e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(5); 151-155

Original Research Article

Evaluation of Serum Lead Levels in Schizophrenic Patients and Its Correlation with Stages of Disease & PANSS Score

Santosh Kumari Sharma, Atul Kumar Sharma

[1]Assistant Professor, Dept of Biochemistry, GMC, Kota, Rajasthan, India
[2]Associate Professor, Dept of Surgery, GMC, Kota, Rajasthan, India

Received: 30-03-2023 / Revised: 15-04-2023 / Accepted: 05-05-2023
Corresponding author: Dr. Santosh Kumari Sharma
Conflict of interest: Nil

Abstract

Background: Lead is associated with many diseases including psychiatric disorder and schizophrenia is one of them.

Aims: To find out serum level of Lead in schizophrenic patients and compare it with stage of disease and PANSS score.

Methods: This study was done in Dept of Biochemistry and Dept of Psychiatry, SMS Medical College, Jaipur. Serum lead was estimated on Atomic Absorption Spectrophotometer ECIL AAS 4141A.

Results: Serum lead levels were significantly higher in schizophrenic patients when compared to healthy subjects ($P < 0.05$). Though there was increased level of lead in chronic patients when compared with acute cases but this relation was not significant. When we Correlated serum Lead & PANSS among Total, Acute and Chronic cases, none of these correlations were statistically significant ($p > 0.05$).

Conclusions: A significant alteration in level of serum lead were found in schizophrenic patients when compared to the control group and comparison of serum Lead with the stage of disease and PANSS score was unable to find significant relation. This indicates that serum Lead may has important role in schizophrenia but furthermore studies on number of patients are required to show definite correlation of serum Lead with stage of disease and PANSS score.

Keywords: Psychiatric disorders, Schizophrenia, Lead, PANSS.

Introduction

Schizophrenia is characterised by significant impairments in perception and changes in behaviour including persistent delusions, hallucinations, disorganised thinking, highly disorganised behaviour, or extreme agitation like symptoms. People with schizophrenia may experience persistent difficulties with their cognitive functioning. Schizophrenia affects approximately 24 million people or 1 in 300 people worldwide [1]. People with schizophrenia have a life expectancy 10-20 years below that of the general population [2].

Literature suggests that aetiopathogenesis and progression of psychiatric disorders including schizophrenia may have a correlation with altered levels of trace elements.[3-7]

Lead is a neurotoxic metal and exposure to lead is widely recognized as a major risk factor for several human diseases, and the structure of industrial ecological systems

has made exposure to lead unavoidable for most people alive today. [8] Alterations in blood lead levels of Lead were found in many psychiatric disorders and it is speculated that reducing blood lead levels in psychiatric patients may contribute to an improvement in symptoms in psychiatric disorders.[9-12]

As there was scarcity of literature on assessment of serum lead levels in schizophrenic patients and its association with chronicity of disease, so we undertook the present study to explore the status of serum Lead with the schizophrenic patients and also correlated this with stage of disease and PANSS score.

Material and Methods

This study was conducted on schizophrenic patients and healthy controls in Department of Biochemistry and Psychiatric Centre at SMS Medical College, Jaipur (Rajasthan). In this hospital based comparative analysis 150 women and men attending OPD of psychiatric centre with schizophrenia served as study group.

Study Population: 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. On the basis of duration, symptoms of illness and PANSS score [13,14] 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.

Eligibility Criteria:

A. Inclusion Criteria:

1. Subjects aged more than 15 years.
2. Subjects without any metabolic disorder.
3. Subjects providing consent to be included in the study.

B. Exclusion Criteria:

1. Subjects taking trace elements supplementation.
2. Subjects with a history of drug abuse.
3. Subjects having chronic systemic diseases such as diabetes mellitus, hypertension, severe head injury or seizure, and inflammatory diseases.
4. Subjects not cooperative.
5. Subjects not willing to participate.

A written detailed informed consent was obtained from the patients or their relatives after explaining the nature of the study and tests to be carried out, prior to the enrollment in the study. After obtaining their informed written consent, their PANSS score was assessed by an expert psychiatrist. PANSS score were recorded on a pre-designed semi-structured Performa.

All the enrolled subjects underwent laboratory workup as follows; Venous blood (7ml) was collected from antecubital vein by using aseptic techniques into a metal free vial. Samples were left standing at room temperature for 20 minutes. Subsequently the serum was separated by centrifuging at 3000 rpm for 15 minutes and preserved at -20°C until assay.

Atomic Absorption Spectrophotometer ECIL AAS 4141A was used to estimate the serum Lead. ECIL's Atomic Absorption Spectrophotometer (AAS) is a PC based instrument for absorption and emission analysis. It is used for quantitative element analysis by measuring the absorbance of a sample atomized in a flame. The data processing and partial control of the instrument are done by P. C.

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.

Result

Table No. 1 shows that mean Lead level was 5.49 ± 1.10 µg / dl in case group while it was 4.52 ± 1.10 µg / dl in control group. Unpaired 't' test revealed this difference significant (p = 0.000).

Table No. 2 shows that in acute cases of schizophrenia mean Lead level was 5.41 ± 1.18 µg / dl while it was 5.58 ± 1.01 µg / dl in chronic cases. This difference was not found statistically significant (p = 0.359) when unpaired t-test was applied.

Table 1: Comparison of cases and controls (N=300) w.r.t. disease

	Group	N	Mean	Std. Deviation	'p' Value*
Lead (µg / dl)	Control	150	4.52	1.10	0.000
	Case	150	5.49	1.10	

Table 2: Comparison in cases (N=150) w.r.t. stage of disease

	Group	N	Mean	Std. Deviation	'p' Value*
Lead (µg / dl)	Acute	79	5.41	1.18	0.359
	Chronic	71	5.58	1.10	

Table 4: Correlations between serum Lead & PANSS among Total cases (N=150), Acute cases (N=79) and Chronic cases (N=71)

		PANSS
Total cases	Spearman's Correlation Coefficient (ρ)	0.024
	'p' Value	0.768
Acute cases	Spearman's Correlation Coefficient (ρ)	0.011
	'p' Value	0.927
Chronic cases	Spearman's Correlation Coefficient (ρ)	-0.150
	'p' Value	0.213

Table No. 3 shows correlation between serum Lead & PANSS among Total cases (N=150), Acute cases (N=79) and Chronic cases (N=71) It was found that Pb had positive correlation with PANSS in total case and acute cases and negative correlation with PANSS in chronic cases however none of these correlations was statistically significant (p > 0.05), when spearman's correlation coefficient (ρ) was calculated.

Discussion

previous studies suggest that exposure of Pb is associated with elevated risk of psychotic disorders in life.[12,15] and this exposure to lead has been accompanied by reduced intelligence, memory, analysis, reading, visual, motor, and other skills. Moreover, the exposure time of this metal was found to be effective in creating anxiety, depression, and phobias.[16]

Based on the findings of this study, the lead levels were significantly higher in schizophrenic patients than in healthy subjects (P <0.05). Though there was increased level of lead in chronic patients when compared with acute cases, but this relation was not significant. When we Correlated serum Lead & PANSS among Total, Acute and Chronic cases, none of these correlations was statistically significant (p > 0.05).

Some studies found significantly higher values of Lead in schizophrenic patients than controls and even few patients were having high values of Lead.[17] While other found significantly increased Pb in newly diagnosed drug-free schizophrenic patients and no significant difference of Pb in Schizophrenic patients on antipsychotic medication.[18] In our study Lead was found 5.49±1.10 µg/dl which is significantly higher than controls who had Pb values 4.52±1.10 µg/dl. However, in our study none of the patients in both groups was having high / low values of Pb, which again may be due to difference in criteria for normality used or enlarged study population. As Pb is a toxic trace metal whose elevated level has been implicated in schizophrenia, a mechanism that will decrease blood Pb level may be helpful in the management of schizophrenia.[18]

In contrast, Karim P et al concluded that analysis of serum Pb indicated a trend of decreasing serum Pb in schizophrenics, but it was found nonsignificant when compared to the controls.[19]

Limitations

1. Patients/ relatives were convinced very hardly to provide consent and blood samples so selection bias may distort results.
2. Very few studies have been conducted so far on schizophrenic patients, did not include correlation between stage of disease and levels of serum Lead andiIt is a pioneer work to show correlation between serum Lead and PANSS, therefore scarcity of literature was limiting factor for discussion.
3. Findings on serum Lead related to schizophrenia show a variety of results that are difficult to interpret.

Conclusion

Based on the findings of this study, there was a significant alteration in level of serum lead in schizophrenic patients compared to the control group. When we compared serum Lead with the stage of disease and PANSS score, unable to find significant relation. Furthermore, studies on number of patients are required to show definite correlation of serum Lead with stage of disease and PANSS score.

Author Contributions: All authors participated in the formulation of the research questions and planning of the study. Sharma S K conducted data collection and Sharma S K participated in the data analysis. Both wrote the initial draft of the article and approved the final manuscript.

