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Determination of serum Calcitriol and thyroid hormone levels amongst patients of depression: A hospital based survey

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Abstract

Background: Depression is a major health problem worldwide. It is estimated to be the second major burden for health issues by 2020 and 2030. It has been estimated that 350 million people worldwide are affected by depression. Light therapy is found to be advantageous for winter depression. Patients with depression have been documented with a dysfunctional hypothalamus-pituitary-thyroid axis. The aim of present study is to determine the levels of vitamin D, T3, T4 and TSH amongst patients suffering from depression and to establish the presence of absence of any relation between depression and levels of above mentioned hormones.

Materials and methods: All the patients who were diagnosed with unipolar depressive syndrome aged between 18 years- 50 years were included in the study. Only patients reporting for the first time and not taking antidepressants were involved in the study. Patients having any prior thyroid disorder, diabetes or hypertension were not included in the study. Blood samples of all the patients were collected from anticubital vein under complete aseptic conditions by a trained nurse. T3 and T4 were detected using competitive solid ELISA (enzyme linked immunosorbent assay).TSH was estimated using monoclonal antibodies. Vitamin D was estimated by a competitive test, where vitamin D of patient's serum competes with biotin Vitamin D conjugate (that was added simultaneously) for antivitamin D antibodies binding sites. The data was arranged in a tabulated form and student t test was applied to determine the significance. SPSS software was used for analysis.

Results: Mean levels of T3 amongst control was 118.4+/- 28.9 ng/dl and that amongst patients of minor depression was 74.9+/- 18.9 ng/dl. Patients with moderate depression had mean levels of 42.5+/- 23.4 ng/dl and patients of severe depression had mean levels of 44.3+/- 20.8 ng/dl. The p value was less than 0.05. Mean levels of T4 amongst control was 11.02+/- 2.43 ug/dl and that amongst patients of minor depression was 6.89+/- 1.97 ug/dl. Patients with moderate depression had mean levels of 6.60+/- 3.30 ug/dl and patients of severe depression had mean levels of 5.84+/- 2.85 ug/dl. The p value was more than 0.05. Mean levels of TSH amongst control was 4.21+/- 0.83 uU/ml and that amongst patients of minor depression was 3.67+/- 1.01 uU/ml. Patients with moderate depression had mean levels of 2.54+/- 0.99 uU/ml and patients of severe depression had mean levels of 2.89+/- 1.32 uU/ml. The p value was more than 0.05. Mean levels of calcitriol amongst control was 94.76+/- 32.11 nmol/L and that amongst patients of minor depression was 70.86+/- 27.21 nmol/L. Patients with moderate depression had mean levels of 69.48+/- 21.08 nmol/L and patients of severe depression had mean levels of 59.13+/- 18.53 nmol/L. The p value was more than 0.05.

Conclusion: T3 levels are lower in patients of depression which could further lead to subclinical hypothyroidism. The role of Vitamin D amongst depressive patients still remains controversial.

Keywords: calcitriol, depression, hypothyroidism, hypothalamus

Introduction

Unipolar depression or major depressive emotional disorder is an emotional disease that has negative influence on feelings, thoughts, behaviour and physical health [1]. It has a seasonal pattern and according to a study in US, it peaks during summers and winters [2]. It is the third leading cause of disability and has accounted for almost 4.4% of the total disability in 2002 [3]. It is estimated to be the second major burden for health issues by 2020 and 2030 [4]. It has been estimated that 350 million people worldwide are affected by depression [5]. Light therapy is found to be advantageous for winter depression [6]. Diseases like cancer, depression, psoriasis; schizophrenia and multiple sclerosis are more prevalent amongst patients with vitamin D deficiency [7-9].

Abnormal levels of thyroid hormones have also been implicated in psychiatric disorders like schizophrenia, personality disorders and major affective disorders [10]. Patients with depression have been documented with a dysfunctional hypothalamus-pituitary-thyroid axis [11, 12] Various authors have implicated an abnormality in thyroid hormone levels amongst depressive patients [13]. S.Y.Z. Sham *et al* have reported subclinical hypothyroidism amongst depressive patients [14]. The aim of present study is to determine the levels of vitamin D, T3, T4 and TSH amongst patients suffering from depression and to establish the presence of absence of any relation between depression and levels of above mentioned hormones.

Materials and Methods

The study was carried out in the institute, state during a period from June, 2016- September, 2016. All the patients who were diagnosed with unipolar depressive syndrome aged between 18 years- 50 years were included in the study. Only patients reporting for the first time and not taking antidepressants were involved in the study. Patients having any prior thyroid disorder, diabetes or hypertension were not included in the study. All the patients were divided into mild, moderate and severe category as per DSM-IV and ICD- 10 criteria. Group I

patients were taken as controls, who were not suffering from any psychiatric ailment.

Procedure

After obtaining a prior informed consent, blood samples of all the patients were collected from anti cubital vein under complete aseptic conditions by a trained nurse. The sample was divided into three parts. In the first sample, T3 and T4 were detected using competitive solid ELISA (enzyme linked immunosorbent assay). In the second sample TSH was estimated using monoclonal antibodies. In the third sample Vitamin D was estimated by a competitive test, where vitamin D of patient's serum competes with biotin Vitamin D conjugate (that was added simultaneously) for antivitamin D antibodies binding sites. In the end streptavidin HRP conjugate was added and then addition of TMB reagent detected the reaction.

The data was arranged in a tabulated form and student t test was applied to determine the significance. SPSS software was used for analysis.

Results

A total of 71 subjects were enrolled in the study, 28 were control patients and 43 patients were suffering from depression. Out of these 43 patients 28 were males and 26 females. The mean age of the patients was 37.41 +/- 11.20 years. There were 9 patients of severe depression, 28 of moderate depression and 6 patients of mild depression.

Table 1 show the thyroid and calcitriol profile of the control and the subjects. Mean levels of T3 amongst control was 118.4+/- 28.9 ng/dl and that amongst patients of minor depression was 74.9+/- 18.9 ng/dl. Patients with moderate depression had mean levels of 42.5+/- 23.4 ng/dl and patients of severe depression had mean levels of 44.3+/- 20.8 ng/dl. The p value was less than 0.05. There was a significant difference in the levels of T3 amongst the control and the subjects.

Mean levels of T4 amongst control was 11.02+/- 2.43 ug/dl and that amongst patients of minor depression was 6.89+/- 1.97 ug/dl. Patients with moderate depression had mean levels of 6.60+/- 3.30 ug/dl and patients of severe depression had mean levels of 5.84+/- 2.85 ug/dl. The p value was more than 0.05. There was no significant difference in the levels of T4 amongst the control and the subjects.

Mean levels of TSH amongst control was 4.21+/- 0.83 uU/ml and that amongst patients of minor depression was 3.67+/- 1.01 uU/ml. Patients with moderate depression had mean levels of 2.54+/- 0.99 uU/ml and patients of severe depression had mean levels of 2.89+/- 1.32 uU/ml. The p value was more than 0.05. There was no significant difference in the levels of TSH amongst the control and the subjects.

Mean levels of calcitriol amongst control was 94.76+/- 32.11 nmol/L and that amongst patients of minor depression was 70.86+/- 27.21 nmol/L. Patients with moderate depression had mean levels of 69.48+/- 21.08 nmol/L and patients of severe depression had mean levels of 59.13+/- 18.53 nmol/L. The p value was more than 0.05. There was no significant difference in the levels of calcitriol amongst the control and the subjects.

Table 1: Mean levels of calcitriol and thyroid hormone amongst control and subjects

Levels	Control	Mild Depression	Moderate Depression	Severe Depression	P Value
T3 (ng/dl)	118.4 +/- 28.9	74.9 +/- 18.7	42.5 +/- 23.4	44.3+/- 20.8	<0.05
T4(ug/dl)	11.02+/-2.43	6.89+/- 1.97	6.60+/- 3.30	5.84+/-2.85	>0.05
TSH (uU/ml)	4.21 +/- 0.83	3.67 +/- 1.01	2.54+/- 0.99	2.89 +/- 1.32	>0.05
Calcitriol (nmol/L)	94.76 +/- 32.11	70.8 6+/- 27.21	69.48 +/- 21.08	59.13 +/- 18.53	>0.05

