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CORRELATION AND PROGNOSTIC SIGNIFICANCE OF MEAN PLATELET VOLUME (MPV) IN PATIENTS OF TYPE 2 DIABETES MELLITUS WITH CEREBROVASCULAR ACCIDENT (CVA)

Medicine

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ABSTRACT

Background: The present study was conduct in Motilal Nehru Medical College, Swaroop Rani Nehru Hospital Prayagraj, a tertiary care center and data was collected over a period from January 2019 to April 2020. The study was conducted Amongst 113 patients diagnosed with CVA with Diabetes and who presented to the hospital within 48 hours of onset of symptoms. 47 were also selected Diabetic Controls were matched for age, sex, known risk factor including hypertension, dyslipidemia, smoking, and alcoholism.
Aim & Objective: Establishing the correlation of MPV and its prognostic value in patients of Type 2 Diabetes Mellitus with CVA.
Methodology: This was a 16 month case control, hospital-based study involving 160 diabetes patients. Among them 113 patients were CVA with Diabetes and 47 patients were non-CVA with Diabetic control. Demographic data and history of the patients were recorded. Investigations such as hemoglobin estimation, platelet count, MPV, HbA1c, imaging studies were conducted and evaluated for CVA. All the patients underwent neurological examination according to National Institute of Health Stroke Scale (NIHSS) at the time of admission and MPV was noted. Outcome of stroke was assessed during discharge by modified Rankin morbidity (MRM) score. SPSS 23 version was used to analyze the data.
Result: In this study the number of case was 113 in which 70 were ischemic infarct and 43 were hemorrhagic infarct and numbers of control were 47. The mean age of cases was 62.52±9.91 year and in Controls were 60.70±7.4year. CVA patient with Hemorrhagic Stroke mean age were 63.9±9.55 year and in ischemic Stroke mean age were 60.70±10.17 year. MPV in CVA was 11.91 ± 0.37(fl), and in control MPV was 11.11±0.37 (fl), P value (<0.001). MPV increased both in CVA and control group from baseline, but in CVA, MPV was increased significantly high than control. So, there was significant correlation of MPV with CVA and control. In ischemic Stroke MPV was 12.22 ± 0.86(fl), and in Hemorrhagic Stroke the MPV was 11.41 ± 0.55(fl) and P value was (<0.001). MPV was significantly high in ischemic Stroke than Hemorrhagic Stroke.
Conclusion: In Ischemic Stroke patients with Diabetes, MPV increased significantly high in comparison to Diabetes with non CVA and hemorrhagic Stroke patients with Diabetes. On increasing MPV prognosis was worsened and mortality was increased in ischemic Stroke. In Hemorrhagic Stroke patients with Diabetes mellitus MPV was increased from base line but there was no association of MPV with the prognosis in hemorrhagic Stroke. Overall mortality in Hemorrhagic Stroke was very high than in ischemic Stroke. Diabetes itself is a cause of increased MPV. Diabetic patients with HbA1c >=9.12% associated with increased risk of ischemic Stroke.

KEYWORDS

Ischemic Stroke, Hemorrhagic Stroke, Mean Platelet Volume, Type 2 Diabetes mellitus

INTRODUCTION

Cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause is one of the most common neurological disorders and it comprises Ischemic Stroke and Hemorrhagic Stroke. (1)

Ischemic Stroke is rapidly developing clinical symptoms and / or signs of focal and at times global loss of brain function with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin. (2) Ischemic Stroke occurs due to thrombus occluding a stenosed atherosclerotic blood vessel. Platelets have a crucial role in the pathophysiology of atherothrombosis. (3)

Hemorrhagic Stroke is caused by bleeding directly into or around the brain; it produces neurologic symptoms by producing a mass effect on neural structures, from the toxic effects of blood itself, or by increasing Intracranial Pressure, so the definition of Stroke is clinical and laboratory studies including brain imaging are used to support the diagnosis. The clinical manifestations of Stroke are highly variable because of the complex anatomy of the brain and its vasculature. (4)

Stroke is a major cause for death and acquired disability in world population after myocardial infarction. Majority of the strokes are ischemic (80%) while others result from primary hemorrhage either intracerebral or into subarachnoid space. (5) Acute ischemic stroke is more common than hemorrhagic stroke and is a result of thrombosis or embolism. Various risk factors involved for stroke include hypertension, cigarette smoking, hyperlipidaemia and diabetes mellitus. (6) Among these, risk factors, DM, and ischemic stroke often ascend together. (7)

