



## ALTERED BIOCHEMICAL PARAMETERS IN CATATONIA: A SHORT TERM EVALUATION

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### ABSTRACT

**BACKGROUND** Catatonia, a bizarre psychomotor syndrome, which was earlier considered as a manifestation of schizophrenia, is now often seen in patients with mania, depression and many other medical conditions. It has been a matter of debate for several decades, whether catatonia is a separate disease entity or a manifestation of different psychiatric or medical disorder. **AIMS AND OBJECTIVES** In our study, we tried to evaluate and compare the altered biochemical parameters in different conditions of catatonia. **METHODS** This hospital based cross-sectional observational study was conducted in a tertiary care hospital in Guwahati, Assam for a period of 1 year from May 2021 to April 2022 after obtaining clearance from Institutional Ethical Committee(H) of the institution. Total 50 cases of catatonia fulfilling the selection criteria were included in the study. Bush Francis Catatonia Rating Scale (BFCRS) was used to quantify different conditions of catatonia. **RESULTS** The biochemical parameters that were altered in majority of the catatonia patients were CPK (increased in 98%patients), haemoglobin(low in 64%patients) and serum iron(low in 54%patients). Statistically significant difference with the highest mean CPK (514.86) was found in schizophrenia while the lowest mean CPK value(254.54) was found in organic catatonia patients. **CONCLUSION** Although, there is no specific test for catatonia, laboratory studies provide insight into the pathogenesis of catatonia and has diagnostic and therapeutic implications.

**KEYWORDS :** Serum CPK, Serum iron, BFCRS.

### INTRODUCTION

Catatonia, a term coined by Kahlbaum about 100 years ago is one of the most exciting conditions in psychiatry, which may present with a large number of different motor signs and even vegetative instability.<sup>1</sup> It is a neuropsychiatric syndrome with a unique combination of mental, motor, vegetative and behavioral signs.<sup>2</sup> Whether catatonia is a separate disease entity or a manifestation of different psychiatric or medical disorder, has been a matter of debate for several decades. Several investigators have now drawn attention to the fact that catatonia is a non-specific syndrome. As there is a lack of familiarity with the condition among clinicians, catatonia is frequently missed among the patients in hospital settings. The term catatonia in simple words means increased tone of muscles at rest. It is characterized by striking behavioral abnormalities, which may include motoric immobility or excitement, profound negativism, or mimicry (of speech or movement).<sup>3</sup>

The DSM-5 gives 12 categories of symptoms that can lead to a diagnosis of catatonia. These symptoms include stupor, mutism, waxy flexibility, catalepsy, negativism, posturing, mannerisms, stereotypy, agitation not influenced by external stimuli, grimacing, echolalia and echopraxia. At least 3 of these symptoms must be present for the diagnosis of catatonia.

Catatonia is actually a syndrome with multiple etiologies, and a new case of catatonia without a significant psychiatric history should be a cause for further evaluation for an underlying organic insult.

The diagnosis of catatonia is a clinical diagnosis that does not require specific lab tests or imaging. However, certain laboratory tests can help to determine the underlying etiology of the catatonia.<sup>4</sup>

Catatonia is a common syndrome, highly treatable, and associated with significant morbidity and mortality if left untreated. Therefore physicians should maintain a high level of suspicion for this complex clinical syndrome.<sup>5</sup> Familiarity with the clinical features and varied etiologies is essential for effective management of catatonia.

### AIMS AND OBJECTIVES

In our study, we tried to evaluate and compare the altered biochemical parameters in different conditions of catatonia.

1. To study the different conditions of catatonia categorically.
2. To compare the altered biochemical parameters in different conditions of catatonia.

### MATERIALS AND METHODS

This hospital based cross sectional observational study was carried out for a period of 1 year from May 2021 to April 2022 in the Department of Psychiatry, Gauhati Medical College and Hospital(GMCH), Assam. The sample size of this study includes a total number of 50 cases. Samples from both the sex, male and female, were included in this study ranging between the age group of 15 years to 65 years.

**Ethical Consideration:** Permission to conduct this study has been obtained from the Institutional Ethics Committee (Human) of Gauhati Medical College, Assam, before starting the study. A written informed consent was obtained from all the individual participants included in the study.

**Selection of Study Subjects:** All the cases of catatonia, attending the Out Patient Dept. (OPD) & Inpatient Dept. (IPD) of Department of Psychiatry, Gauhati Medical College and Hospital, during the study period and fulfilling the selection criteria were included in this study.