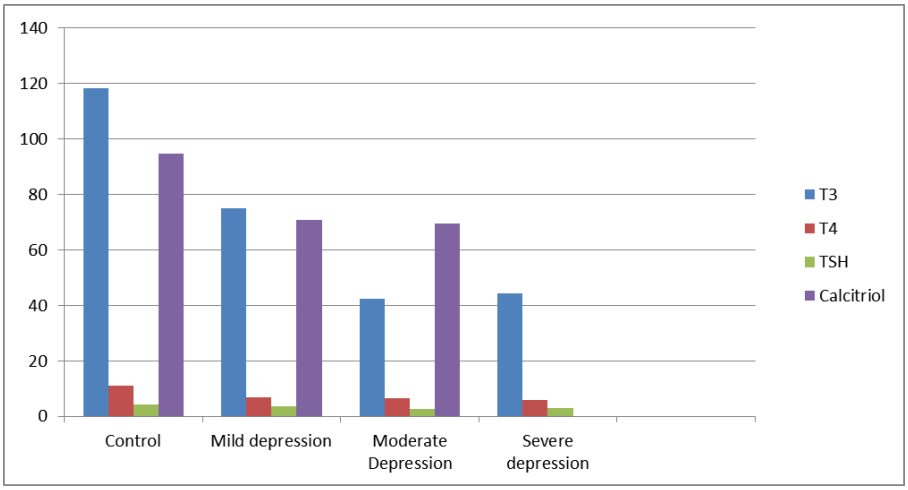

Fig 1: Mean levels of thyroid hormone and calcitriol amongst subjects

Discussion

Vitamin D deficiency has been seen in patients suffering from autism, alzheimer's disease, multiple sclerosis and parkinson's disease [15]. The centre in brain that is thought to be responsible for depression is hippocampus. Vitamin D receptors are found in hippocampus, which could be the possible explanation for the reason that vitamin D deficiency has role in psychiatric problems. There is not much evidence in the literature to favour this fact. In a study conducted by Howland RH [16], he failed to establish any possible relationship between the two. It has always been a matter of controversy. In a meta-analysis of randomised control trials, the conclusion came out to be that there is a unequivocal effects of vitamin D supplements as an antidepressant [17]. According to our present study, there was

no significant relation between the levels of vitamin D and depression. Though patients with depression had decreased levels of vitamin D but the levels were comparable to those of controls. In a study conducted by Pallavi SN *et al* [18], they found out that 50% of the patients suffering from depression had vitamin D deficiency and considerable improvement was seen amongst these patients after vitamin D supplementation.

The relationship between brain and thyroid function was first established in the year 1786 by Parry [19]. This was further confirmed by 1888 by the committee of clinical society of London, as 36% of the patients suffering from myxoedema had symptoms related to insanity. According to a study conducted by Boswell *et al* [20], 50% of the patients suffering from hypothyroidism had symptoms of depression and 28% of hyperthyroidism patients had symptoms of depression. According to our study the levels of T3 varied significantly amongst the case and the controls. T3 levels were markedly less in patients of depression. Our study was in accordance with the study conducted by Tappy *et al* [21] in 1987 and Orsulak *et al* [22]. In 1995 who demonstrated low levels of T3 amongst patients suffering from depression. In a study conducted by Bauer *et al* in 1994 [23]. 62% of the patients had low levels of T3. In our present study, the TSH levels had no significant difference between the control and the cases. Similar results were also demonstrated by Stewart in 1982[24] and Fava *et al* in 1995 [25]. On the contrary, in the study conducted by Maes *et al* [26] and Baver *et al* [23] in 1994the levels of TSH were markedly lower amongst patients of depression.

Our study was associated with few limitations like the sample size of our study was very small and the number of patients in the control group were not at par with the patients of case group. There was no categorization given to the age of the patients.

Conclusion

According to this study, we can conclude that T3 levels are lower in patients of depression which could further lead to subclinical hypothyroidism. The role of Vitamin D amongst depressive patients still remains controversial as according to our study, no significant difference was found amongst the case and controls.

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