Mean platelet volume (MPV) is the mostly used laboratory marker of platelet function and activation. Increased platelet reactivity has emphasized to play an important role in developing various vascular complications.(8) Particularly, the patients with DM show increased platelet activity. The factors that contribute to this increased platelet activity are not clearly elucidated; however, metabolic abnormalities such as insulin resistance, hyperglycaemia, hyperlipidaemia, and conditions such as oxidative stress, endothelial dysfunction and inflammation have been presumed. (9) Studies also have stated that high MPV acts as a risk factor for several vascular complications of DM, which include thromboembolism, myocardial infarction and stroke.(10-12)

Therefore, an increase in MPV is associated independently with stroke and increased levels of MPV have been found in CVA patients than in normal subjects. The patients with highest quintile of MPV had a >2 fold risk of severe stroke than those with lower quintiles. 10 These findings postulate that, the increase of MPV, specifically in diabetic patients might have a critical role for genesis or worsening of CVA. This prompted us to describe association between MPV and CVA events, which may serve as a valuable indicator for outcome of the event. MPV, being a cheap and easily available blood parameter, helps to prognosticate stroke in diabetics.

The objective of this study was to Establishing the correlation of MPV and its prognostic value in patients of Type 2 Diabetes Mellitus with CVA.

MATERIAL AND METHODS

Study design

This was a 16 month case control, hospital-based study (January 2019 to April 2020) conducted at the Department of Internal Medicine in Swaroop Rani Nehru Hospital, Motilal Nehru Medical College, Prayagraj.The ethical clearance was obtained from Ethics and Research Committee. Patients screened based on selection criteria

were informed about the nature of the study. In case of comatose patients, the relatives/ caretaker were informed about the study. The patients/caregivers expressing their willingness to contribute in the study were enrolled after obtaining a written informed consent.

Selection Criteria

This study include CVA patient with prior history of diabetes mellitus. Exclusion criteria patients who had Severe thrombocytopenia ,Anemia, Coronary artery disease ,Known cases of hereditary disorders of large Platelets, Medications reducing Platelet count like hydroxyurea, antineoplastic agents, Patients on antiplatelet medication like aspirin, clopidogrel, Peripheral smear showing Platelet aggregates, Patients presenting to the institution 48 hours after the onset of the Symptoms. Each control is matched for age (+/5), sex, risk factors for Stroke like hypertension, smoking, alcoholism, and dyslipidemia.

Data Collection

All Stroke patients with Diabetes mellitus admitted in Swaroop Rani Nehru Hospital Prayagraj during the time period described above were assessed. Demographic data such as age and sex were recorded. History of other comorbid conditions including hypertension, DM, previous stroke, personal history such as habits of alcohol consumption, and smoking, were noted. A thorough physical examination was conducted for vitals (respiratory rate, pulse rate, and blood pressure) followed by systemic examination. The diagnosis of stroke was entertained after fulfilling WHO definition of stroke by the patient. The nature of stroke was established by computed tomographic/ magnetic resonance imaging scan. Evaluation of stroke severity was carried out based on National Institute of Health Stroke Scale (NIHSS), Modified Rankin Scale (MRS) score, and GCS score. All the outcomes were noted on a predesigned as well as pretested Performa. Clinical investigations such as hemoglobin estimation, platelet count, MPV, HbA1c, imaging studies (Magnetic resonance imaging or computed tomography scan of brain) were conducted and evaluated for CVA.

DATAANALYSIS

The data obtained was coded in a Microsoft Excel Worksheet. SPSS statistics software version 23.0 was used to analyze the data. The categorical data was expressed in terms of rates, ratios, and proportions and compared using chi-square test or Wilcoxon-Mann-Whitney U Test. The continuous data was expressed as mean ± standard deviation (SD) and compared using independent sample t-test. A $p \leq 0.05$ was considered as statistically significant.

RESULT

This study was a case control study consisted of total 160 patients in which 113 were CVA with Diabetes patient(study group) and 47 were diabetic with non CVA(control group) patients. The baseline study characteristics of the CVA and control group are presented in table.1 significant difference was found between the CVA and control group regarding age, gender, type of CVA, platelet count, MPV, FPG, Urine Microalbumin, RPG, HbA1c, Serum triglycerides, NIHSS, GCS and MRS score (p>0.005). However, severity of stroke and MPV was found statistically significant between the CVA outcomes. MPV increased in all CVA with diabetic and control group but MPV is significantly very high in diabetic with CVA infarct.

