Study of Vitamin C in Depression at a Tertiary Care Teaching Hospital in Rural Area

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ABSTRACT

BACKGROUND

Depression is a state of extreme sadness that reaches a point where it affects a person's day to day activities and also disturbs socio-occupational functioning. Several molecular changes were found in the pathogenesis of depression. Natural antioxidants in the body like vitamin A, vitamin C and vitamin E were found to be deranged in patients suffering from depression. In many studies deficient levels of vitamin C are constantly observed in patients suffering from depression.

METHODS

The present observational cases-control study was carried out in the Department of Physiology, Rural Medical College, Loni in collaboration with the Department of Psychiatry. Study was done over a period of four years from 2010 to 2014. 183 subjects were recruited for the study. 83 patients were diagnosed with depression and 100 were normal individuals without any psychiatric disorder. A non-probabilistic international sampling method was adopted for the selection of subjects.

RESULTS

Significant decrease in vitamin C was observed in patients suffering from depression as compared to normal healthy individuals (p value <0.05).

CONCLUSIONS

Vitamin C levels decreased significantly in depression. The present study concludes that determination of Vitamin C levels plays an important role in the diagnosis, treatment and monitoring of patients with depression.

KEYWORDS

Vitamin C, Depression, Antioxidant

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BACKGROUND

Psychiatric disorders are major contributors to the burden of disease and disability worldwide; depression is one of those psychiatric disorders.[1] Jahan C et al (2014) predicted that by 2020 depression will be the second leading cause of disability and illness worldwide.[2] Atypical depression has symptoms such as hypersomnia, fatigue, increased appetite, weight gain, mood reactivity and sensitivity to interpersonal rejection. Metabolic disturbances, especially those related to obesity, are common in atypical depression. Metabolic dysregulation occurs in a variety of conditions, including cardiovascular disease, diabetes, obesity, impaired cognition, and even cancer, and is therefore a possible link mechanism between depression and incident somatic conditions.[3] Depression is a state of extreme sadness that reaches a point where it affects a person's day to day activities and also disturbs socio - occupational functioning. Depression may have a relationship with vitamin C deficiency. In a clinical study when a group of patients were deprived of Vitamin C the symptoms like sad mood, reduced concentration, fatigue and hypochondriasis were increased. These patients were more anxious and more depressed as compare to patient without depravation of vitamin C.[4] Vitamin C perform many functions at molecular levels in the body. The synthesis of some neurotransmitters is dependent on vitamin - C. Vitamin C is a cofactor for dopamine beta – hydroxylase - 2 it is involved in the conversion of dopamine to nor - epinephrine.[5] Norepinephrine plays an important role in executive functioning regulating cognition, mood, interest, and intelligence, which are fundamental in social relationships.[6] Vitamin C is also a cofactor for tryptophan – 5 - hydroxylase which is required for the conversion of tryptophan to 5 - hydroxytryptophan during serotonin production. Vitamin C may therefore be valuable for patients with depression associated with low levels of serotonin.[7]

In a study to find out whether patients with generalized anxiety disorder (GAD) and depression have any difference in blood serum levels of vitamins A (β - carotene), C, and E in comparison to normal healthy controls and whether supplementation of adequate doses of vitamins A, E, and C leads to significant reduction in anxiety and depressive scores of the subjects. It was observed that patients with GAD and depression had significantly lower levels of vitamins A, C, and E in comparison to healthy controls. After supplementing these deficient vitamins in the diets of the subjects, a significant reduction in anxiety and depressive scores was observed.[8]

Major depression is marked by inflammatory processes, an increase in proinflammatory cytokines, a decrease in the number of neurons and neuro-progression, mitochondrial dysfunction and interruption of the hypothalamic – pituitary - adrenal axis.[9] The symptoms of depression of the disease imply that many regions of the brain are involved depressed. The images of the human brain have provided evidence for alterations in hemorheology and related parameters in regions of the brain such as the amygdala, thalamus, striatum, hippocampus, prefrontal cortex, and cingulate cortex.[10]

Vitamin C level decreased in Major Depressive Disorder (MDD) and at same time the serum levels of superoxide dismutase (SOD) and serum malondialdehyde (MDA) are increased.[11] Vitamin C prevents stress-induced cerebrocortical and hippocampal lipid peroxidation and SOD activity in mice. In addition, it also inhibits the glutathione reductase and glutathione peroxidase activities in a preclinical model.[12] The water - soluble vitamin C or ascorbic acid is one of the most important antioxidants in humans.[13] Vitamin C is a part of the intracellular antioxidant system with neuroprotective effects. Vitamin C also decreased psychological subjective stress.[14]

Many studies are done on Vitamin C in patient suffering from depression. Most of these studies are from urban population and metropolitan cities. But few studies are done in rural areas. So we decided to study Vitamin C in patient suffering from depression in the rural population of India.

METHODS

The present observational case - control study was carried out in the Department of Physiology over a period of four years from 2010 to 2014. Registration no. FN.24/2010 (PMT/PIMS/RC/2010/24 dt:06/01/2010) ---

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants. The intentional non - probability sampling method was used for those who meet the inclusion criteria.

