

**Study of Serum Calcium Level in Schizophrenic Patients and it's Association with Stage of Disease****Santosh Kumari Sharma<sup>1</sup>, Seerat Sachdeva<sup>2</sup>, Puneet Kumar<sup>3</sup>, Sanjay Bhatt<sup>4</sup>**<sup>1</sup>Assistant Professor, Department of Biochemistry, Government Medical College, Kota, Rajasthan<sup>2</sup>MBBS, Dr. SN Medical College, Jodhpur, Rajasthan<sup>3</sup>Assistant Professor, Department Of Physiology, Government Medical College, Budaun, Uttar Pradesh<sup>4</sup>Assistant Professor, Department Of Biochemistry, MBD Autonomous State Medical College, Deoria, Uttar Pradesh

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**Abstract:****Objectives:** Schizophrenia is a mental disorder having positive and negative symptoms and imbalance in the element composition of the human body may have important role in the pathogenesis or progression of this disease. The study is aimed to evaluate the concentration of calcium in Rajasthan population and its correlation with PANSS score.**Methods:** This study was done in Department of Biochemistry and Psychiatric Centre, SMS Medical College, Jaipur (Rajasthan). 150 controls and 150 patients were enrolled in this study. The concentration of serum calcium in 300 individuals was determined by fully automated analyzer.**Results:** Mean serum Ca level of case group was found statistically significant ( $p=0.000$ ) when compared with controls. In acute cases of schizophrenia mean Calcium level was  $9.01 \pm 0.48$  mg/dl while it was  $8.85 \pm 0.37$  mg/dl in chronic cases. This difference was found significant ( $p = 0.028$ ) when unpaired t-test was applied.**Conclusion:** Thus we detected a significant imbalance in the distribution of calcium in Rajasthan population and the data obtained provide evidence that in chronic schizophrenia serum calcium is decreased significantly when compared to acute schizophrenic patients.**Keywords:** Schizophrenia, PANSS Score, Acute, Chronic, Calcium

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**Introduction**

Schizophrenia is a severe mental disorder that affect more than 21million people worldwide [1]. It is a severe mental illness characterized by persistent or relapsing episodes of positive symptoms and negative symptoms[2] and associated with poor quality of life [3] and individual and societal impacts [4,5,6], and requiring long-term treatment [7].

Trace elements (TE) and macro-minerals (MM) play an important role in the biological system, from regulating metabolic reactions to acting as antioxidants [8,9]. Several studies have suggested that alterations of these elements in serum levels are associated with an increased risk of many mental disorders [10,11,12,13,14] including schizophrenia[15].

Calcium (Ca) plays an important role in neuromuscular excitability and activation of different enzymes. Low Ca level in the blood serum causes fragility of hair and nails and can also lead to mood disorders and depression and deficiency in the human body is also linked with several chronic diseases [16,17].As very few studies done on this

topic, so the present study was undertaken to explore the status of serum calcium with the schizophrenia in Rajasthan population.

**Material and Methods****Study Population**

This study enrolled 150 schizophrenic patients and 150 healthy individuals. The 150 patients were recruited from the Psychiatric Centre, SMS Medical College, Jaipur.

The subjects for the present study comprised of two groups:

**Group 1:** The diagnosed patients of schizophrenia (Age from 17-56 yrs). After detailed history and mental status evaluation, a diagnosis of schizophrenia was confirmed by one senior consultant psychiatrist of psychiatric centre, Jaipur, according to ICD-10 criteria. On the basis of duration, symptoms of illness and PANSS score [18] each of schizophrenic was further categorized as, in the Acute (n=79) and Chronic (n=71).

Acute schizophrenia refers to the reemergence or intensification of psychotic symptoms in a person who previously had no symptoms or whose symptoms had not changed for a significant amount of time. Chronic schizophrenia refers to an illness that has been present for at least 2 years.

**Group 2:** Age & sex matched 150 control subjects from general population.

One hundred fifty patients of Group 1 attending OPD of Psychiatric Centre, SMS Medical College, Jaipur, were studied and the result was compared with 150 normal healthy control subjects (Group 2).

Subjects aged more than 15 years, without any metabolic disorder were included in this study. Subjects taking trace elements supplementation, with a history of drug abuse, having chronic systemic diseases such as diabetes mellitus, hypertension, severe head injury or seizure, and inflammatory diseases were excluded from this study.

Patients diagnosed by a qualified psychiatrist using ICD-10 criteria were approached by investigator herself and after giving written consent explaining the nature of the study and tests to be carried out, were included in the study. After obtaining their informed written consent, their PANSS score was assessed by an expert psychiatrist. Information regarding patient's sociodemographic characteristics and PANSS score were recorded on a pre designed semi structured performa.

Blood samples (7ml) were collected from antecubital vein from each participant by using aseptic

techniques into a metal free vial. The samples were allowed to clot for 20 minutes at room temperature. After centrifugation at 3000 rpm for 15 min, serum samples were extracted from the collected blood samples, placed into microtubes and stored at  $-20^{\circ}\text{C}$  until analysis.

Estimation of serum Calcium (Ca) was carried out on a fully automated chemistry analyzer (OLYMPUS AU 400) in the Central Laboratory, Department of Biochemistry, SMS Medical College, Jaipur.

### Statistical Analysis

Data thus collected was entered in excel sheet and was subjected to statistical analysis.

Continuous data was summarized as mean and standard deviations while categorical data as percentages. Unpaired 't' test was used for comparing continuous data whereas chi-square test was used for comparison of categorical and nominal scale data. Spearman correlation coefficient was calculated to find out correlation between continuous and ordinal scale data. 'p' Value  $<0.05$  was taken as significant.

### Results

#### Distribution of study participants

In Table No.1, distribution of study participants has been Shown. 79 (26.33 %) were acute schizophrenic patients, 71 (23.67 %) were chronic schizophrenic patients & 150 (50.00%) were healthy controls and overall study participants were 300.

**Table 1: Distribution of study participants**

	Total	
	No.	%
Acute Cases	79	26.33
Chronic Cases	71	23.67
Controls	150	50.00
Total	300	100.00

Distribution of study participants according to Sex: Among 150 cases, 100 (66.67 %) were male while in 150 controls, males were 105 (70.00%). Female cases were 50 (33.33%) while female controls were 45 (30.00%). Total males in study were 205 (68.33%) & Females were 95 (31.67%) as shown in Table 2 .

**Table 2: Distribution of study participants according to Sex**

Sex	Case		Control		Total	
	No.	%	No.	%	No.	%
Male	100	66.67	105	70.00	205	68.33
Female	50	33.33	45	30.00	95	31.67
Total	150	100.00	150	100.00	300	100.00

Table No. 2 reveals that among 150 cases, 100 (66.67 %) were male while in 150 controls, males were 105 (70.00%). Female cases were 50 (33.33%) while female controls were 45 (30.00%). Total males in study were 205 (68.33%) & Females were 95 (31.67%).

**Table 3: PANSS Score in Cases**

	Sex	N	Mean	Std. Deviation
Acute cases	Male	68	70.54	7.97
	Female	11	70.27	8.96
	Total	79	70.51	8.06
Chronic cases	Male	32	107.03	10.77
	Female	39	104.38	16.63
	Total	71	105.58	14.26
Total cases	Male	100	82.22	19.29
	Female	50	96.88	20.85
	Total	150	87.11	20.93

Mean PANSS score was  $87.11 \pm 20.93$  in 150 cases ( $82.22 \pm 19.29$  in males,  $96.88 \pm 20.85$  in females),  $70.51 \pm 8.06$  in 79 acute cases ( $70.54 \pm 7.97$  in 68 males,  $70.27 \pm 8.96$  in 11 females) and  $105.58 \pm 14.26$  in 71 chronic cases ( $107.03 \pm 10.77$  in 32 males,  $104.38 \pm 16.63$  in 39 females) shown in Table No. 3.

