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Original Research Article

Assessment of Vitamin B12 and D Status in Patients Suffering from Neuro-Psychiatric Disorders: A Hospital Based Study in North Indian Population

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Abstract: Vitamin B12 and D are essential for normal functioning of human body and deficiency of both has become serious concern in recent times. Occurrence of various neurologic, psychiatric, and mood disorders due to deficiency of both vitamin B12 and 25(OH)D have been established. Present study was aimed to assess the levels of vitamin B12 and 25(OH)D in patients suffering from Neuro-Psychiatric disorders visiting a tertiary care hospital in North India. The cross-sectional descriptive study included 150 patients (75 neurology and 75 psychiatry group respectively) and 75 healthy controls. Serum levels of vitamin B12 and 25(OH)D were estimated. The data was analyzed statistically and $p < 0.05$ was considered significant. The levels of Vitamin B_{12} and 25(OH)D were significantly decreased in sera of neurology and psychiatry group in comparison to healthy control. Comparison among patients revealed significant decrease in vitamin B12 and 25(OH)D levels in sera of psychiatry group than neurology group. The deficiency state of both vitamin B12 and 25(OH)D is very common in Indian subcontinent but often goes unnoticed. Although role of 25(OH) D in neuro psychiatric disorders is still being explored, deficiency of both certainly contributes appreciably towards occurrence of neuropsychiatric illnesses. Therefore we emphasize that screening for deficiency of both vitamins in neuropsychiatric patients should be suspected and evaluated.
Keywords: Vitamin B12, Vitamin D, neuropsychiatry, deficiency.

INTRODUCTION:

Vitamin deficiencies are a common problem worldwide, with deficiency of both vitamin B12 and D being recognized as a serious health concern over the past decade. In recent times numerous studies have been conducted which highlight the link between suboptimal nutritional status of vitamin B12 and 25(OH) D with increased risk of neuropsychiatric illnesses [1].

The role of vitamin B12 in neurological and psychiatry illnesses is well established since it is essential for synthesis of S-adenosyl methionine and is involved in the metabolism of proteins, phospholipids and neurotransmitters. Its deficiency leads to several neurological manifestations and affects all age groups [2]. On the other hand till recent past, 25(OH)D deficiency had been reported to be associated with abnormalities in skeletal ailments like rickets, osteomalacia and osteoporosis, involving calcium and phosphorus metabolism. Now the perspective has widened and it has been linked to non skeletal illnesses like certain cancers, autoimmune disorders, cardiovascular diseases [3] and the neuropsychiatric disorders like depression [4-7] and cognitive impairment [8,9].

The major source of 25(OH)D is sunlight as most dietary sources are not adequately rich in their 25(OH)D content [10].However, 25(OH)D deficiency is widely prevalent even in those areas of the world that receive ample sunlight like, Saudi Arabia, Australia and India according to several studies [11-13]. Social, cultural and economical heterogeneity greatly influence dietary pattern of Indian population. The prevalence of subnormal Vitamin B12 concentration in elderly varies from 3-40.5% depending on the cut-off used for defining deficiency of the cobalamin level in serum [14]. In developing countries, deficiency is much more common, it starts in early life and persists across the life span; also the prevalence of deficiency increases with age [15].Therefore the present study was planned to study the status of vitamin B12 and D in patients suffering from neuropsychiatric disorders in our hospital.

MATERIALS AND METHODS:

Subjects

The cross-sectional descriptive study was conducted in the Department of Biochemistry of a tertiary care teaching hospital in North India over a period of four months from February 2016 to May 2016. All the records of the patients were screened where vitamin B12 and 25(OH) D were assayed. Data on vitamin B12 and 25(OH) D level, age and sex was collected. The study included 150 patients (75 patients each in neurology and psychiatry group) according to their clinical diagnosis and the outpatient department they were visiting. The third group consisted of equal number of age and sex matched healthy controls. Patients with history of liver disease, renal disease, chronic infections, malignancies, hematological diseases present in the record were excluded.

Biochemical Analyses

The vitamin B12 and 25(OH) D levels in sera of patients and controls were estimated by Roche Cobas e411 analyzer using electrochemiluminescence immunoassay (Manheim Germany) using commercially available kits from Roche. Results for serum vitamin B12 levels were reported in pg/ml (normal range 211-946).The biochemical vitamin B12 deficiency was defined at a concentration below < 200 pg/ml [16, 17]. The 25 (OH) D status was defined based on serum 25-hydroxycholecalciferol (25(OH) D) concentration as sufficiency > 30 ng/ml, insufficiency 20.0-30.0 ng/ml and deficiency < 20 ng/ml [18].

Statistical Analyses

All the data so collected was duly recorded and was compiled; results and observations drawn and statistically analysed using Mean, Standard deviation, one way analysis of variance (ANOVA), and Tukey HSD test. Values were expressed as mean ± standard deviation (SD) and p value <0.05 was considered statistically significant.

