International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 8; Issue 06 (D); June 2019; Page No.19254-19257
DOI: http://dx.doi.org/10.24327/ijcar.2019.19257.3704

Research Article

STUDY OF VITAMIN B12 LEVELS AND IRON INDICES IN PATIENTS OF DEPRESSION AND SCHIZOPHRENIA

Nisha Kureshi, Bushra Fiza*, Rubal Singh and Maheep Sinha

Department of Biochemistry, Mahatma Gandhi Medical College & Hospital, Jaipur

A R T I C L E I N F O

Article History:
Received 4th March, 2019
Received in revised form 25th April, 2019
Accepted 18th May, 2019
Published online 28th June, 2019

Key words:

Vitamin B12, Depression, Schizophrenia, serum iron, TIBC, iron indices

A B S T R A C T

Introduction: Vitamin B12 plays a significant role in maturation of Red Blood Cells as well as nerve functions. Its diagnostic role in psychiatric patients of depression and schizophrenia has not been explored much.

Aims & Objectives: The present study was planned to explore the significance of serum vitamin B12 & iron indices in patient of depression & schizophrenia.

Material & Method: 50 psychiatric patients diagnosed for depression and schizophrenia visiting the Out-Patient department of Psychiatry were enrolled for the study. 50 age and sex matched healthy individuals contributed the control group. Serum levels of Vitamin B12, Hemoglobin, iron and Total Iron Binding capacity (TIBC) were estimated and compared with those of healthy control group.

Result: The present study reported significantly low levels of Serum vitamin B12, hemoglobin and iron levels in both depression and schizophrenia patients as compared to healthy control group. However, serum TIBC levels exhibited no significant difference.

Conclusion: The study suggests that vitamin B12 deficiency and anemia can both be a causative factor for development of depression or schizophrenia. Evaluation of these parameters in depression and schizophrenia patients is therefore, recommended.

INTRODUCTION

Depression is one of the most common form of mental disorder in the general population. It has a lifetime prevalence as high as 15%, is associated with substantial morbidity and mortality, and imposes a substantial burden in developing and developed countries. According to recent data, unipolar major depression is the fifth leading cause of worldwide disability, accounting for around 4% of the world's total burden of disease.[1] (DSM-4) Schizophrenia is considered one of the most severe psychiatric disorders and carries a lifetime risk of around 0.5-1%. Its early onset and tendency to chronicity suggests that its prevalence is relatively high.

Vitamin B_{12}, also called cobalamine, is a water-soluble vitamin that has a key role in the normal functioning of the brain and nervous system via the synthesis of myelin (myelinogenesis).[2] Vitamin B_{12} deficiency can potentially cause severe and irreversible damage, especially to the brain and nervous system.[3] At levels only slightly lower than normal, a range of symptoms including fatigue, lethargy, depression, poor memory, breathlessness, headaches, and pale skinetc have been reported. Incidence of Vitamin B12 deficiency has reasonably increased over time.

Corresponding author:* **Bushra Fiza
Department of Biochemistry, Mahatma Gandhi Medical College & Hospital, Jaipur

Psychiatric disorders usually have a typical medical management and biochemical investigations do not contribute to diagnosis, management or followup of the disease. However, like other diseases, there is possibility of biochemical derangements causing disease manifestation such as depression or schizophrenia.

The present study was planned to explore the importance of estimation of serum vitamin B_{12}, Iron, Total iron binding capacity (TIBC) in patients with depression & schizophrenia.

METHODOLOGY

The study was conducted in Department of Biochemistry in association with the Department of Psychiatry, Mahatma Gandhi Medical College & Hospital, Jaipur after seeking approval from Institutional Ethics Committee. Patients confirmed with depression (n=50) & schizophrenia (n=50) based on DSM-V / ICD 10 criteria along with 50 age and sex matched healthy control subjects were enrolled for the study. Subjects below 18 and more than 65 years of age and those suffering from other psychiatric disorders were excluded. Blood samples were collected using standard aseptic techniques and analyzed for Vitamin B12 by enhanced chemiluminescence using VITROS reagents. Serum Fe and TIBC were estimated on VITROS 5600.

RESULTS

In the present study the age was compared among the control and depression group. The mean age of control group was 38.62±9.70 years & the depression group was 38.50±17.83 years. On comparing age was non-significant in both groups. On comparing the vitamin B_{12} levels between the control group & depression group the mean value of depression group was significantly lower (P< 0.0001) as compared to healthy control group.When the result of Fe level in control & depression group were compared, the mean Fe level in control group is 96.26±44.69 (µg/dl) & that of subject group was 59.28±78.89, were significant. On comparing the mean ±SD levels of Hb in control & subject group, the mean value of Hb in control group was 13.52±1.12 (g/dl) and that of depression group was 10.93±1.12. The P-value of distribution of Hb was <0.0001& results were significantly lower. (Table 1)

The levels of vitamin B_{12} in control & schizophrenia group was statistically significant with the P value 0.00. The mean level of vitamin B_{12} in control group was 566.80±23.96 (pg/ml) & schizophrenia group it is 265.90±33.25. (Table 2)

When Fe levels were compared among control group and schizophrenia group, the mean level of Fe in control group was 96.26±44.69 (µg/dl) & in subject group it was 67.25±64.97. The distribution among these two groups showed significant results with the P value 0.011. On comparing the TIBC levels in control & schizophrenia group, the mean TIBC level of control group was 328.36±63.47 (µg/dl) & that of schizophrenia group was 324.37±104.48. The value were non-significant among the two groups. On comparing distribution of Hb level among control group and schizophrenia group, the mean level of Hb in control group is 13.52±1.33 (g/dl) & in schizophrenia group it is 12.04±1.95. The results were statistically significant with the P value 0.00. (Table 2)

Table 1 Comparison of Control and Depression group

Parameter	Control (n=50)	Depression (n=50)	P-Value
Age (years)	38.62±9.70	38.50±17.83	NS
Vitamin B_{12}	566.80±231.96	354.20±228.22	0.00
Fe	96.26±44.69	59.28±78.89	0.06
TIBC	328.0±63.47	316.52±96.10	NS
Hemoglobin	13.52±1.33	10.93±1.12	0.00

Table 2 Comparison of Control and Schizophrenia group

Parameter	Control (n=50)	Schizophrenia (n=50)	P Value
Age	38.62±9.70	37.78±10.13	NS
Vitamin B_{12}	566.80±231.96	265.90±133.25	0.00
Fe	96.26±44.69	67.25±64.97	0.011
TIBC	328.0±63.47	324.37±104.48	NS
Hemoglobin	13.52±1.33	12.04±1.95	0.00

DISCUSSION

Depression is a common and serious medical illness that negatively affects how you feel, the way you think and how you act. (DSM-5) Depression causes bereavement, neglect, mental abuse, physical abuse, sexual abuse, and unequal parental treatment of siblings can contribute to depression in adulthood.[4] According to the study Henning T *et al*., 2003[5] elderly patient with vitamin B_{12} deficiency are more likely to have a depressive disorder. The present study reported low vitamin B12 levels in depression patients. According to Kim JM *et al*., 2008[6] incident depression was associated with lower base line levels of vitamin B_{12}.The Framingham study has demonstrated a prevalence of 12% among elderly people living in the community. According to the study of Phennix *et al*., 2000[7] physically disable women with vitamin B_{12} deficiency were twice as likely to have severe depression symptoms. Vitamin B_{12} is required for proper red blood cell formation, neurological function, and DNA synthesis.[8-10]The likely reason for low B12 levels in psychiatric disorders is due to its role in neurological functions.

Low vitamin B12 levels were also reported among patients of schizophrenia. Schizophreniais characterized by abnormal social behaviorand failure to understand reality.[11]

In schizophrenia, patient may experience hallucinations (most reported are hearing voices), delusions (often bizarre or persecutoryin nature), and disorganized thinking and speech. The last may range from loss of train of thought, to sentences only loosely connected in meaning, to speech that is not understandable known as word salad. Social withdrawal, sloppiness of dress and hygiene, and loss of motivation and judgment are all common in schizophrenia.[12]

Genetic and environmental factors play a role in the development of schizophrenia. People with a family history of schizophrenia who have a transient psychosis have a 20-40% chance of being diagnosed one year later.[13]

A study by Silver H[14],2000 on 644 bedridden psychotics reported that 78.3% of schizophrenic patients had vitamin B_{12} deficiency.

Among the iron indices, hemoglobin and serum iron levels were significantly lower in depression patients' group as compared to healthy controls. According to the study of Mu-Hong chen *et. al*.,2013[15] iron deficiency significantly associated with increased risks of depressive disorder and mental retardation and adolescents. According to the study of Lever-van Milligen *et. al*.,2014[16]showed that there is no association between depressive and/or anxiety disorders and Hb levels or anemia status. On the contrary Benton and Donohoe showed that depression is significantly associated with early fatigue and apathy and the symptoms were results were significant. The above finding are similar to those of Tiemeier H *et al*., 2002[17] who demonstrated that subject with vitamin B_{12} deficiency are nearly 70% more likely to develop depression.

Nagamine T *et. al*, 2016[18] in his study demonstrated that in schizophrenia patient with iron deficiency whose negative symptoms and antipsychotic-induced hyperprolactinemia were improved by iron supplementation.

On comparing the Hb levels among control group and schizophrenia group, the mean level of Hb was observed to be lower among schizophrenia patients. In the study of Saedisomeolia *et.al*.; 2011[19] there was no significant difference in hemoglobin and hematocrit concentration between schizophrenic patient and control.

According to Sung-Wan Kim *et .al*., 2018[20] study Iron deficiency may alter dopaminergic transmission in the brain. A study by Nelson C. *et al*.,1997[21] iron deficiency has been reported to alter both dopaminergic and serotoninergic transmission in the brain. This iron-dopamine interaction might therefore conceivably account for symptoms in patients

with schizophrenia. Iron deficiency was significantly associated with negative symptoms, implying a potential relationship between iron dysfunction and negative symptoms in patients with schizophrenia spectrum disorder.

Iron accumulates as the brain ages and may be linked to motor and cognitive dysfunction in the elderly.[22] Iron is also required for cell viability, as it is a constituent of proteins involved in DNA synthesis, cell proliferation, and energy metabolism [23]. Furthermore, iron is the most abundant transition metal in the brain, and is vital for a number of neurological functions including neurotransmitter synthesis, myelination of neurons, mitochondrial function, and electron transfer.[24,25]

Therefore, a sufficient iron supply is necessary for neuro developmental processes,[26] in fact, reductions in the iron supply at several stages of development result in long-term changes in monoamine neurotransmission that outlast the iron deficient periods.[27] Conversely, iron overload can cause cellular toxicity and neuronal damage via free radical formation and peroxidation of lipid membranes.[28] Previous study by the authors has reported higher serum homocysteine levels in patients of depression and schizophrenia.[29] Since Vitamin B12 plays an important role in utilization of homocysteine, further research on their correlation may be interesting to explore.

CONCLUSION

The present study concluded that vitamin B_{12} levels are significantly lower in both depression & schizophrenia patients. Serum iron and Hb levels were also found to be significant lower in the selected group of patients. Serum TIBC level were, however, non-significant among these groups. The study recommends further research on association of vitamin B_{12} with homocysteine and other minerals& thyroid profile.

