

## Original Research Article

# Thyroid profile in depression: a cross-sectional study from North-East India

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## ABSTRACT

**Background:** Thyroid function disorder is a common feature in depression, with mixed type of response. Some cases are associated with hyperthyroidism and most commonly hypothyroidism. Unipolar and bipolar depressions are also related differently in consideration to thyroid status. This study comprises of assessment of the thyroid disorder prevalence in depressive patients and comparative analysis among unipolar and bipolar groups.

**Methods:** Study consisted of 161 unipolar and 160 bipolar cases of depression as diagnosed by ICD 10 criteria supported by MINI. Thyroid profiling was done against common thyroid hormones TSH, T3, T4 and FT4 by standard method.

**Results:** Gender wise males were dominant with majority in bipolar group in the younger age group. Most of the cases were normal with few hyperthyroid and hypothyroid cases. Bipolar group comprised the majority of overt hyperthyroid, overt hypothyroid and subclinical hyperthyroid cases, whereas unipolars were more in the subclinical hypothyroid category.

**Conclusions:** This study concludes that differences exist in the thyroid response among the unipolar and bipolar depression group, more prominent numbers of hypothyroidism in unipolar group.

**Keywords:** Bipolar, Depression, North-East India, Thyroid dysfunction, Unipolar

## INTRODUCTION

Depression is a common mental disorder, with an estimated global burden of 350 million.<sup>1</sup> Unipolar depression ranked fourth in 1990 and could rise to second by 2020 in terms of the overall burden of all diseases in the world.<sup>2</sup> Bipolar disorder affected an estimated 29.5 million individuals worldwide in 2004, according to the World Health Organization.<sup>3</sup> Unipolar and bipolar depression are the most severe psychiatric disorders associated with high prevalence rate, chronic course, significant mental and somatic comorbidity, lost

productivity and increased medical expenses. Majority of bipolar depression are misdiagnosed as unipolar depression due to the absence of biologically relevant diagnostic markers resorting to misdiagnosis and false treatment.<sup>4-6</sup>

Thyroid-stimulating hormone (TSH) stimulates the thyroid gland to produce metabolism stimulating hormones as thyroxine (T4) and triiodothyronine (T3). TSH is synthesized in the anterior pituitary gland by the hypothalamus, which produces thyrotropin releasing hormone (TRH). Production of TSH is inhibited by

somatostatin, which is also produced by the hypothalamus, and via a negative feedback loop by T3 and T4.<sup>7</sup>

There has always been association between thyroid function disorder and depression. Condition of both excess and insufficient thyroid hormones can cause mood abnormalities including depression, which can adequately be reversed by thyroid treatment.<sup>8</sup> Overt thyroid disease is rare in depression, 1 to 4% found to be hypothyroid, while subclinical hypothyroidism occurs in 4% to 40% of these patients.<sup>9,10</sup> The most common abnormalities include features of subclinical or overt hypothyroidism, with associated lower levels of thyroxine<sup>11</sup>, and elevated levels of TSH.<sup>12,13</sup> The link between hyperthyroidism and depression is poorly understood. A vast majority of patients with overt hyperthyroidism were found to display psychiatric disorders as anxiety, mania or depression.<sup>14</sup> Case study reports hints out hyperthyroidism in patients with depression on their follow up diagnosis.<sup>15</sup> Decreased TSH secretion has also been observed in patients with both unipolar and bipolar affective disorder during acute episode of the illness.<sup>16,17</sup>

This study was undertaken with the objective of assessing thyroid hormone profile of the patients with unipolar and bipolar depression. It also aimed to determine the prevalence rate of thyroid disorders associated with depressive disorders.

## METHODS

This study is a cross sectional study conducted from July 2011 to July 2013, in a tertiary care psychiatry hospital in North-East India. Patients with unipolar and bipolar depression from outpatient department and inpatient wards fulfilling the inclusion criteria selected on systematic random sampling. A total of 321 depression patients, 161 unipolar and 160 bipolar cases, were included.

### *Inclusion criteria*

Patients of the age group 18-65 years, irrespective of their genders, diagnosed of depression both unipolar and bipolar as per ICD 10 criteria, were included. Patients without medication for at least 1 month prior to the onset of the current episode, who gave written informed consent, were considered.

### *Exclusion criteria*

Patients with co morbid medical illness or any other psychiatric disorder were excluded.

### *Tools*

A semi structured proforma was used for the assessment of the socio-demographic and clinical variables of the patients. ICD-10 diagnostic criteria for the diagnosis of

depression were used, supported by Mini-International Neuropsychiatric Interview (M.I.N.I.). Only cases diagnosed as unipolar and bipolar depression were included.

### *Assay of thyroid function*

A maximum amount of 5 ml of venous blood was withdrawn from each subject. The blood samples were centrifuged and analyzed for T3, T4, TSH and FT4 on the same day. Thyroid function test panel were assayed by the Fluorescence EIA (Enzyme Immuno Assay) technique using standard kit. All the estimations were done in Tosoh AIA-360 automated immunoassay analyzer as per standard protocol provided by the manufacturer (Tosoh Bioscience). Interpretations of the results were as per the laboratory optimized reference range of serum T3 (0.79 – 1.58 ng/ml), T4 (4.0 – 11.0 µg/dl), TSH (0.39 – 5.00 µIU/ml) and FT4 (0.82 – 2.0 ng/dl).

### *Definition of thyroid status*

When the subjects were presented with normal T3, T4, TSH and FT4, the thyroid function is considered as normal, i.e. Euthyroid. Abnormal thyroid status was further categorised as hyperthyroid, those with increased level in any one or combination of T3, T4, FT4 and decreased TSH, and hypothyroid, having single or combined decrease in level of T4 and FT4, with high TSH whereas, low TSH in secondary hypothyroidism. Subclinical hypothyroids were those characterised by normal FT4 and elevated serum TSH level and subclinical hyperthyroid subjects presented decreased TSH and normal FT4 level. All other results not in accordance with the above criteria were grouped as discordant.

### *Statistical analysis*

The observed findings were analysed using SPSS (23.0 Version). Discrete data were expressed as frequency (%) and were analysed using Chi-square test. Statistical significance was assessed at 5% level of significance ( $p < 0.05$ ).

## RESULTS

The study consisted of 161 unipolar and 160 bipolar depression cases, with male consisting 60.7% of the total. Representation in the unipolar group was almost equal for both genders, whereas in bipolar group 71.9% were male. Pearson chi-square test revealed, male were significantly higher in the bipolar group in contrast to female comprising the unipolar group ( $p = 0.000$ ). However, age categories did not give any significant variation between unipolar and bipolar group (Table 1).

Regarding the thyroid status, total 220 cases were euthyroid, among which 63.6% were male, 50.5% cases

were bipolar and 57.7% are in the productive age group of 20-40 years. Majority of the hypothyroid cases were more male of productive age group, however, common in unipolar group 58.3%. Females were more hyperthyroid and the vulnerable age group in the category of 20-40 years, in 70.6% unipolar hyperthyroids. Subclinical hypothyroidism was common among male 52.4%, bipolar

group comprised 66.7% and in the 20-40 years age group. Male comprised the majority of subclinical hyperthyroids 61.5%, bipolar cases were majority 69.2% and age group of > 40 years 61.5%. Discordant results were also more in male 52.6%, unipolar 57.9% and in age group 20-40 years 50% (Table 2).

**Table 1: Frequency distribution of general characteristics and depressive characters.**

Variable	Frequency (%)			Chi-Square (p-value)
	Depressive character	Unipolar depression	Bipolar depression	
Gender	Male	80 (41.0)	115 (59.0)	0.000
	Female	81 (64.3)	45 (35.7)	
Age (years)	< 20	9 (56.2)	7 (43.8)	0.069
	20-40	80 (44.4)	100 (55.6)	
	> 40	72 (57.6)	53 (42.4)	

**Table 2: Cross tabulation of general characteristics and thyroid status.**

Variable	Frequency (%)							Chi-Square p-value
	Thyroid Status	Euthyr	Hypo	Hyper	Sub C Hypo	Sub C Hyper	Discord	
Gender	Male	140 (71.8)	8 (4.1%)	8 (4.1)	11 (5.6)	8 (4.1)	20 (10.3)	0.566
	Female	80 (63.5)	4 (3.2)	9 (7.1)	10 (7.9)	5 (4.0)	18 (14.3)	
Depressive character	Unipolar	109 (67.7)	7 (4.3)	12 (7.5)	7 (4.3)	4 (2.5)	22 (13.7)	0.134
	Bipolar	111 (69.4)	5 (3.1)	5 (3.1)	14 (8.8)	9 (5.6)	16 (10.0)	
Age (years)	< 20	13 (81.2)	0 (0.0)	1 (6.2)	0 (0.0)	1 (6.2)	1 (6.2)	0.633
	20-40	127 (70.6)	7 (3.9)	9 (5.0)	14 (7.8)	4 (2.2)	19 (10.6)	
	> 40	80 (64.0)	5 (4.0)	7 (5.6)	7 (5.6)	8 (6.4)	18 (14.4)	

Euthyr = Euthyroidism/ Normal , Hypo = Hypothyroidism, Hyper = