

# Creatine Phosphokinase Levels in Predicting the Severity of Acute Stroke

Investigator: Kamalakannan M, Final Yr MBBS  
 Guide: Dr. Dayanandan, Assistant Professor,  
 Department of General Medicine,  
 Saveetha Medical College, Chennai, Tamilnadu, India.

## Abstract:-

### ➤ Introduction:

Stroke is the second leading cause of death all around the world. There is no specific investigations to assess the prognosis of patients with acute stroke as yet. A variety of enzymes like CPK are produced in the brain and any injury like stroke to brain tissue could result in an increase in the levels of these enzymes. The test not usually considered in stroke is CPK, which is though a nonspecific, although same degree of raised CPK levels may have prognostic implications. The aim of this study was to highlight the importance of using CPK in acute stroke as a tool to predict the severity and its role in assessing worsening prognosis with rising level.

### ➤ Objectives:

1. To study the creatine phosphokinase levels (CPK levels) in stroke patients
2. To determine the association between CPK levels and the severity of acute stroke.

### ➤ Materials And Method:

A prospective study was conducted at Saveetha medical college hospital, Thandalam, Chennai. It comprises 50 stroke patients who were admitted at the hospital (sample size=50). The Study period was from January 2020 to March 2020 (3 months). The Study population was Acute stroke patients. The study subjects were sent for laboratory test of Serum creatine phosphokinase (CPK total). Clinical examination was conducted on all study subjects. Modified rankin scale (mRS) was employed to assess the severity of acute stroke.

### ➤ Results:

A total of 50 stroke patients took part in this study. The study showed that 36 had ischemic stroke (72%) and 14 had hemorrhagic stroke (28%). The number of patients who are diabetic is 31 (62%) and hypertensive is 29 (58%) which are all the risk factors for stroke. On calculating the serum Creatine phosphokinase levels, the mean was 239.75 IU/L. mRS score was 4 for 19 of the study subjects. With increasing severity of acute stroke in study subjects, there has been persistent increase in Serum CPK levels.

### ➤ Conclusion:

It is concluded that there has been presence of association between the creatine phosphokinase levels and the severity of acute stroke through this prospective study. Serum levels of CPK were found to be increased in acute stroke patients signifying the need of calculating the CPK levels for assessing the prognosis of acute stroke.

**Keywords:-** Creatine Phosphokinase, Acute Stroke, Modified Rankin Scale

## I. INTRODUCTION:

Cerebrovascular diseases which include Stroke is considered to be one of the leading causes of death around the world. The incidence of cerebrovascular diseases rises with rise in age. A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause.

During acute cerebral damage such as stroke, trauma or meningoencephalitis, the serum concentration of creatine phosphokinase increases, although to different levels. For assessment of the severity of acute stroke, we used the MODIFIED RANKIN SCALE (mRS). It is a 6 point disability scale with scores ranging from 0 to 5. A score of 6 is given for patients who are dead because of the illness. The prime aim of this study was to find out whether the CPK serum concentration can be taken as predictive factor in assessment of severity of acute stroke.

## II. METHODOLOGY:

The study involved 50 acute stroke patients (includes both ischemic and hemorrhagic types) admitted in medical wards (Department of Medicine) and casualty of Saveetha medical college hospital, Thandalam, Chennai during the period of 3 months (January 2020 to March 2020). Out of 50, 38 are men and 12 are women. The mean age of the study subjects is 62.5 and range is 41-90.

CT scan was used to differentiate various causes of stroke (ischemic or hemorrhagic). The study was explained to the study subjects and informed consent was taken before the collection of data from them.

On compiling the data regarding the type of stroke in 50 study subjects, 36 patients presented an ischemic stroke, 14 with hemorrhagic stroke. A detailed History taking on all subjects was taken considering various risk factors for stroke such as smoking, alcohol intake, Diabetes and hypertension and also previous history of stroke attacks. Clinical examination was done on all subjects individually for acquiring data such as Pulse, Blood pressure and involvement of limbs in acute stroke. Blood sample was collected for estimation of serum Creatine Phosphokinase (CPK levels). Modified rankin scale was used to assess the severity of acute stroke.

### III. RESULTS:

Out of 50 stroke patients in this study, most of them belonged to an age group of 61-70 years(72%).On calculating the gender ratio, males were 42 in number(84%) and number of females were 8(16%) and the ratio of

male:female is roughly 5:1. It has also been found that 76% study subjects had habits of smoking (n= 38)and 68% had habits of alcohol consumption (n= 34) and 64% had both habits(n= 32). On assessing the Type of stroke , 36 had ischemic stroke(72%) and 14 had hemorrhagic stroke(28%).

Also the number of study subjects who were diabetic is 31(62%)and hypertensive is 29(58%) which are all the risk factors for stroke. On examination, clinical data on acute stroke includes 58% had left hemiplegia/hemiparesis (n= 29) and 42% had right sided hemiplegia/ hemiparesis (n=21). On determining modified rankin scale for the study subjects, 28% had scale ranging from 0 to 3 (n=14) and 72% had scale from 4 to 6 (n= 36).

In the present study, it was found that there has been significant increase in serum Creatine phosphokinase levels with a mean of 239.75 IU/L and increase in mRS correlates with increase in serum CPK levels.

