances”. In the observations containing 50 cases, the variance observed was 30452.28571mg/dl and the variance observed in 50 controls was 7412.246531mg/dl, there was a highly statistically significant difference between both the groups.

TABLE 1: SHOWING THE MEAN AND STANDARD DEVIATION OF PLASMA FIBRINOGEN LEVELS IN CASES AND CONTROLS

Patients	Number	Mean \pm SD mg%	p-value
Cases	50	637.4 ± 174.505	<0.01
Controls	50	292.7 ± 86.094	

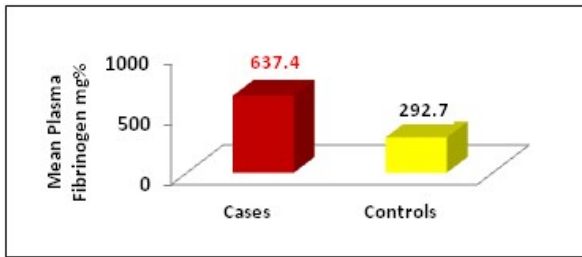


Figure 1

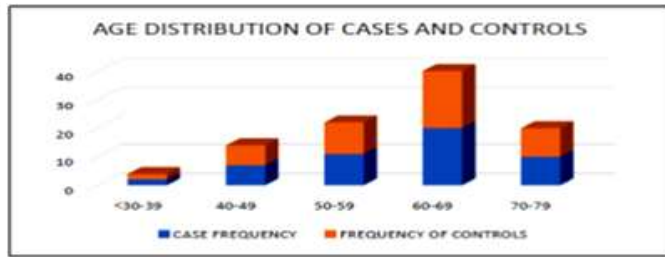


Figure 2

FIGURE 1: SHOWING THE MEAN PLASMA FIBRINOGEN LEVELS IN CASES AND CONTROLS; FIGURE-2: SHOWING THE AGE DISTRIBUTION AMONG CASES AND CONTROLS

TABLE-2: SHOWING AGE AND MEAN FIBRINOGEN LEVEL

AGE	NUMBER	CASES	CONTROLS
30-39 YRS	2	290	290
40-49 YRS	7	551.4	318.5
50-59 YRS	11	540.9	264
60-69YRS	20	712.5	301
>70 YRS	10	723	280.2

An increase the mean plasma fibrinogen levels as the age are increasing in cases noted. In the control group, the highest mean fibrinogen level found as the age increases for the age group of 40-49 years and 60-69 years.

TABLE-3 SHOWING THE MEAN PLASMA FIBRINOGEN IN RELATION TO VARIOUS VARIABLES

No	Parameter under study	Number of study subjects	Plasma fibrinogen mg% in cases	Plasma fibrinogen mg% in controls	p-value
1	Ischemic stroke	42	643.09±169.698	293.95±84.76	<0.01
2	Hemorrhagic stroke	8	607.5 ± 208.03	286.25±91.41	0.0041
3	Gender-Male	29	680 ± 139.12	319.58 ± 90.649	<0.01
4	Gender-Female	21	578.57 ± 203.08	255.61 ± 64.527	
5	Smoking habit-Present	25	706.8 ± 102.66	333.52 ± 87.8	<0.01
6	Smoking habit-Absent	25	568 ± 203.96	251.92 ± 62.78	
7	Hypertensive	34	705±120.10	300.67±80.155	<0.01
8	Non-Hypertensive	16	493.75±188.07	275.81±98.13	
9	Diabetic	17	727.05±178.005	297.76±82.97	<0.01
10	Non-Diabetic	33	591.21±130.18	290.12±94.28	
11	Alcoholic	18	667.7±169.16	319.05±83.15	<0.01
12	Non-Alcoholic	32	620.31±177.7	277.90±85.4	

DISCUSSION

In the present study 50 cases and 50 controls age, sex, risk factor matched were included. The mean plasma fibrinogen in cases under study was 637.4 ± 174.505mg/dl and the mean plasma fibrinogen in controls under this study was 292.72 ± 86.0944mg/dl, there was a statistically significant correlation between the data analyzed when compared to other studies as the p-value was <0.01. In the observations containing 50 cases, the variance observed was 30452.28571mg/dl and the variance observed in 50 controls was 7412.246531mg/dl which has a high statistical significant variance between the two groups.