For the selection of the control (Group I), the inclusion criteria were that the controls were free of depression and in the age group of 20 to 55 years, willing to participate in the study, while the exclusion criteria were history of psychotropic substance use and patients suffering from other comorbidities (HTN, COPD, asthma, diabetes).

For the selection of cases (Group II), the inclusion criterion was that the depression cases were diagnosed by a psychiatrist and in the age group 20 - 55 years, willing to participate in the study. The exclusion criteria were the history of consumption of psychotropic substances and patients suffering from other comorbidities (HTN, COPD, asthma, diabetes).The patient were rated according to the Hamilton depression scale.

Both groups were further in to three categories according to age. Category I (20 - 30 years), category II (31 - 40 years) and category III (41 - 55 years). Only male patients were included in the present.

With all aseptic precautions blood sample were collected from anti - cubital vein in plain bulb. The serum was separated by centrifugation at 3000 rpm for 10 minutes. Estimation of vitamin C was done by Ayekyaw method. 1978: 302-310.[15]

Normal range of vitamin- C in plasma is 0.7 -1.7 mg / dl.

Data analysis was done using SPSS version 22 for window p value < 0.05 taken as significant and p value >0.05 as non - significant.

RESULTS

Table 1 shows vitamin C levels in cases and controls. In all three categories vitamin C levels were significantly decreased in cases as compare to control groups.

Category I (20-30 years), (p value 0.01), Category II (31-40 years), (p value 0.02), Category III (41-55 years), (p value 0.01)

Statistically significant decrease in Vitamin C levels observed in cases as compare to controls in all the three categories (p value <0.05).

Anti-Oxidants	Control (Group I) n=100 Mean ± SD	Range	Depression Cases (Group II) n = 83 Mean ± SD	Range		P Value
Vitamin-C (mg / dl)						
Category I (26)	0.87 ± 0.06	0.8 -1.00	Category I (11)	0.8 ± 0.0	0.81 -0.84	0.01
Category II (38)	0.89 ± 0.14	0.1 -0.99	Category II (39)	0.8 ± 0.0	0.81 -0.84	0.02
Category III (36)	0.89 ± 0.06	0.81 -0.84	Category III (33)	0.8 ± 0.0	0.81 -0.84	0.01

Table 1. Comparison of Vitamin C in Group I and Group II

DISCUSSION

Many studies have reported that there is a definite decrease in vitamin C levels in patients suffering from depression. Vitamin C levels in patients with depression were compared with normal healthy subjects. Total 183 men were included in the present study consisting of 100 healthy normal controls and 83 patients suffering from depression. They belong to the age group 20 - 55 years and were subdivided into category I (20 - 30 years), category II (31 - 40 years) and category III (41 - 55 years). Only male patients were included in the present study.

In the present study, serum ascorbic acid or vitamin C was estimated. Estimated mean values of antioxidant vitamins were significantly low in patients with depression (Group II) as compared to the control group (Group I) (p value <0.05).

There are several studies done evaluating vitamin C in depression. The results similar to present study were observed by D'Souza B, et al who observed increase in lipid peroxidation and a decrease in vitamin C levels in schizophrenic patients. They suggested that it can cause an injury mediated by oxygen radicals in patient suffering from depression. Treatment with antioxidant like vitamins C in the early stages of the disease can prevent further oxidative damage, improving and preventing the possible deterioration of the neurological and behavioural deficits associated in schizophrenia.[16] Another study by Gautam M, et al also observed reduced vitamin C levels in both depressed subjects and generalized anxiety disorder (GAD) compared to normal healthy subjects. After the treatment with antioxidant vitamin C for six weeks, an improvement in depressive mood observed.[17] Dadheech G, et al also reported an increase in oxidative stress, along with decrease in antioxidant vitamins -C in patients suffering from schizophrenia (SCZ).[18] Bajpai A, et al in his study concluded that oxidative damage leads to increased oxidative stress. The body's antioxidant defence system try to counteract stress and it leads to altered antioxidant levels. Ascorbic acid, being one of the main free radical scavengers generated during the pathogenesis of major depression. It was found that it have a negative correlation with depression.[19]

However, there are other studies which show no changes in vitamin C levels in patient suffering from depression. The study by Liu T, et al reported no changes in vitamin C levels in depression; therefore, this study results related to vitamin C were not accordance to present study.[20] Similarly few other studies focusing on effect of Vitamin C supplement for improvement of depression does not observed any significant results. This was in line with a study that vitamin C level was not associated with depression symptoms in community - based adults.[21] Another explanation given for non - improvement is that although MDD is associated with oxidative stress the effect of antidepressants is independent of oxidative and anti - oxidative stress systems.[22] So from above studies it is clear that further research is needed with more studies on human beings. More research is needed on levels of vitamin C in depression and effect of vitamin C supplement on depression. Limitations of present study were done exclusively on males and so results are not applicable to females. The sample size was small and it is done particularly in subjects from rural population so results cannot be applied to general population.

CONCLUSIONS

Vitamin C levels were found to be decreased significantly in depressed patients compared to healthy subjects. The present study concludes that the determination of Vitamin C plays an important role in the diagnosis, treatment and monitoring of patients with depression. This study provides reference data for the further research in the evaluation and treatment of patients suffering from depression.

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