Table 1: Association between CVA and Control variables

Parameters	Group		p value
	CVA (n = 113)	Control (n = 47)	
Age (Years)	62.52 ± 9.91	60.70 ± 7.40	0.205[1]
Gender			0.452[2]
Male	79 (69.9%)	30 (63.8%)	
Female	34 (30.1%)	17 (36.2%)	
Type of CVA			1.000[2]
Infarct	70 (61.9%)	0 (NaN %)	
ICH	43 (38.1%)	0 (NaN %)	
Platelet Count (Lacs/cu.mm)	1.81 ± 0.56	1.84 ± 0.72	0.786[3]
MPV (fl)***	11.91 ±0.84	11.11±0.37	<0.001[3]
FPG (mg/dL)	149.05 ± 22.04	142.68 ± 20.00	0.059[3]
Urine Microalbumin (mg/dL) ***	80.19 ± 62.23	39.82 ± 13.50	<0.001[3]
RPG (mg/dL) ***	254.34 ± 73.25	205.32 ± 43.04	<0.001[3]
HbA1c (%) ***	8.59 ± 1.19	7.88 ± 1.08	0.001[3]

The Age was normally distributed in the CVA and in Control group and Parametric tests (t-test) was use to make group comparisons. The mean (SD) of Age in the CVA group was 62.52 (9.91) years and in the Control group was 60.70 (7.40) years. The Age in the CVA group was from 40 – 90 years and in Control group from 45 – 78 years. There was no significant difference between the groups in terms of Age (t = 1.276, p = 0.205). There was no significant difference between the various groups in terms of distribution of Gender (X^2 = 0.565, p = 0.452). In CVA 69.9% of the participants were Male and 30.1% Female and in control group 63.8% were male and 36.2% Female.

Platelet Count was not normally distributed in CVA and Control group. Mean (SD) of Platelet Count in CVA group was 1.81 (0.56) Lacs/cu. mm and in Control group was 1.84 (0.72) Lacs/cu.mm. The Platelet Count in CVA was from 0.87-3.54(Lacs/cu.mm) in Control range was 0.98 - 3.98(Lacs/cu.mm).There was no significant difference between the groups in terms of Platelet Count (Lacs/cu.mm) (W = 2728.500, p = 0.786). The MPV (fL) was not normally distributed in CVA and in Control. The mean (SD) of MPV (fL) in CVA is 11.91 (0.85) fL and in Control group was 11.11 (0.38). MPV in CVA ranged from 10.7 – 14fL and in Control ranged from 10.4 - 12.6 fL. There was a significant difference between the 2 groups in terms of MPV (fL) (W = 4213.000, p = <0.001).

PCT (mm/Hr) was not normally distributed in CVA and in Control. The mean (SD) of PCT in CVA group was 0.19 (0.07) mm/Hr and in Control group was 0.19 (0.08) mm/Hr. In CVA PCT range was 0.09 - 0.47mm/Hr and in Control range was 0.07-0.43 mm/Hr. There was no significant difference between the groups in terms of PCT (mm/Hr) (W = 2888.000, p = 0.154). The mean (SD) of FPG in CVA group was 149.05(22.04)mg/dL and in Control group was 142.68 (20.00) mg/dL. The FPG range in CVA was 112–214 mg/dL and in Control group was 112 - 212 mg/dL. There was no any significant difference between the groups in terms of FPG (mg/dL) (W = 3160.000, p = 0.059). The mean (SD) of Urine Microalbumin (mg/dL) CVA group was 62.30 (80.19) mg/dL, and in Control group was 39.82 (13.50) mg/dL. Urine Microalbumin (mg/dL) ranges in CVA was from 28 – 167 and in Control range was from 3.6 - 78. There was a significant difference between the 2 groups in terms of Urine Microalbumin (mg/dL) (W = 3752.000, p = <0.001). RPG in CVA group was 254.34 (73.25) mg/dL and in Control group was 205.32 (43.04) mg/dL. The RPG(mg/dl)range in CVA was from 151.1 –327.59 mg/dL and in Control range was from 122 -248.72 mg/dL. There is a significant difference between the 2 groups in terms of RPG (mg/dL) (W = 3977.000, p = <0.001), with the mean RPG being highest in CVA group. HbA1c (%) in CVA group was 8.59 (1.19) % and in Control group was7.88 (1.08) %. The HbA1c in CVA was from 5.8 - 10.9% and in Control was from 6.6 – 10%.

Table 2: Association between Outcome and Parameters

Parameters	Outcome		p value
	Survived (n = 74)	Non-survived (n = 39)	
Age (Years)***	58.12 ± 7.77	70.87 ± 8.02	<0.001[1]
Gender			0.585[2]
Male	53 (71.6%)	26 (66.7%)	
Female	21 (28.4%)	13 (33.3%)	
Type of CVA			0.198[2]
Infarct	49 (66.2%)	21 (53.8%)	
ICH	25 (33.8%)	18 (46.2%)	
Platelet Count (Lacs/cu.mm)	1.80 ± 0.54	1.84 ± 0.60	0.657[3]
MPV (fL)***	11.7 ± 0.76	12.17 ± 0.97	0.034[3]
PCT (mm/Hr)	0.19 ± 0.07	0.20 ± 0.06	0.651[3]
FPG (mg/dL) ***	145.49 ± 20.29	155.82 ± 23.85	0.020[3]
Urine Microalbumin (mg/dL) ***	60.27 ± 96.61	66.15 ± 31.66	0.008[3]
RPG (mg/dL)	245.31 ± 59.04	271.46 ± 93.06	0.076[3]
HbA1c (%)	8.47 ± 1.18	8.83 ± 1.20	0.155[3]
Serum Triglycerides (mg/dL)	200.66 ± 48.81	218.79 ± 62.85	0.197[3]
Serum LDL (mg/dL)	106.36 ± 25.02	110.23 ± 22.25	0.403[3]
Serum HDL (mg/dL)	44.23 ± 7.93	42.05 ± 7.80	0.163[3]
NIHSS (Day 1) ***	26.65 ± 4.60	34.92 ± 3.36	<0.001[3]
NIHSS (Day 3) ***	24.28 ± 4.11	36.51 ± 3.18	<0.001[3]
NIHSS (Day 5) ***	21.55 ± 3.78	37.69 ± 3.49	<0.001[3]
NIHSS (Day 7) ***	20.06 ± 3.65	38.68 ± 4.11	<0.001[3]
GCS (Day 1) ***	9.24 ± 1.51	7.38 ± 0.94	<0.001[3]
GCS (Day 3) ***	10.20 ± 1.45	6.57 ± 1.17	<0.001[3]
GCS (Day 5) ***	11.16 ± 1.33	5.31 ± 1.31	<0.001[3]
GCS (Day 7) ***	11.79 ± 1.35	4.86 ± 1.46	<0.001[3]
MRS (Day 1) ***	4.74 ± 0.50	4.92 ± 0.35	0.020[3]
MRS (Day 3) ***	4.45 ± 0.69	5.00 ± 0.00	<0.001[3]
MRS (Day 5) ***	4.00 ± 0.62	5.06 ± 0.25	<0.001[3]
MRS (Day 7) ***	3.73 ± 0.58	5.27 ± 0.46	<0.001[3]
Diabetes (Present)	74 (100.0%)	39 (100.0%)	1.000[2]

***Significant at p<0.05, 1: T-Test, 2: Chi-Squared Test, 3: Wilcoxon-Mann-Whitney U Test.

The following variables were significantly associated (p<0.05) with the variable 'Outcome': , Age (Years), MPV (fL), FPG (mg/dL), PPPG (mg/dL), Urine Microalbumin (mg/dL), NIHSS (Day 1), NIHSS (Day 3), NIHSS (Day 5), NIHSS (Day 7), GCS (Day 1), GCS (Day 3), GCS (Day 5), GCS (Day 7), MRS (Day 1), MRS (Day 3), MRS (Day 5), MRS (Day 7), Hospital Stay (Days).

Table 3: Association between Type of CVA and Parameters

Parameters	Type of CVA		p value
	Infarct (n = 70)	ICH (n = 43)	
Age (Years)	63.91 ± 9.55	60.26 ± 10.17	0.061[1]
Gender***			0.010[2]
Male	55 (78.6%)	24 (55.8%)	
Female	15 (21.4%)	19 (44.2%)	
Platelet Count (Lacs/cu.mm)	1.74 ± 0.53	1.92 ± 0.60	0.113[3]
MPV (fL)***	12.22 ± (0.86)	11.41 ± (0.55)	<0.001[3]
PCT (mm/Hr)	0.20 ± 0.07	0.18 ± 0.06	0.112[3]
FPG (mg/dL) ***	153.79 ± 22.76	141.35 ± 18.61	0.002[3]
PPPG (mg/dL) ***	223.97 ± 40.74	203.70 ± 33.48	0.006[3]
Urine Microalbumin (mg/dL) ***	73.33 ± 99.72	44.35 ± 16.69	<0.001[3]
RPG (mg/dL) ***	263.43 ± 79.71	239.53 ± 59.23	0.049[3]
HbA1c (%) ***	9.18 ± 1.02	7.64 ± 0.77	<0.001[3]
Serum Triglycerides (mg/dL) ***	230.15 ± 48.55	169.10 ± 40.97	<0.001[3]
Serum LDL (mg/dL) ***	116.23 ± 23.62	93.81 ± 17.59	<0.001[3]
Serum HDL (mg/dL) ***	41.21 ± 7.65	47.17 ± 6.96	<0.001[3]
NIHSS (Day 1)	28.59 ± 5.88	31.00 ± 5.30	0.052[3]
NIHSS (Day 3) ***	27.35 ± 6.85	30.02 ± 6.82	0.048[3]
NIHSS (Day 5)	25.48 ± 8.14	28.00 ± 8.47	0.147[3]
NIHSS (Day 7)	23.66 ± 8.21	25.85 ± 9.70	0.358[3]
GCS (Day 1) ***	8.96 ± 1.73	8.02 ± 1.16	0.005[3]
GCS (Day 3) ***	9.38 ± 2.18	8.36 ± 2.09	0.016[3]
GCS (Day 5)	9.79 ± 2.93	8.72 ± 3.04	0.051[3]
GCS (Day 7) ***	10.64 ± 3.04	9.29 ± 3.49	0.031[3]
MRS (Day 1) ***	4.74 ± 0.50	4.91 ± 0.37	0.033[3]
MRS (Day 3)	4.55 ± 0.70	4.76 ± 0.43	0.178[3]
MRS (Day 5)	4.24 ± 0.72	4.46 ± 0.72	0.111[3]
MRS (Day 7)	3.98 ± 0.78	4.29 ± 0.97	0.165[3]
Diabetes (Present)	70 (100.0%)	43 (100.0%)	1.000[2]
Outcome			0.198[2]
Survived	49 (70.0%)	25 (58.1%)	
Non-survived	21 (30.0%)	18 (41.9%)	

Parameters	Type of CVA		p value
	Infarct (n = 70)	ICH (n = 43)	
Age (Years)	63.91 ± 9.55	60.26 ± 10.17	0.061[1]
Gender***			0.010[2]
Male	55 (78.6%)	24 (55.8%)	
Female	15 (21.4%)	19 (44.2%)	
Platelet Count (Lacs/cu.mm)	1.74 ± 0.53	1.92 ± 0.60	0.113[3]
MPV (fL)***	12.22 ± (0.86)	11.41 ± (0.55)	<0.001[3]
PCT (mm/Hr)	0.20 ± 0.07	0.18 ± 0.06	0.112[3]
FPG (mg/dL) ***	153.79 ± 22.76	141.35 ± 18.61	0.002[3]
PPPG (mg/dL) ***	223.97 ± 40.74	203.70 ± 33.48	0.006[3]
Urine Microalbumin (mg/dL) ***	73.33 ± 99.72	44.35 ± 16.69	<0.001[3]
RPG (mg/dL) ***	263.43 ± 79.71	239.53 ± 59.23	0.049[3]
HbA1c (%) ***	9.18 ± 1.02	7.64 ± 0.77	<0.001[3]
Serum Triglycerides (mg/dL) ***	230.15 ± 48.55	169.10 ± 40.97	<0.001[3]
Serum LDL (mg/dL) ***	116.23 ± 23.62	93.81 ± 17.59	<0.001[3]
Serum HDL (mg/dL) ***	41.21 ± 7.65	47.17 ± 6.96	<0.001[3]
NIHSS (Day 1)	28.59 ± 5.88	31.00 ± 5.30	0.052[3]
NIHSS (Day 3) ***	27.35 ± 6.85	30.02 ± 6.82	0.048[3]
NIHSS (Day 5)	25.48 ± 8.14	28.00 ± 8.47	0.147[3]
NIHSS (Day 7)	23.66 ± 8.21	25.85 ± 9.70	0.358[3]
GCS (Day 1) ***	8.96 ± 1.73	8.02 ± 1.16	0.005[3]
GCS (Day 3) ***	9.38 ± 2.18	8.36 ± 2.09	0.016[3]
GCS (Day 5)	9.79 ± 2.93	8.72 ± 3.04	0.051[3]
GCS (Day 7) ***	10.64 ± 3.04	9.29 ± 3.49	0.031[3]
MRS (Day 1) ***	4.74 ± 0.50	4.91 ± 0.37	0.033[3]
MRS (Day 3)	4.55 ± 0.70	4.76 ± 0.43	0.178[3]
MRS (Day 5)	4.24 ± 0.72	4.46 ± 0.72	0.111[3]
MRS (Day 7)	3.98 ± 0.78	4.29 ± 0.97	0.165[3]
Diabetes (Present)	70 (100.0%)	43 (100.0%)	1.000[2]
Outcome			0.198[2]
Survived	49 (70.0%)	25 (58.1%)	
Non-survived	21 (30.0%)	18 (41.9%)	

****Significant at p<0.05, 1: t-test, 2: Chi Squared Test, 3: Wilcoxon-Mann-Whitney U Test.*

Table no. 3 represent the significant associated (p>0.005) with all variables of'type of CVA'. The mean (SD) of Age (Years) in the Type of CVA Infarct group is 63.91 (9.55) and in CVA ICH group is 60.26 (10.17). The Age (Years) in the Type of CVA Infarct range from 40 - 90. The Age (Years) in the Type of CVA ICH range from 40 - 81.There is no significant difference between the groups in terms of Age (Years) (t =1.900, p = 0.061).

There is a significant difference between the various groups in terms of Distribution of Gender (X^2 = 6.558, p = 0.010). 78.6% of the participants in CVA Infarct group is Male and 21.4% is Female. 55.8% of the participants in CVA ICH is Male and 44.2% is Female. Participants in the group Type of CVA Infarct has the larger proportion of Male Participants in the group Type of CVA ICH has the larger proportion of Female.

Platelet Count (Lacs/cu.mm) in the Type of CVA Infarct group is 1.74 (0.53). The mean (SD) of Platelet Count (Lacs/cu.mm) in the Type of CVA ICH group is 1.92 (0.60). The Platelet Counts (Lacs/cu.mm) in CVA Infarct range from 0.87–3.54 and in CVA ICH range from 0.95-3.2. There is no significant difference between the groups in terms of Platelet Count (Lacs/cu.mm) (W = 1236.500, p = 0.113).

MPV (fL) in CVA Infarct group is 12.22 (0.86) and in CVA ICH group is 11.41 (0.55). The MPV (fL) in CVA Infarct ranged from 10.9 – 14 and in CVA ICH ranged from 10.7 - 13. The mean (SD) of PCT (mm/Hr) in CVA Infarct group is 0.20 (0.07) and in CVA ICH group is 0.18 (0.06). The PCT (mm/Hr) range in CVA Infarct from 0.09 - 0.47and in CVA ICH range is from 0.1 - 0.3. FPG (mg/dL) in CVA Infarct group is 153.79 (22.76) and in CVA ICH group is 141.35 (18.61. The FPG (mg/dL) in CVA Infarct range from 112 – 214 and in CVA ICH range from 112 -198. Urine Microalbumin (mg/dL) in CVA Infarct group is 73.33 (99.72) in CVA ICH group is 44.35(16.69). The Urine Microalbumin (mg/dL) in the Type of CVA Infarct ranges from 30 – 867 and in CVA ICH ranges from 28 - 98.

RPG (mg/dL) in CVA Infarct group is 263.43 (79.71) and in CVA ICH group is 239.53 (59.23. The RPG (mg/dL) in the Type of CVA Infarct ranges from 151.1 - 730.21. The RPG (mg/dL) in the Type of CVA ICH ranges from 154 - 423. HbA1c (%) in the Type of CVA Infarct group is 9.18 (1.02) and in CVA ICH group is 7.64(0.77).The HbA1c (%) in the Type of CVA Infarct range from 5.8 - 10.9. The HbA1c (%) in the Type of CVA ICH range from 6.1 - 9.2.

Serum Triglycerides (mg/dL) in CVA Infarct group is 230.15 (48.55) and in CVA ICH group is 169.10 (40.97). The Serum Triglycerides (mg/dL) in Infarct range from 123 - 432. The Serum Triglycerides (mg/dL) in the Type of CVA ICH range from 112 - 265. Serum LDL (mg/dL) in CVA Infarct group is 116.23 (23.62) and in CVA ICH group is 93.81 (17.59). The Serum LDL (mg/dL) in the Type of CVA Infarct ranges from 48 – 176 and in the Type of CVA ICH ranges from 68 -134. Serum HDL (mg/dL) in the Type of CVA Infarct group is 41.21 (7.65) and in CVA ICH group is 47.17 (6.96). The Serum HDL (mg/dL) in CVA Infarct ranges from 27.5 – 64 and in CVA ICH ranges from 35 - 64.1.

Chi-square test is use to explore the association between 'Type of CVA' and 'Outcome'. There is no significant difference between the various groups in terms of distribution of Outcome (X^2 = 1.658, p = 0.198). In CVA Infarct 70.0% of the participants Outcome is survive and 30.0% is Non-survived. In CVA ICH 58.1% of the participants outcome is survived and in 41.9% outcome is Non-survived.

DISCUSSION

Cerebrovascular accident is one of the leading cause of the morbidity and mortality worldwide. This study was a case control study consisted of total 160 patients in which 113 were CVA with Diabetes patient(study group) and 47 were diabetic with non CVA(control group) patients.