Reference

1. Diagnostic and Statistical Manual of Mental Disorder 4th Edition Washington, DC, American Psychiatry 2013.
2. Miller A, Korem M, Almog R, Galboiz Y. Vitamin B12, demyelination, remyelination and repair in multiple sclerosis. J Neurol Sci. 2005 Jun 15;233(1):93-7.
3. Vitamin B_{12} or folate deficiency anemia - Symptoms. National Health Service, England. May 16, 2016. Retrieved February 16, 2017.
4. "Depression (major depressive disorder)". Angry outbursts, irritability or frustration, even over small matters "Irritability, Anger Indicators of Complex, Severe Depression".
5. Henning Tiemeier,H Ruud van Tuijl, Albert Hofman ,Amanda J Kiliaan, Monique MB Breteler;Plasma fatty acid composition and depression are associated in the elderly: the Rotterdam Study; July 2003, Pages 40–46.
6. Kim JM1, Stewart R, Kim SW, Yang SJ, Shin IS, Yoon JS; Predictive value of folate, vitamin B12 and homocysteine levels in late-life depression.Br J Psychiatry. 2008 Apr;192(4):268-74
7. Penninx BW, Guralnik JM, Ferrucci L, Fried LP, Allen RH, Stabler SP.Vitamin B(12) deficiency and depression in physically disabled older women: epidemiologic evidence from the Women's Health and Aging Study.Am J Psychiatry. 2000 May;157(5):715-21.
8. Robin MM, Mike T, Martin S. Clinical Feature. Chapter 1, An Atlas Schizophrenia. 2002: 7-8.
9. Jon B, David BS. Description of the depressive disorders. Chapter 4 and 7, An Atlas of Depression. 2002: 11-12.
10. World Health Organization. The ICD-10 Classification of Mental and Behavioural Disorders.Clinical descriptions and diagnosis guidelines. Geneva: WHO, 1992.
11. Heim C, Newport DJ, Mletzko T, Miller AH, Nemeroff CB. The link between childhood trauma and depression: insights from HPA axis studies in humans. Psychoneuroendocrinol. 2008 Jul 1;33(6):693-710.
12. World Health Organization (WHO). Schizophrenia Fact sheet N 397. Retrieved 3 February. 2016.
13. Drake RJ, Lewis SW. Early detection of schizophrenia.Cure Op Psychiatry. 2005 Mar 1;18(2):147-50.
14. Silver H. Vitamin B12 levels are low in hospitalized psychiatric patients. Isr J Psychiatry Relat Sci. 2000;37(1):41–5.
15. Mu-Hong Chen , Tung-Ping Su0, Ying-Sheue Chen , Ju-Wei Hsu1 , Kai-Lin Huang, et.al,Association between psychiatric disorders and iron deficiency anemia among children and adolescents: a nationwide population-based study,BMC Psychiatry 2013;131-16.
16. Lever-van Milligen BA1, Vogelzangs N2, Smit JH2, Penninx BW3.Hemoglobin levels in persons with depressive and/or anxiety disorders,2014 Apr;76(4):317-21
17. Henning Tiemeier, H. Ruud van Tuijl, Albert Hofman, John Meijer, Amanda J. Kiliaan, Monique M.B. Breteler, .Vitamin B12, Folate, and Homocysteine in Depression;Am J Psychiatry 2002; 159:2099–2101.
18. Takahiko Nagamine, Nobuyuki Yamaoka and Masaru Nakamura;Iron Depletion Affects Dopamine Neurotransmissions, CNPT7 2016; 9-10.
19. Saedisomeolia A, Djalali M, Moghadam AM, Ramezankhani O, Najmi L. Folate and vitamin B12 status in schizophrenic patients. J Res Med Sci. 2011;16 Suppl 1(Suppl1):S437–S441.
20. Kim, S. W., Stewart, R., Park, W. Y., Jhon, M., Lee, J. Y., Kim, S. Y., Yoon, J. S. Latent Iron Deficiency as a Marker of Negative Symptoms in Patients with First-Episode Schizophrenia Spectrum Disorder. Nutrients,2018;10(11)
21. Nelson, C.; Erikson, K.; Pinero, D.J.; Beard, J.L. In vivo dopamine metabolism is altered in iron-deficient anemic rats. J. Nutr. 1997, 127, 2282–2288.
22. Stankiewicz, J.; Panter, S.S.; Neema, M.; Arora, A.; Batt, C.E.; Bakshi, R. Iron in chronic brain disorders: Imaging and neurotherapeutic implications. Neurotherapeutics 2007, 4, 371–386.
23. Ganz, T.; Nemeth, E. Regulation of iron acquisition and iron distribution in mammals. Biochim. Biophys. Acta 2006, 1763, 690–699.
24. Moos, T.; Morgan, E.H. The metabolism of neuronal iron and its pathogenic role in neurological disease: Review. Ann. N. Y. Acad. Sci. 2004, 1012, 14–26.

25. Hare, D.; Ayton, S.; Bush, A.; Lei, P. A delicate balance: Iron metabolism and diseases of the brain. Front. Aging Neurosci. 2013, 5, 34.
26. Aguilar-Valles, A.; Flores, C.; Luheshi, G.N. Prenatal Inflammation-Induced Hypoferremia Alters Dopamine Function in the Adult Offspring in Rat: Relevance for Schizophrenia. P LoS ONE 2010, 5, e10967
27. Felt, B.T.; Beard, J.L.; Schallert, T.; Shao, J.; Aldridge, J.W.; Connor, J.R.; Georgieff, M.K.; Lozoff, B. Persistent neurochemical and behavioral abnormalities in adulthood despite early iron supplementation for perinatal iron deficiency anemia in rats. Behav. Brain Res. 2006, 171, 261–270
28. Gutteridge, J.M. Iron and oxygen radicals in brain. Ann. Neurol. 1992, 32, S16–S21
29. Singh R, Fiza B, Kureshi N, Sinha M. Study Of Plasma Homocysteine Levels In Patients Of Depression And Schizophrenia. IJSR. 2018; 8(7): 13-15

How to cite this article:

Nisha Kureshi *et al* (2019) 'Study of Vitamin B12 Levels and Iron Indices in Patients of Depression and Schizophrenia', *International Journal of Current Advanced Research,* 08(06), pp. 19254-19257.
DOI: http://dx.doi.org/10.24327/ijcar.2019.19257.3704

****