Funding: The study received no funding.

References

1. Institute of Health Metrics and Evaluation. Global Health Data Exchange (GHDx), (https://vizhub.healthdata.org/gbd-results/, accessed 14 May 2022).
2. Laursen TM, Nordentoft M, Mortensen PB. Excess early mortality in schizophrenia. Annual Review of Clinical Psychology, 2014;10,425-438.
3. Cao B, Yan L, Ma J, Jin M, Park C, Nozari Y, et al. Comparison1. of serum essential trace metals between patients with schizophrenia and healthy controls. J Trace Elem Med and Biol 2019; 51:79-85.
4. Santa Cruz EC, Madrid KC, Arruda MA, Sussulini A. Associa-4. tion between trace elements in serum from bipolar disorder and schizophrenia patients considering treatment effects. J Trace Elem Med Biol 2020; 59:126467.
5. Naim Uddin S. M, Sultana F, Giash Uddin M, Dewan SMR, Hossain M K, Islam M S. Effect of antioxidant, malondialdehyde, macro-mineral, and trace element serum concentrations in Bangladeshi patients with schizophrenia: A case-control

study: Health Sci Rep. 2021; 4:e291.
6. Awais M H, Aamir M, Bibi A, Ali S, Wand A, Safdar S A. Association of Trace Metals in Patients with Schizophrenia. Journal of the College of Physicians and Surgeons Pakistan: 2022, Vol. 32(02): 193-196.
7. Jeje O. A., Ajose O. A., Mosaku K. S. Adedeji T. A. Plasma and Tissue Trace Element Levels in Drug Naïve Patients with Schizophrenia in a Tertiary Health Facility in Southwest Nigeria. WAJM. 2022; 39(12): 1266–1272.
8. Pruss-Ustun A, Fewtrell L, Landrigan PJ, Ayuso-Mateos JL. Lead Exposure. In: Ezzati M, AD. Lopez AD, Rodgers A, Murray CJ, editors. Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors. Geneva: World Health Organization; 2004;1495-552.
9. González-Estecha M, Trasobares EM, Tajima K, Cano S, Fernández C, López JL, et al. Trace elements in bipolar disorder. J Trace Elem Med Biol 2011;25 Suppl 1:S78-83.
10. Kanofsky JD, Rosen WA, Ryan PB, Decina P, Fieve RR, Kanofsky PB. Lead levels in the hair of bipolar patients and normal controls. Med Hypotheses 1986; 20:151-5.
11. Reuben A, Schaefer D J et al Association of Childhood Lead Exposure with Adult Personality Traits and Lifelong Mental Health. JAMA Psychiatry. 2019;76(4):418-425.
12. Parsian H, Alipour P, Gholinia H, Saadat P, Comparison of Serum Lead and Cadmium Levels in Parkinson's Patients and Healthy Controls: Archives of Neuroscience. 2021;8(3).
13. Morrison AP, French P, Walford L, Lewis JW, Kilcommons A, Green AJ, Parker S, Bentall RP. Cognitive therapy for the prevention of psychosis on people at ultra-high risk. Br J Psychiatry.1991;185:291-7.
14. Kaplan HI and Sadock BJ. Schizophrenia. In: Comprehensive Textbook of Psychiatry. V. Vol.1, Williams and Wilkins. USA. 1989; 699-815.
15. Opler MGA, Buka SL, Groeger J, McKeague I, Wei C et al. Prenatal Exposure to Lead, δ Aminolevulinic Acid, and Schizophrenia: Further Evidence. Environmental Health Perspectives. 2008;116(11):1586-1590.
16. Mason LH, Harp JP, Han DY. Pb neurotoxicity: Neuropsychological effects of lead toxicity. *Biomed Res Int*. 2014; 2014:840547.
17. Stanley PC, Wakewe VC. Toxic trace metals in the mentally ill patients. Niger Postqrad Med J 2002;9(4):199-204.
18. Arinola G, Idonije B, Akinlade K, Ihenyen O. Essential trace metals and heavy metals in newly diagnosed schizophrenic patients and those on anti-psychotic medication. JRMS 2010;15 (5): 245-249.
19. Karim P, Hossain MI, Sadat AFMN, Nahar Z, Hossain MK, Hasnat A. Serum levels of Cadmium, Calcium, Lead and Iron in Schizophrenic Patients. Dhaka Univ J Pharm Sci 2006; 5(1-2): 9-13.