Author/Study	Study population	Mean Plasma Fibrinogen in cases (mg%)	Mean Plasma Fibrinogen in controls (mg%)	p-value
Present study	50 cases	637.4 ± 174.505	292.72 ± 86.094	<0.001
	50 controls			
Rothwell <i>et al</i> ⁶ UK TIA (2004)	210 cases	410 ± 102	387 ± 112	<0.005
	210 controls			
Madhuri Pandharipande <i>et al</i> ⁷ (2017)	60 cases	349 ± 36.4	239.6 ± 45.01	<0.001
	60 controls			
Elmowafy RM <i>et al</i> ⁹ (2017)	30 cases	366.3 ± 79.68		< 0.0001
	56 cases			
Mistry <i>et al</i> ⁸	56 cases	531.73 ± 74	445.78 ± 92.28	<0.01
	40 controls			

The plasma fibrinogen level in acute stroke and the present study were similar. The variation of the fibrinogen levels in this study could be due to variations among subjects and ethnic variations, genetic predisposition and the relative difference in the collection of the sample and methodology of various assays. In the study done by Rothwell *et al*⁶ in 2004 with 5113 subjects with TIA, it was found that increasing age, female sex, smoking, and increased systolic blood pressure had associated high levels of fibrinogen. In Madhuri Pandharipande *et al*⁷ study done in 2017, 60 cases and 60 controls were taken under study and analysed for the plasma fibrinogen levels. The above study reported that plasma fibrinogen in males(n=36) was 352.11±7.46mg/dl and in the present study, it was 680mg/dl, higher than in females 345.83±11.46mg/dl, compared the present study 578.57mg/dl. In the present study, hypertensives had higher fibrinogen as compared to normotensives and was statistically significant while Madhuri Pandharipande *et al*⁷ study had reported no significant difference. In Elmowafy RM *et al*⁹ study done in 2017, the study was about the fibrinogen levels within 24 hours of admission into the hospital and after five days in thirty subjects with an acute ischemic stroke which correlated with prognosis in the study subjects. Observation is the study subjects recorded higher levels of plasma fibrinogen within 24 hours of admission with a mean fibrinogen 366±79.6 mg/dl. In the present study, the mean plasma fibrinogen level in 50 study subjects within twenty-four hours of acute stroke was observed to be 637.4±174.505mg/dl. It is statistically high and is consistent with the previous studies Elmowafy RM *et al*⁹ reported that the elevated plasma fibrinogen level within 24 hours of onset of acute ischemic stroke significantly associated with poor prognosis.

CONCLUSION

Plasma fibrinogen levels gets elevated in patients with acute stroke when compared to age, sex and risk factor

matched controls. This study has demonstrated increased plasma fibrinogen levels in patients with acute stroke as compared to controls. Plasma fibrinogen levels found elevated in both ischemic and hemorrhagic strokes. Plasma fibrinogen levels rise as age advances. Hypertension and smoking do influence plasma fibrinogen levels.

REFERENCES

1. Global Health Estimates. Geneva: World Health Organization; 2012. Available from: http://www.who.int/healthinfo/global_burden_disease/en/. (Last accessed on 07.09.2019).
2. Kamalakannan S, Gudlavalleti AS, Gudlavalleti VS, Goenka S, Kuper H. Incidence and prevalence of stroke in India: A systematic review. The Indian journal of medical research. 2017 Aug;146(2):175. (Last accessed on 07.09.2019).
3. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. Journal of stroke. 2013 Sep;15(3):128. (Last accessed on 07.09.2019).
4. Boehme AK, Esenwa C, Elkind MS. Stroke risk factors, genetics, and prevention. Circulation research. 2017 Feb 3;120(3):472-95. (Last accessed on 07.09.2019).
5. Murray RK, Granner DK, Mayes PA, Rodwell VW. Harper's Illustrated Biochemistry, Twenty. (Last accessed on 08.09.2019).
6. Rothwell PM, Howard SC, Power DA, Gutnikov SA, Algra A, van Gijn J, Clark TG, Murphy MF, Warlow CP. Fibrinogen concentration and risk of ischemic stroke and acute coronary events in 5113 patients with transient ischemic attack and minor ischemic stroke. Stroke. 2004 Oct 1;35(10):2300-5. (Last accessed on 08.09.2019).
7. Dube A, Pandharipande M, Patil M. Study of plasma fibrinogen in acute ischemic stroke. Indian journal of applied research. 2018 aug 24;7(10). (Last accessed on 08.09.2019).
8. Mistry PP, Chawla KP, Rai HP, Jaiswal PP. Plasma fibrinogen levels in stroke. Journal of postgraduate medicine. 1990 Jan 1;36(1):1.
9. Elmowafy RM, Khodair AZ, Ali AE. Plasma Fibrinogen Levels As A Prognostic Biomarker In Acute Ischemic Stroke.

Source of Support: None Declared
Conflict of Interest: None Declared