### Inclusion Criteria

1. All patients/caregivers willing to give written informed consent
  2. Age 15-65 years
  3. Both male and female sex
  4. Patients diagnosed with catatonia as per DSM 5 criteria.
- Patients who were uncooperative, severely ill, having neurodevelopmental disorder and those who did not want to participate were excluded from this study. The findings were subjected to standard statistical analysis and logical conclusions were drawn.

### TOOLS USED

1. SEMI STRUCTURED SOCIO-DEMOGRAPHIC PROFORMA
2. DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (DSM-5)
3. BUSH-FRANCIS CATATONIA RATING SCALE (BFCRS)
4. MODIFIED KUPPUSWAMY SOCIO-ECONOMIC SCALE (UPDATED FOR 2020)

A written informed consent has been obtained from all the patients and a total of 50 patients has been enrolled in the study. All the patients included in the study population has been subjected to thorough history taking and detailed clinical examination. Data collection was done using the semi structured socio demographic proforma with Modified Kuppusswamy Socio-Economic Scale (updated for 2020). All the patients fulfilling the inclusion criteria were evaluated using Diagnostic and Statistical Manual of Mental Disorders (DSM-5) diagnostic criteria. Bush-Francis Catatonia Rating Scale (BFCRS) was used for scoring of the catatonic signs and symptoms. Blood samples were collected after giving pre-test counseling. Laboratory

investigations were carried out for the estimation of common biochemical parameters -serum creatine phosphokinase (CPK), serum iron, vit. B12,folate, serum electrolytes including the complete blood count (CBC), WBC count, blood sugar, liver function test and renal function test. Analysis of the altered biochemical parameters and the various etiologies were done using Microsoft Excel and IBM SPSS Version 26.0. The statistical comparisons were made using the Chi square test and ANOVA test wherever applicable.

## RESULTS

An analysis of the altered biochemical parameters and the various etiologies in patients presenting with catatonia, was done at the Department of Psychiatry, Gauhati Medical College and Hospital, Guwahati. The study was done over a period of one year from May 2021 to April 2022. Data analysis was done using Microsoft Excel and IBM SPSS Version 26.0. The statistical comparisons were made using the Chi square test and ANOVA test wherever applicable and p-value of <0.05 was considered statistically significant. The results and observation of the study are summarised below:

The age distribution of the 50 patients under study were 15 – 25 years 34%(n=17) , 25 -35 years 28%(n=14) , 35 - 45 years 18% (n=9) and the rest 10% (n=5) each belong to the age groups of 45 - 55 years and 55- 65 years respectively. The overall mean and SD of the study population is found to be 33.42 and 13.50 years respectively. Out of all the 50 cases, 22 were male patients (44.0%) whereas, 28 were female patients (56.0 %). Most of the patients in our study belong to rural population (Table 1).

In our study, 46%(n=23) of the patients were diagnosed as Schizophrenia. 14%(n=7) diagnosed as having Acute and Transient Psychotic Disorder (ATP), 10%(n=5) as Major Depressive Disorder(MDD). Rest 16%(n=8) and 4%(n=2) were diagnosed as Bipolar (BPAD) depression and Bipolar(BPAD) Mania respectively. Catatonia due to a medical condition, frequently referred to as 'Organic Catatonia', was present in 10%(n=5) of our catatonic patients.

Out of the 50 patients, Psychotic disorder (n=30; 60%) was the most common diagnostic group in the study population, with schizophrenia (n=23; 46%) being the most common diagnosis. The other two diagnostic groups included Affective disorders (N=15; 30%) and Organic disorders (n=5; 10%).

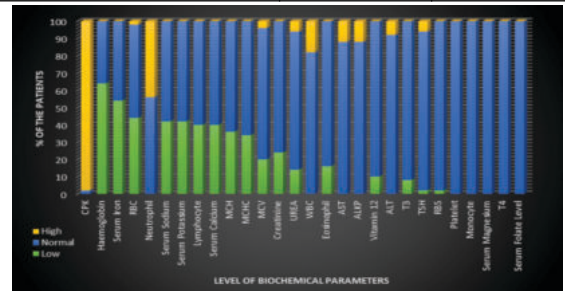
The altered biochemical parameters in the study participants are as follows (Figure 1)- CPK, WBC, RBC, Hemoglobin, MCV, MCH, MCHC, neutrophil, lymphocyte, sodium, potassium, calcium, vitamin B12, AST, ALT, ALKP, T3, TSH, serum iron, urea, creatinine. The biochemical parameters that were altered in majority of the catatonia patients were CPK (increased in 98% patients), hemoglobin (low in 64%patients) and serum iron (low in 54%patients).

