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A CROSS-SECTIONAL COMPARISON OF MINERALS IN PSYCHIATRIC DISORDER

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ABSTRACT--The burden of mental disorders with onset in childhood and adolescence decreased by varying degrees for the individual disorders, and this decrease was generally smaller in the less developed states than in the more developed states. The increase in the burden of depressive disorders, anxiety disorders, Panic disorders, Social phobia, and bipolar disorder was driven by the ageing of the population because age-standardisation nullified this increase. To study the levels of, sodium, potassium and calcium in psychiatric disorders.The present study includes total 100 subjects were selected for study. Out of which 50 were age and sex matched normal healthy control, 50 were suffered from psychiatric disorders. Blood sample were collected, and Electrolyte levels were measured by electrolyte analyzer, as electrolyte analyzer has different electrodes, specific for different ions of interest. Each electrode has an ion selective membrane that undergoes a specific reaction with the corresponding ions contained in the sample being analyzed**.**In our study the mean sodium levels in cases as 131.52±2.099 and in controls it was 137.98±6.06 (P<0.0001), this was statistically significant. Mean calcium and Potassium levels in cases were 13.30±3.35 and 3.35±0.23, while in controls it was 9.44±4.40 and 3.78±0.71 respectively. These results were also found to be statistically significant.The present study showed the levels of Na, K are decreased, and Ca concentration was increased found in psychiatric patients. Hyponatremia, hypokalemia, hypercalcaemia are clinical conditions which were present in patients of psychiatric disorders. Present study concludes that Careful evaluation of the patient will be helpful in Correction of underlying electrolyte abnormality which may improve the psychiatric symptoms and helpful for clinician for further treatment.

KEYWORDS-- Na, K, Ca, Anxiety disorders, Panic disorders, Social phobia, Depression, Bipolar disorders.

I. INTRODUCTION

In India, one among every seven people suffering from mental disorder, ranging from mild to severe. Major depressive disorder is accompanied by inglorious and loss of interest or happiness or addiction of internet in day

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to day activities that adversely affect a person's both professional and personal life [1, 2]. Disorders of alcohol use pose a heavy strain on healthcare systems in many ways, both direct and indirect. Screening and quick interventions by trained healthcare practitioners at the general hospital will identify risky drinking before serious harm happens which will play a major role in reducing the total burden on healthcare facilities. [3] Female sex and being the spouse are strongly linked to the incidence psychological distress. Psychological distress is generally demonstrated by somatic and depressive symptoms which may help to recognize survivors at risk early. [4]

A small proportion (12.5 percent) of male patients attending a primary care centre in Gujarat had depression and a greater number (22.1 percent) had positive screening with PHQ-9. Depression has been substantially linked with self-reported financial stress and life stressors.[5]

Depression gives the extensive burden on an individual's life and vast efforts have been made to explore the biological mechanisms of it [6]. Major depression has been considered as a multifactorial disorder with genetic, neurological, and environmental factors contributing to overall risk. However, the mechanisms of these risk factors are still unknown [7]. In the world in 2017, mental disorders were the second leading cause of disease burden lived with disability (YLDs) and the sixth leading cause of disability-adjusted life-years (DALYs), it is major serious challenge to health systems, particularly for low-income and middle-income countries.[8]

Mental health is being recognised as one of the priority areas in health policies around the world and has also been included in the Sustainable Development Goals.[9] Nutritional deficiencies, resulting from insufficient intake or absorption of nutrients critical to human health, are now a recognized risk factor for psychiatric disorders.[10] Trace elements (TE) play a versatile role in the biological system ranging from regulating metabolic reactions to acting as antioxidants [11]. Several studies have suggested that alterations of these elements in serum levels are linked with the etiology and pathophysiology of many mental disorders [12-14], including major depression [15]. Calcium (Ca) is play important role in activation of different enzymes and in neuromuscular excitability. Low Ca level in the blood serum causes fragility of hair and nails and can also lead to mood disorders and depression [16]. Thus, the deficiency of this mineral in the human body is linked with several chronic diseases [17]

Sodium abnormalities are seen in various psychiatric conditions like eating disorders, psychotic illnesses, and certain substance use disorders. Hyponatremia including drug side effects in patients of psychiatric illnesses, can cause or worsen psychiatric conditions and may lead to medical comorbidities. The possibility that abnormalities in Na or K metabolism might lead to altered neuronal excitability and might manifest clinically as disturbed behaviour and studies indicated that Na retention occurred during depression [18]. Studies have found that residual there was an increase in sodium in major depression and was even more abnormal in mania and sodium levels returned to normal after recovery [19].