#### DEMOGRAPHIC DETAILS OF ACUTE STROKE PATIENTS:

| Demographic data | Group  | No. Of patients (n) | Percentage (%) |
|------------------|--------|---------------------|----------------|
| Age              | 41-50  | 4                   | 8              |
|                  | 51-60  | 10                  | 20             |
|                  | 61-70  | 36                  | 72             |
| Gender           | Male   | 42                  | 84             |
|                  | Female | 8                   | 16             |

#### PERSONAL HISTORY OF ACUTE STROKE PATIENTS:

| History            | No. Of patients (n) | Percentage (%) |
|--------------------|---------------------|----------------|
| Smoking habits     | 38                  | 76             |
| Alcoholism         | 34                  | 68             |
| Known hypertensive | 29                  | 58             |
| Known diabetic     | 31                  | 62             |

#### MODIFIED RANKIN SCALE AND CORRESPONDING SERUM CPK LEVELS

| Modified rankin scale score | No. Of patients (n) | Average of Serum CPK levels for that mRS score (IU/L) |
|-----------------------------|---------------------|---|
| 0                           | 0                   | -   |
| 1                           | 0                   | -   |
| 2                           | 5                   | 193   |
| 3                           | 9                   | 226   |
| 4                           | 19                  | 258   |
| 5                           | 17                  | 282   |
| 6                           | 0                   | -   |

**Modified rankin scale :**

| <b>Score:</b> | <b>Description:</b>            |
|---------------|--------------------------------|
| 0             | = No symptoms                  |
| 1             | = No significant disability    |
| 2             | = slight disability            |
| 3             | = moderate disability          |
| 4             | = moderately severe disability |
| 5             | = severe disability            |
| 6             | = Dead                         |

**IV. DISCUSSION:**

The current study was carried out among 50 acute stroke patients (which includes both ischemic and hemorrhagic types) admitted in medical wards (Department of Medicine) and casualty of Saveetha medical college hospital, Thandalam, Chennai during the period of 3 months (January 2020 to March 2020). In this study, we could clearly note that with increasing score of Modified Rankin scale of acute stroke patients, there has been significant increase in the calculated serum Creatine Phosphokinase levels of those patients. The rise in CPK levels with severity of stroke in the present study is in correlation with previous study of B.Preethi, C.Ramakrishna et al [2]. The normal value of serum CPK levels ranges from 20 to 200 IU/L. [1]

With the help of CT scan, the patients were classified into ischemic and hemorrhagic lesion. The rise in CPK levels in males was greater than that in females indicating gender has significant role in CPK levels in acute stroke patients. History of personal habits like smoking and alcohol intake were taken and also data of diabetes and hypertension were taken as these are some of the major risk factors (modifiable and non modifiable) for acute stroke.

Based on the symptomatic evaluation of severity of acute stroke, by Modified Rankin Scale, each patient was determined an mRS score where most of the patients (n=19) came under mRS score of 4 which is Moderately severe disability; Also the blood sample was collected for evaluation of serum total creatine phosphokinase levels in them and was documented. For the particular mRS score, the mean of the serum CPK levels of those patients were calculated. For eg. for mRS=4, average serum CPK levels is 258 IU/L calculated from those 19 patients with mRS =4. With increasing severity of acute stroke, the values of serum cpk levels kept increasing (directly proportionate) indicating the association of CPK levels with severity of acute stroke. This finding has been in correlation with the previous study by Preethi et al [2] and Capocchi et al [10].

The Serum CPK level determination can be a potential and time saving method of assessing the prognostic potential of patients of acute stroke and also severity and progression of brain damage and improvements after treatment as suggested by Bell and al, 1986 [8].

**V. CONCLUSION:**

From the study, it is evident that Serum CPK levels were elevated in acute stroke patients implying the benefit of measurement of CPK levels which would help assess the severity and prognosis of acute stroke. Also from this study, there has been establishment of impending risk factors playing a major role in causing stroke such as diabetes, hypertension, personal habits like smoking and alcohol intake. Thus the aim of this study was to highlight the importance of using CPK in acute stroke as a tool to predict the severity and its role in assessing worsening prognosis with rising level. As acute stroke is a medical emergency situation, time equals life and the patients should be adequately managed through appropriate investigations and management without wasting time on lesser helpful tests.

**REFERENCES**

- [1]. Aujla RS, Patel R. Creatine Phosphokinase. [Updated 2020 Apr 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546624/>
- [2]. Preethi B, Ramakrishna C, Roopa M et al. Serum Creatine kinase in ischemic stroke: a case control study. *J. Evolution Med. Dent. Sci.* 2016; 5(52):3386-3390, DOI: 10.14260/jemds/2016/782.
- [3]. KARPMAN R.R., WEINSTEIN P.R., FINLEY P.R.: Serum CPK isoenzymes B B as an indicator of brain tissue damage following head injury. *J. Trauma* 21:148-151, 1981.
- [4]. LONGSTRETH W.T., KATHLEEN J.C., YUMI M.: Cerebrospinal fluid and serum creatine kinase BB activity after out-of-hospital cardiac arrest. *Neurology* 31:455-458, 1981.
- [5]. HANS P., BORN J.D., CHAPELLE J.P., MILBOUW C.: Creatine kinase isoenzymes in severe head injury. *J. Neurosurg.* 58:689-692, 1983.
- [6]. PFEIFFER E.E., HOMBURGER A., YANAGIRA T.: Creatine kinase BB isoenzyme in CSF in neurological disease. Measurement by radioimmunoassay. *Arch. Neurol.* 40:169-172, 1983.
- [7]. PFEIFFER F.E., HOMBURGER H.A., TAKEHIKO Y.: Serum creatine kinase concentrations in acute cerebrovascular disease. *Arch. Neurol.* 41:1175-1178, 1984.
- [8]. BELL R.D., ALEXANDER M.G., NGUYEN T, ALBIN S.A.: Quantification of cerebral infarct size by creatine kinase BB isoenzymes. *Stroke* 17:254-260, 1986.
- [9]. PHILLIPS J., HORNER B., DOORLY T.: Cerebrovascular accident in a 14 year old marathon runner. *Brit. Med. J.* 26:351-352, 1983.