This study, there were 69.9% male and 30.1% female in case and 63.8% male and 36.2% female in control group. The mean age of cases was 62.52±9.91 year and in Controls were 60.70±7.4year. CVA patient with Hemorrhagic Stroke mean age were 63.9±9.55 year and in ischemic Stroke mean age were 60.70±10.17year. Maximum subject were in between 50-70-year age group. It is found that Cerebrovascular accident is more common in the middle and old age group. This is because the risk of Cerebrovascular accident increases with age because risk factor increases with age like Diabetes mellitus, hypertension, obesity, dyslipidemia and environmental factor. Prognosis becomes worse with advance age. Prognosis is poor in mean age group 70.87±8.02 years due to increase additional risk factor with age.

Mean Platelet count in cases was 1.83±0.56 lac cells/mm^3 and in control group 1.84±0.72 lac cells/mm^3. There was no significant correlation of mean Platelet count in CVA and control group. In ischemic Stroke mean Platelet count was 1.74±0.53 lac cells/mm^3 and in Hemorrhagic Stroke 1.92±0.60 lac cells/mm^3. In present study

there was no significant co-relation of Platelet count in between CVA and Control group, and also no statistically significant difference in ischemic and Hemorrhagic Stroke.

MPV in CVA was 11.91 ± 0.37(fl), and in control MPV was 11.11±0.37 (fl), P value (<0.001). MPV increased both in CVA and control group from baseline, but in CVA, MPV was increased significantly high than control. So, there was significant correlation of MPV with CVA and control. In ischemic Stroke MPV was 12.22 ± 0.86(fl), and in Hemorrhagic Stroke the MPV was 11.41 ± 0.55(fl) and P value was (<0.001). MPV was significantly high in ischemic Stroke than Hemorrhagic Stroke. MPV in Non-survived group was 12.18 ± 0.97(fl), and in survived group MPV was 11.77 ± 0.76(fl), and P value was (<0.034). There was a significant difference MPV in between survived and Non-survived group. This study showed that increase MPV associated with worse prognosis. Priyanka patil et.al [(20)] study showed that MPV in patient with ischemic Stroke with Diabetes is significantly high as compare to non-diabetic patients. The mean MPV was 10.6 ± 0.89(fl) in diabetic and in non-diabetic MPV was 8.25 ± 0.91(fl), and showed that mean NIHSS significantly high in diabetic as compare to the non- diabetic. The mean NIHSS in diabetic was 20.38 ± 3.19 and in non-diabetic 17.76 ± 3.74 and P value (<0.006). MRS score was significantly high in diabetic patients in comparison to non-diabetic patients. This study showed that MPV was significantly high in diabetic patients with ischemic Stroke than non-diabetic ischemic Stroke.

In this study FPG, RPG, HbA1c and urine Microalbumin were significantly increased in all diabetic. In CVA, FPG was 149.05±20.04mg/dl and in control diabetic 142.68 ± 20 mg/dl and P value (0.059). Urine Microalbumin in CVA 62.39 ± 30.9 mg and in control 39.82 mg and P value (0.001). RPG in CVA 254.39±73.35 mg/dl and in control 205 ± 43.04 mg/dl and P value (0.001). HbA1c in CVA 8.59 ± 1.19% and in control 7.88 ± 1.08% and P value (0.001). And FPG, RPG, HbA1c and Urine Microalbumin in CVA infarct 153.79 ± 22 mg/dl, 223.97 mg/dl, 9.18%, 73.33 mg/dl and in CVA ICH 141.35 mg/dl, 203.20 mg/dl, 7.64±0.77%, 44.35 mg, respectively, all these were increases in ischemic Stroke more significantly and were associated with worse outcome in ischemic Stroke, but there were no any prognostic correlation with Hemorrhagic Stroke. MRS Score and NIHSS Score were higher side and GCS score lower side in ischemic Stroke with increasing FPG, RPG, HbA1C, and there were no prognostic correlation of diabetic profile with CVA ICH.

Serum lipid profile in CVA patient serum triglycerides 206.92±54.48 mg/dl, serum LDL- 107.07±44.07 mg/dl, serum HDL - 43.48±7.92mg/dl, and in diabetic control Serum TG -178.87±40.87 mg/dl, Serum LDL-101.79±22.72 mg/dl, Serum-HDL48.23±7.03mg/dl. Study showed lipid profile was significantly high in all diabetic patients but in CVA with Diabetes lipid profile was significantly high.

Prognosis explained by using NIHSS score, GCS score and MRS score. In CVA NIHSS score was in day one was 29.50±5.76 and in Control 0.00 and p (<0.001). GCS score in CVA was 8.60±1.60 and in Control 15 and P value (<0.001). MRS score in CVA was 4.81±0.60 and in control was 0.00 and P value (<0.001). Ischemic Stroke VS. Hemorrhagic Stroke NIHSS score was 28.59±5.98 and 31±5.30 respectively and P value was (0.052) and GCS score was 8.96±1.73 and 8.02±1.16 respectively and P value was (0.003) and MRS score was 4.74 and 4.91 and P value was (0.038). NIHSS Score in survived group was 26.65±1.51 and in Non-survived group was 34.92±3.36. GCS Score in survived group was 9.24±1.51 and in Non-survived group 7.38±0.94. MRS score in survived group was 4.74±0.5 and in Non-survived group were 4.92±0.35.

CONCLUSION

This study has shown an elevation of MPV in all diabetic patients. In Ischemic Stroke patients with Diabetes, MPV increased significantly high in comparison to Diabetes with non CVA and haemorrhagic Stroke patients with Diabetes. On increasing MPV prognosis was worsened and mortality was increased in ischemic Stroke. On increasing MPV NIHSS score and MRS score were increased in ischemic Stroke and prognosis became poor, so study showed increased MPV was associated with poor prognosis and increase risk of ischemic Stroke in Diabetes patients. In Hemorrhagic Stroke patients with Diabetes mellitus MPV was increased from base line but there was no association of MPV with the prognosis in haemorrhagic Stroke. Overall mortality in Haemorrhagic Stroke was very high than in ischemic Stroke. On advancing age, outcome become worse and mortality increased significantly both in Hemorrhagic and ischemic Stroke. Diabetes itself is a cause of increased MPV. Diabetic patients with HbA1c >=9.12% associated with increased risk of ischemic Stroke. Serum cholesterol, serum LDL and serum triglycerides significantly increased in Diabetes and increased lipid profile associated with increased MPV and increased risk of ischemic Stroke. In Diabetes with ischemic Stroke patients serum lipid profile was associated with prognosis and mortality and MPV were increased with increasing serum lipid profile.

REFERENCES

1. Wade S Smith, S. Clai born Johnston, J. Claude Hemphill, III. Cerebrovascular Disease, Harrison's Principles of Internal Medicine 20th Edition, Mc Graw Hill Education Publications, 2018; 3068- 3095.
2. Feigin VL, Wiebers DO, Nikitin YP, O'Fallon WM, Whisnant JP. Risk factors for ischemic Stroke in a Russian community: a population-based case control Study. Stroke 1998; 29: 34-39.
3. P k Sethi. Stroke-Incidence in India and management of ischemic Stroke.Neurosciences Today; Volume VI no 3. July-September. 2002.
4. J. DU*, Q. WANG*, B. HE †, P. LIU †, J.-Y. CHEN †, H. QUAN*, X.MA*, Association of mean Platelet volume and Platelet count with the development and prognosis of ischemic and Hemorrhagic Stroke.International Journal of Laboratory Hematology, December 2015.
5. Shah B, Mathur P. Workshop report on stroke surveillance in India. Division of Noncommunicable Diseases, Indian Council of Medical Research 2006:1-2.
6. Sethi P. Stroke-incidence in India and management of ischemic stroke. Neurosci 2002; 4:139-41.
7. Luitse MJ, Biessels GJ, Rutten GE, Kappelle LJ. Diabetes, hyperglycaemia, and acute ischaemic stroke. Lancet Neurol 2012; 11:261-7
8. Tavil Y, Sen N, YazÄ±cÄ± HU, HÃ±zal F, AbacÄ± A, Cengel A. Mean platelet volume in patients with metabolic syndrome and its relationship with coronary artery disease. Thromb Res 2007; 120:245-50.
9. Kiliâ§li-â‡amur N, Kiliâ§li-Camur N, Konuralp C, Eskiser A. Could mean platelet volume be a predictive marker for acute myocardial infarction? Med Sci Monit 2005; 11:CR387-CR92.
10. McCabe DJ, Harrison P, Sidhu PS, Brown MM, Machin SJ. Circulating reticulated platelets in the early and late phases after ischaemic stroke and transient ischaemic attack. Br J Haematol 2004; 126:861-9.
11. Boos CJ, Lip GY. Assessment of mean platelet volume in coronary artery disease--what does it mean? Thromb Res 2007; 120:11-3
12. Greisenegger S, Endler G, Hsieh K, Tentschert S, Mannhalter C, Lalouschek W. Is elevated mean platelet volume associated with a worse outcome in patients with acute ischemic cerebrovascular events? Stroke 2004; 35:1688-91.