Hypokalemia is a clinically important condition in psychiatric conditions. Compared to the general population, the prevalence of hypokalemia (20%) in acute psychiatric patients is very high, also hypokalemia may present with disorientation, memory impairment, and confusion. Hypokalemia may mimic neurovegetative symptoms, such as weakness, fatigue, lethargy, apathy, and depressed mood [20]. Headache, irritability, nervousness, paraesthesia's, visual disturbance are also seen in hypokalemia [21].

II. AIM AND OBJECTIVE

AIM

To study the levels of calcium, sodium and potassium in psychiatric disorders.

III. OBJECTIVE

To correlate the levels of calcium, sodium and potassium between psychiatric patients and healthy controls (age matched) attending AVBRH Wardha and SMHRC Nagpur.

IV. MATERIAL AND METHOD

The present Study was carried out in the Department of Biochemistry and Dept. of Psychiatrics at Datta Meghe Medical College, Shalinitai Meghe Hospital &Research Centre, Nagpur in collaboration with Jawaharlal Nehru Medical College and AVBRH (Datta Meghe Institute of Medical Sciences), Sawangi (Meghe) Wardha Maharashtra.

Total **100** subjects were selected for study. Out of which **50** were age and sex matched normal healthy control, **50** were suffered from psychiatric disorders.

Informed consent was taken from all participants included in the study.

Sample Collection*:*

Blood sample were collected, and Electrolyte levels were measured by electrolyte analyzer, as electrolyte analyzer has different electrodes, specific for different ions of interest. Each electrode has an ion selective membrane that undergoes a specific reaction with the corresponding ions contained in the sample being analyzed**.**

Biochemical Investigations:

Parameters were assessed immediately using following method:

Plain vials were used for the estimating of serum minerals (Na^+, K^+, Mg^{++} and $ca2^+$). Serum sodium and potassium were measured by UV spectrometer using enzymatic method.[22] Calcium was estimated using atomic absorption spectrophotometry. [23]

Inclusion Criteria:

- Anxiety disorders
- Panic disorders
- Social phobia
- Depression
- Bipolar disorders

Statistical Analysis

All estimated results were expressed as mean±SD. Mean values will be assessed for significance by paired student–t test. A statistical analysis will be performed using the Statistical Package for the Social Science program

(SPSS, 24.0). Frequencies and percentages will be used for the categorical measures. Probability values $p < 0.05$ will be considered statistically significant.

Ethical Consideration:

Informed and written consent (Marathi and English) was taken from each subject before collecting data and blood sample. Only those individuals, who volunteer to participate in the study, was included and the data was kept confidential.

The study will not impose any burden on the subjects and the Institute; therefore, the study is ethically justified. The proposed study was undertaken after approval by Institutional Ethical Committee.

V. OBSERVATION AND RESULTS

Table 1: Correlation of Minerals levels between cases and control**.**

Minerals	**Cases Mean ± SD (n=50) mEq/l**	**Controls Mean ± SD (n=50) mEq/l**	**t-value**	**p-value**
Sodium	131.52±2.099	137.98±6.06	7.123	0.0001
Calcium	13.30±3.35	9.44±4.40	-4.936	0.0001
Potassium	3.35±0.23	3.78±0.71	4.074	0.0001

Table No. 1 depicts, mean sodium levels in cases as 131.52±2.099 and in controls it was 137.98±6.06 (P<0.0001), this was statistically significant. Mean calcium and Potassium levels in cases were 13.30±3.35 and 3.35±0.23, while in controls it was 9.44±4.40 and 3.78±0.71 respectively. These results were also found to be statistically significant.

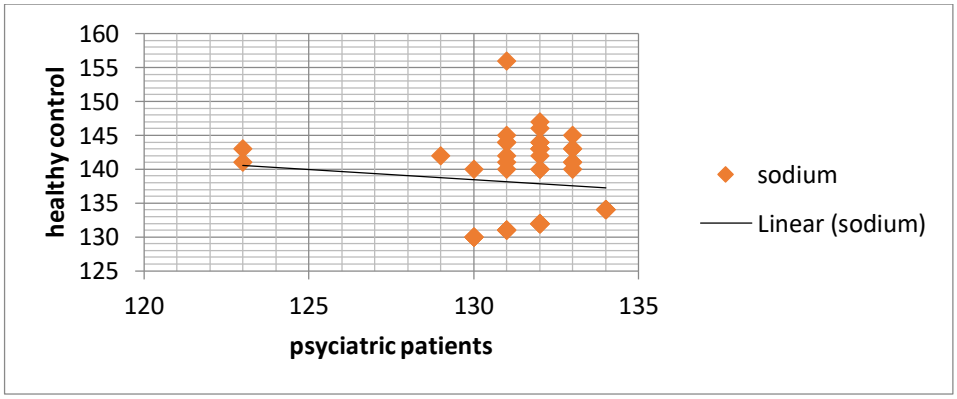

Figure 1: A scatter graph showing the levels of Sodium in psychiatric patients and healthy controls.

Scatterplot no. 1 shows a positive, association between psychiatric cases and sodium levels

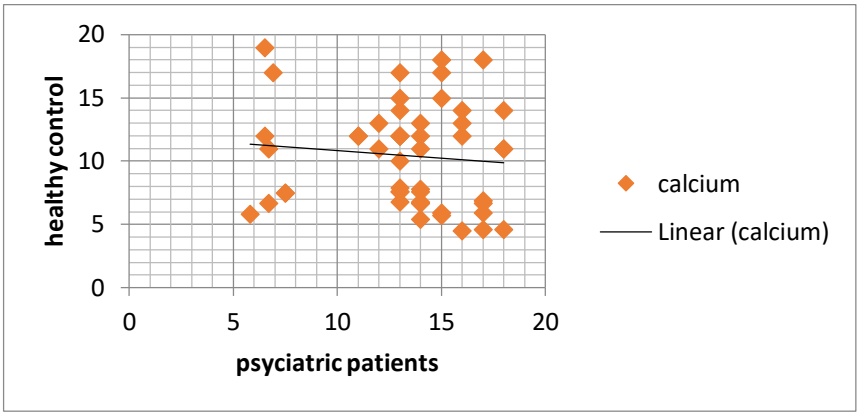

Figure 2: A scatter graph showing the levels of Calcium in psychiatric patients and healthy controls.

Scatterplot no. 2 shows positive, association between psychiatric cases and calcium levels

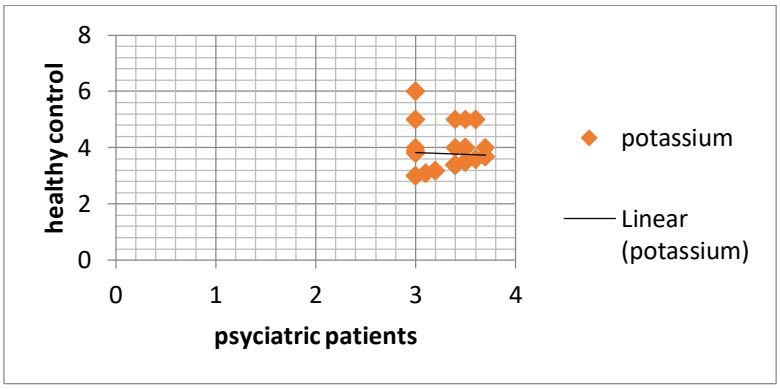

Figure 3: A scatter graph showing the levels of potassium in psychiatric patients and healthy controls.

Scatterplot no. 3 shows a positive, association between psychiatric cases and potassium levels.

VI. DISCUSSION

The proportional contribution of mental disorders to the total disease burden in India almost doubled from 1990 to 2017 [24]. Among the mental disorders that manifest predominantly during adulthood, the highest disease burden in India was caused by depressive and anxiety disorders, followed by schizophrenia and bipolar disorder [25]. Among the mental disorders that have their onset predominantly during childhood and adolescence, the highest disease burden was caused by IDID, followed by conduct disorder and autism spectrum disorders**.**

In this study mean Ca levels in cases was 13.30±3.35, while in controls it was 9.44±4.40. This was found to be statistically significant. Brown et al [26] observed that hypercalcemia may be due to higher concentrations of calcium in the extra-neuronal environment, which triggers calcium influx into the neurons. Which in turn causes depolarization and release of the neurotransmitters into the synaptic cleft, which is manifested by various psychiatric symptoms including psychosis.