The results in Table 2 shows that the mean levels of the biochemical parameters (except CPK) in different catatonia conditions were statistically not significant (p>0.05 for all). Statistically significant difference was observed in mean levels of CPK in different conditions of catatonia with the highest mean CPK (514.86) found in schizophrenia while the lowest mean CPK value (254.54) was found in organic catatonia patients.

**TABLE 1: SOCIO-DEMOGRAPHIC PROFILE OF CATATONIA PATIENTS**

|                      |           |             |
|----------------------|-----------|-------------|
| AGE                  | (MEAN)    | 33.42 YEARS |
| GENDER               | FREQUENCY | PERCENTAGE  |
| MALE                 | 22        | 44.0        |
| FEMALE               | 28        | 56.0        |
| LOCALITY             | FREQUENCY | PERCENTAGE  |
| RURAL                | 38        | 76.0        |
| URBAN                | 12        | 24.0        |
| RELIGION             | FREQUENCY | PERCENTAGE  |
| HINDU                | 22        | 44.0        |
| ISLAM                | 28        | 56.0        |
| SOCIOECONOMIC STATUS | FREQUENCY | PERCENTAGE  |
| LOWER                | 12        | 24.0        |
| UPPER LOWER          | 19        | 38.0        |
| LOWER MIDDLE         | 13        | 26.0        |
| UPPER MIDDLE         | 6         | 12.0        |
| UPPER                | 0         | 00.0        |

|                   |           |            |
|-------------------|-----------|------------|
| FAMILY TYPE       | FREQUENCY | PERCENTAGE |
| NUCLEAR           | 36        | 72.0       |
| JOINT             | 14        | 28.0       |
| EDUCATIONAL LEVEL | FREQUENCY | PERCENTAGE |
| ILLITERATE        | 6         | 12.0       |
| PRIMARY           | 13        | 26.0       |
| MID SCHOOL        | 11        | 22.0       |
| HIGH SCHOOL       | 12        | 24.0       |
| HIGHER SECONDARY  | 5         | 10.0       |
| GRADUATE          | 3         | 6.0        |
| EMPLOYMENT STATUS | FREQUENCY | PERCENTAGE |
| EMPLOYED          | 18        | 36.0       |
| UNEMPLOYED        | 32        | 64.0       |
| MARITAL STATUS    | FREQUENCY | PERCENTAGE |
| MARRIED           | 19        | 38.0       |
| UNMARRIED         | 31        | 62.0       |



**Fig 1:** Staked Bar Diagram Showing The Distribution According To Lowest To Highest Value Of Normal Range Of The Biochemical Parameters

**Table 2: Comparison of the altered biochemical parameters in different conditions of catatonia**

|              | MEAN   | BIPOLAR DEPRESSION | SCHIZOPHRENIA | ATP    | ORGANIC | MDD    | BIPOLAR MANIA | P value |
|--------------|--------|--------------------|---------------|--------|---------|--------|---------------|---------|
| CPK          | 263.65 | 514.86             | 385.71        | 254.54 | 330.4   | 398.00 | 0.048*        |         |
| WBC          | 9.23   | 9.16               | 8.88          | 10.19  | 8.42    | 10.4   | 0.919         |         |
| RBC          | 4.86   | 4.39               | 4.56          | 4.40   | 4.254   | 4.75   | 0.281         |         |
| Hemoglobin   | 12.81  | 12.01              | 12.62         | 12.18  | 12.28   | 12.35  | 0.867         |         |
| MCV          | 86.75  | 83.97              | 78.14         | 86.32  | 76.40   | 79.8   | 0.060         |         |
| MCH          | 29.65  | 27.43              | 27.57         | 28.78  | 26.86   | 28     | 0.311         |         |
| MCHC         | 33.95  | 32.22              | 32.81         | 32.46  | 32.26   | 33.65  | 0.150         |         |
| Neutrophil   | 65.95  | 72.37              | 75.92         | 74.26  | 62.82   | 64.6   | 0.306         |         |
| Lymphocyte   | 21.86  | 20.65              | 23.32         | 19.14  | 24      | 37     | 0.134         |         |
| Sr Sodium    | 138.25 | 137.96             | 136.42        | 139.8  | 137.6   | 138.5  | 0.896         |         |
| Sr Potassium | 3.25   | 3.7478             | 3.67          | 3.38   | 3.82    | 4.4    | 0.279         |         |
| Sr Calcium   | 8.925  | 8.69               | 8.5           | 8.68   | 8.86    | 8.6    | 0.794         |         |
| UREA         | 31.75  | 32.67              | 28.71         | 21.8   | 27.62   | 24.5   | 0.254         |         |
| Creatinine   | 0.98   | 0.69               | 0.7           | 0.81   | 0.824   | 0.69   | 0.062         |         |
| AST          | 34.85  | 54.43              | 47.27         | 39.4   | 37      | 27.5   | 0.422         |         |
| ALT          | 38.75  | 46.62              | 38.28         | 25.2   | 29.8    | 26.5   | 0.741         |         |
| ALKP         | 92.35  | 98.91              | 97.28         | 77.6   | 61.4    | 61     | 0.336         |         |
| T3           | 1.68   | 1.22               | 1.6871        | 1.54   | 1.976   | 2.07   | 0.609         |         |
| T4           | 112.95 | 113.17             | 125.12        | 111.56 | 115.8   | 112.5  | 0.884         |         |
| TSH          | 2.52   | 1.69               | 2.94          | 2.078  | 2.804   | 3.01   | 0.447         |         |
| VIT B 12     | 501.12 | 396.09             | 271.71        | 355    | 481.6   | 557.5  | 0.112         |         |
| Serum Iron   | 64.75  | 47.47              | 46.71         | 43.6   | 41.6    | 47.5   | 0.080         |         |