**Table 4: Comparison of cases and controls (N=300) w.r.t. disease**

	Group	N	Mean	Std. Deviation	'p' Value*
Calcium (mg / dl)	Control	150	9.92	0.42	0.000
	Case	150	8.94	0.44	

Table No. 4 shows that mean Calcium level was  $8.94 \pm 0.44$  mg/dl in case group while it was  $9.92 \pm 0.42$  mg / dl in control group. Unpaired 't' test revealed this difference significant ( $p = 0.000$ ).

**Table 5: Comparison in cases (N=150) w.r.t. stage of disease**

	Group	N	Mean	Std. Deviation	'p' Value*
Calcium (Mg / Dl)	Acute	79	9.01	0.48	0.028
	Chronic	71	8.85	0.37	

Table No.5 shows that in acute cases of schizophrenia mean Calcium level was  $9.01 \pm 0.48$  mg/dl while it was  $8.85 \pm 0.37$  mg/dl in chronic cases. This difference was found significant ( $p = 0.028$ ) when unpaired t-test was applied.

**Table 6: Correlations between trace elements & PANSS**

	Spearman's Correlation Coefficient ( $\rho$ )	'p' Value
Acute cases (N=79)	0.209	0.064
Chronic cases (N=71)	0.002	0.987

The correlation between Trace elements and PANSS among cases is shown in table No 6. Among acute cases Calcium was showing positive correlation with PANSS. Among chronic cases serum Calcium was positively correlated with PANSS ( $p > 0.05$ ). None of these correlation was statistically significant ( $p > 0.05$ ) when spearman's correlation coefficient ( $\rho$ ) was calculated.

## Discussion

Light of the literature shows that people suffering from serious mental illness (SMI), including schizophrenia, leading to a reduced lifespan compared with the rest of the population[19,20]. Calcium signaling dysfunction may constitute the central unifying molecular pathology in schizophrenia and capable of inducing structural and cognitive deficits in schizophrenia[21].

In our study, 63.33% cases of schizophrenia were hypocalcaemia. Mean serum Ca level of case group was  $8.94 \pm 0.44$  mg/dl as compared to control group where it was  $9.92 \pm 0.42$  mg/dl. This difference was found statistically significant ( $p = 0.000$ ).

Karim P et al also found decreased levels of calcium in schizophrenics but there results were non-

significant[22], which is in contrast to our study. The probable reason for this disparity may be due to differences in criteria used, methods of collection, processing, analyzing serum Ca levels in laboratory, composition of study population and it's dietary practices. Whereas, Rahman A found the hair concentration of Ca decreased significantly ( $p = 0.000$ ) in Scalp Hair Samples of Schizophrenic Patients compared with the controls and positive correlation of Ca with BMI in schizophrenic justifies the fact that calcium supplement is beneficial[23].

Calcium was decreased in chronic patients than acute cases and this difference was statistically significant ( $p < 0.05$ ). As serum Calcium was found significantly decreased in chronic cases as compared to acute cases, this may be because of some changed metabolism of Calcium in long duration schizophrenic patients by altering some hormonal

axis or substantial change in diet of patients may be responsible for lower intake of Calcium rich diet. None of the previously done studies included effect of duration of disease on serum trace element levels therefore it could not be discussed with other studies.

Serum Calcium was negatively correlated with PANSS in total cases. Serum Calcium was showing positive correlation with PANSS in acute cases. Serum Calcium was positively correlated with PANSS among chronic cases. None of these correlation was statistically significant ( $p > 0.05$ ) when spearman's correlation coefficient ( $\rho$ ) was calculated.

To the best of our knowledge, this is the first ever study on correlation between serum calcium and PANSS, furthermore studies on number of patients are required to show definite correlation between trace elements and PANSS.

### Conclusion

The present study illustrates that schizophrenic patients have reduced serum concentrations of calcium compared with healthy volunteers. In chronic patients, level of serum calcium was significantly low when compared to acute cases. It was found that there was significant correlation of serum calcium with chronicity of the patient group. We, thus recommend the altered serum levels of calcium is associated with the risk of schizophrenia which may require further study.

### Author declaration

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