In contrast to our study Gitlin D observed that Hypokalemia is an identifiable, clinically important but often overlooked condition in psychiatric patients. Compared to the general population, the prevalence of hypokalemia (20%) in acute psychiatric patients is surprisingly high [27]. Hypokalemia can cause a wide range of clinical

manifestations, such as muscle weakness and are flexes paralysis. Cardiac manifestations include arrhythmia and EKG changes. Neuropsychiatrically, hypokalemia may present with memory impairment, disorientation, and confusion. Hypokalemia may mimic neurovegetative symptoms, such as weakness, lethargy, apathy, fatigue, and depressed mood. Additionally, hypokalemia can mimic anxiety reactions, such as headache, irritability, nervousness, paraesthesia's, visual disturbances, and muscle discomfort.[28]

Our study shows that mean sodium levels in psychiatric cases as 131.52±2.099 and in controls it was 137.98±6.06 **mEq/l** (P<0.0001), this was statistically significant. Hyponatremia represents an abnormal ratio of total body sodium to water and is commonly defined as a plasma sodium concentration less than 135 mEq/L. Signs and symptoms of Hyponatremia generally do not appear until the serum sodium concentration falls below 130 mmol/L. Once the serum sodium falls below 125 mmol/L, neuropsychiatric symptoms predominate [29-30]. The clinical manifestations of hyponatremia are largely due to osmotic swelling of brain cells, resulting in neurologic and systemic symptoms mainly Lethargy, Restlessness, Disorientation, Headaches, Behavioral changes, Muscular weakness, Confusion, irritability, Drowsiness, Seizures, Irritability, Psychotic and Manic behaviour [31-32].

Siegel AJ observed that polydipsia may lead to hyponatremia in patients suffering from schizophrenia, due to reduced osmotic threshold for the release of arginine vasopressin (AVP) and by a defect in the osmoregulation of thirst. [33]

Lam MH-B et al observed that hypokalemia is an identifiable, clinically important but often overlooked condition in psychiatric cases. Compared to the general population, the prevalence of hypokalemia which is 20% in acute psychiatric patients is surprisingly high.[34] In our study mean Potassium levels in psychiatric cases were 3.35±0.23, while in controls it was 3.78±0.71. These results were found to be statistically significant. Neuropsychiatrically, hypokalemia may corelate with memory impairment, disorientation, and confusion and neurovegetative symptoms of hypokalemia weakness, lethargy, apathy, fatigue, and depressed mood. [20]

There was a varying degree of heterogeneity between the states of India in the DALY rates for individual mental disorders in 2017. On one hand, the population-level burden of depressive disorders, anxiety disorders, schizophrenia, bipolar disorder, and eating disorders increased in India between 1990 and 2017, with the increase being generally higher in the more developed states than in the less developed states [35].

On the other hand, the population level burden of mental disorders with onset in childhood and adolescence decreased by varying degrees for the individual disorders, and this decrease was generally smaller in the less developed states than in the more developed states. The increase in the burden of depressive disorders, anxiety disorders, Panic disorders, Social phobia, and bipolar disorder was driven by the ageing of the population because age-standardisation nullified this increase.

The decrease in IDID could partly be attributed to the implementation of laws to reduce lead contamination in the country, [36] though this decrease was smaller in the less developed states than in the more developed ones. The increase in the burden of eating disorders could be related to several factors, including increasing exposure in India to global body-image trends. [37-38]

VII. CONCLUSION

Electrolytes plays a major role in psychiatric disorder. In the present study showed the levels of Na, K are decreased, and Ca concentration was increased found in psychiatric patients. Hyponatremia, hypokalemia, hypercalcaemia are clinical conditions which were present in patients of psychiatric disorders. Present study concludes that Careful evaluation of the patient will be helpful in Correction of underlying electrolyte abnormality which may improve the psychiatric symptoms and helpful for clinician for further treatment. Patients may be treated for depression but if OSA cause the underlying symptoms and apnoea is not treated then depressive symptoms may remain. They can be treating someone with antidepressants when what we can really do is treat their sleep disorder, which in turn may restore their normal mood. [39]

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