## DISCUSSION

In terms of age distribution of the patients, our study seems to be in correspond with other studies conducted by Rogers JP et al.<sup>6</sup>, Dutt et al.<sup>7</sup> The female preponderance in our study is also in accordance with other studies conducted by Ramdurg S et al.<sup>8</sup>, Medda P et al.<sup>9</sup>

Narayanaswamy JC et al.<sup>10</sup> found that majority of the subjects hailed from a rural background (n=85, 79.4%) which corresponds with our study.

In our study, 56%(n=28) patients are Muslims, 44%(n=22) are Hindus .This is in contrast to most of the studies done earlier and can be explained from the fact that, Islam is the fastest growing religion in Assam.

In our study it was found that Psychotic disorder (n=30; 60%) is the most common diagnostic group in the study population, with schizophrenia (n=23; 46%) being the most common diagnosis, followed by ATP (n=7; 14%). Ramdurg S et al.<sup>8</sup>, Grover S et al.<sup>11</sup> have also reported similar findings in their study.

In our study, the overall mean CPK value was high (407.44) in the patients. Majority i.e 98% of the study population had high levels of CPK. Other parameters under study- WBC, RBC, hemoglobin, MCV, MCH, MCHC, neutrophil, lymphocyte, sodium, potassium, calcium, vitamin B12, AST, ALT, ALKP, T3, TSH, serum iron, urea, creatinine were also altered in our patients. These findings are similar to the studies done by Northoff G et al.<sup>12</sup>, Singerman et al.<sup>13</sup>, Lewis AL et al<sup>14</sup>.

Significant difference in the mean levels of CPK in different conditions of catatonia was observed ( $p=0.048$ , which is  $<0.05$ ). Patients with schizophrenia had the highest mean CPK (514.86) while the lowest mean CPK value (254.54) was found in organic catatonia patients.

The raised CPK may be due to muscle injury resulting from the immobility, posturing and rigidity that occur in catatonia, and these symptoms were found to be more severe in the schizophrenic patients compared to those with organic condition in our study.

In the study done by Rogers JP et al.<sup>6</sup> on demographic, clinical and laboratory associations of catatonia, it was found that the most striking laboratory finding in their study was the CPK, where the mean result in patients with catatonia (2545 IU/L) was several times higher than that of the comparison group (459 IU/L). They also found that iron was low relative to psychiatric controls.

Majority of the patients in our study population were females of child bearing age and iron deficiency anemia is very common in this population, which might be a possible explanation for the decreased levels of Hb, MCH, MCHC. Hence we can see that the poor nutritional status in patients possibly plays an important role in the development of catatonia. Low iron is a hallmark of malnutrition, which is likely to occur in catatonia and could be a consequence of the prolonged hospitalisation.

## CONCLUSION

There has been a growing interest in catatonia over the last few decades reflecting the increasing number of publications on the topic. The disease concept is yet ill-defined and poorly understood, which could be related to clinicians' dilemma in its heterogeneous presentations. This study was undertaken with the aim of determining the various biochemical parameters that might be altered in patients with catatonia. Our study reflects that the biochemical alterations in patients with catatonia are not uncommon specifically for CPK (increased in 98% patients), hemoglobin (low in 64% patients) and serum iron (low in 54% patients). A small sample size and a shorter duration of our study merits further exploration of the diagnostic, therapeutic and pathophysiological significance of low serum iron levels and raised CPK levels in catatonia. Although there is no specific test for catatonia, laboratory studies could provide insight into the pathogenesis of catatonia and have diagnostic and therapeutic implications.

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## CONFLICT OF INTEREST

None

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