RESULTS:

A total of 150 patients fulfilling inclusion criteria were included in this study. Out of the total 150 patients, there were 96 men (64%) and 54 women (36%) in study group. In Neurology group there were 50 males and 25 females where as in psychiatry group there were 46 males and 29 female subjects. In control group, there were 50 male and 25 female [Table1].

Table 1: Comparison of serum vitamin B12 and 25(OH) D levels in study population

	Psychiatry Group n=75	Neurology Group n=75	Control Group n=75
Age (years)	33.12 ± 9.13	32.23 ± 8.69	32.56 ± 9.88
Gender Male	62.66%	65.33%	66.66%
Female	37.34%	34.67%	33.34%
Duration of illness	3.2± 1.8 (8months-6years)	3.5± 1.6 (6months-7years)	None
Vitamin B12 (pg/ml)	295± 162***† (82-899)	411± 236*** (96-1433)	574 ± 305 (258-2000)
Vitamin 25(OH)D (ng/ml)	15.78± 10.85*** (3.2-35.6)	18.01± 12.49** (3.1-33.2)	25.15± 16.0 (11.3- 69.1)

*p < 0.05, **p < 0.001 ***p < 0.0001 in comparison with control group

†p < 0.05 in comparison with Neurology group. Parameter values are Mean ± S.D

The Vitamin B12 levels were found to be significantly decreased in sera of neurology and psychiatry group patients when compared to healthy controls (p<0.0001).We also observed a significant difference between psychiatry and neurology group on comparing Vitamin B12 levels in their sera (p<0.05) (Fig.1).In neurology group, 28 patients (37.3%) whereas in psychiatry group 43 patients (57.3%) were found to be Vitamin B12 deficient (with serum Vitamin B12 levels below 200 pg/ml).

The serum 25(OH)D levels were significantly reduced in psychiatry (p<0.0001) as well as in neurology group (p<0.001) as compared to healthy subjects. However, no statistically significant difference was observed in serum 25(OH)D levels when neurology and psychiatry group were compared(Fig.2).Out of 75 neurology group patients,26 patients(34.6%) were found to have Vitamin D deficiency, 39 patients (52%) had insufficient levels of Vitamin D. Ten patients(13.4%) of this group had sufficient Vitamin D levels. Among patients with psychiatric disorders, 29 (38.7%) had deficient levels; 37(49.3%) had insufficient and 9 (12%) had sufficient levels of Vitamin D.

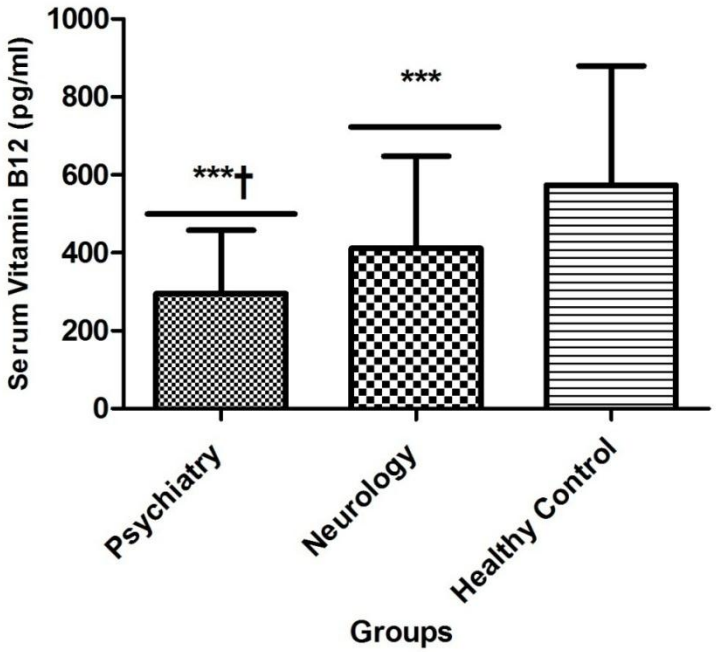

Fig.1 Comparison of serum vitamin B12 levels in psychiatry and neurology patients with healthy controls
Where, ***p < 0.0001 in comparison with Healthy control group
† p < 0.05 in comparison with neurology group

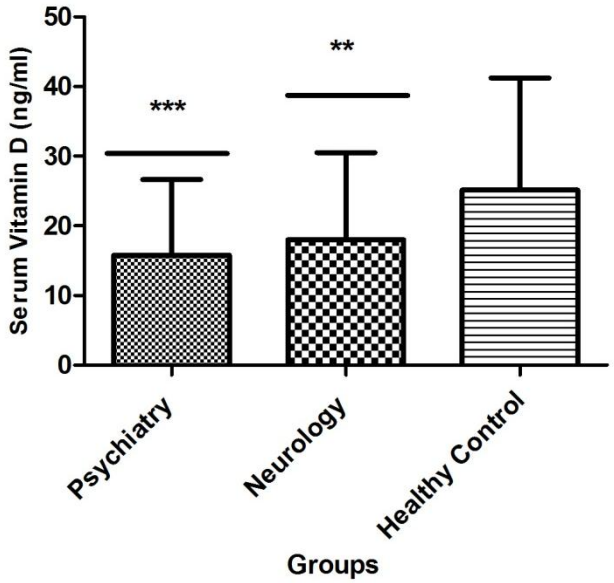

Fig.2 Comparison of serum 25(OH)D levels in psychiatry and neurology patients with healthy controls
Where, **p < 0.001 ***p < 0.0001 in comparison with Healthy control group

DISCUSSION

Vitamin B12 deficiency causes a wide spectrum of neurological manifestations like neural tube defects, movement disorders, seizures, chronic fatigue syndrome, as well as cognition and behavior disorders [19-21]. Psychiatric manifestations like delirium, delusions, hallucinations, confusion, memory changes, depression, acute psychotic states and schizophreniform states resulting from deficiency of vitamin B12 have been described [22]. Vitamin B12 is essential for synthesis of S-adenosyl methionine from homocysteine. As we know that, S-adenosyl methionine is involved in the metabolism of proteins, phospholipids and neuro transmitters, therefore a defect in methylation is

hypothesized to be the biochemical basis of neuropsychiatric manifestations of vitamin B12 deficiency [23].

Earlier surveys have shown that a large number of psychiatric patients have low serum B12 levels, ranging from 6-15% [24]. Lindenbaum *et al*. reported serum cobalamin deficiency in 28% of 141 patients with neuropsychiatric disorders [25]. A high prevalence of low serum vitamin B12 levels have been reported in Alzheimer's disease [26].Previous studies have documented prevalence of 29%, 44% and 70.8% among patients suffering from primary dementia, depression and schizophrenia respectively [27-29]. This study has evaluated the status of vitamin B12 in sera of patients suffering from neurological and psychiatric disorders by the means of clinical case records supported by the laboratory data. In the present study, we found significantly lower levels of vitamin B12 in the sera of group consisting of psychiatry and neurology patients. In this study, we found that 57.3% patients were vitamin B12 deficient in the psychiatry group. Among neurology group, 37.3% were deficient in vitamin B12 (with serum Vitamin B12 levels below 200 pg/ml).Thus, the vitamin B12 deficiency was found to be more prevalent in the psychiatry group than the neurology group.

Earlier studies have linked neuropsychiatric disorders like dementia, schizophrenia, epilepsy, and multiple sclerosis with vitamin D deficiency [30]. Triggiani L *et al*. studied association between vitamin D deficiency and neurological disorders and found that 58.1% of the subjects were vitamin D deficient. They also reported that Vitamin D deficiency was more frequent in patients with stroke (62.6%), polyneuropathies (63.0%), spine lesions (63.3%), amyotrophic lateral sclerosis (66.7%), and ataxic syndromes (72.7%) [31]. McGrath JJ et al. conducted a population based case control study and linked low vitamin D status with high risk of schizophrenia in neonates [32]. Buell JS et al. reported a higher prevalence of dementia among elderly participants (aged 65–99 years) with 25 (OH) D insufficiencies (≤20 ng/mL) (30.5%) [33]. Vitamin D3 supplementation resulted in improved control of seizure in patients suffering from pharmacoresistant epilepsy in a pilot study conducted by Holló A [34]. In another study, mean level of 25(OH) D was found to be decreased in patients with Parkinson's disease as compared to healthy subjects. Moreover, lower levels of 25(OH) D were associated with severe postural instability [35]. Similarly, Zhao Y and Sun Y observed decreased 25(OH) D in Alzheimer's disease patients in a meta-analysis [36]. Vitamin D deficiency was also seen in a higher proportion of multiple sclerosis cases (71.8%) than healthy controls [37]. Lower vitamin D levels were associated with depression in a study conducted among older primary care patients aged ≥60 years in the United States [38]. We also observed significantly reduced serum 25(OH) D levels in psychiatry ($p<0.0001$) as well as in neurology group ($p<0.001$) as compared to healthy subjects. Vitamin D deficiency was prevalent in 34.6% patients of neurology group and 38.7% patients of psychiatry group. Further, 52% neurology group patients and 49.3% psychiatry group patients had insufficient Vitamin D levels.

Our results indicate a considerable occurrence of vitamin D deficiency in patients suffering from neuro-psychiatric diseases in Indian population. Among Indian population with low dietary calcium intake, a prevalence of varying degrees (50-90%) has been reported [39,40].The observed deficiency of vitamin D among patients with neurological and psychiatric disorders in this study may be due to their less possibility of spending time outdoors. Also, studies have suggested that antipsychotic medications may inhibit synthesis of vitamin D [41].

We conclude that the deficiency of vitamin B12 and D is a prevalent health problem with neuro psychiatric consequences. Prevalence of vitamin B12 and D deficiency in the present study connotes that supplementation of vitamin B12 and D should be routinely prescribed in patients suffering from neuropsychiatric disorders since these two micronutrients play a crucial role in mental and physical health.

Limitations

The data on dietary intake of Vitamin B12 and D including supplements was not collected during the course of this study. Also, the duration of sun exposure in the study population was not recorded.

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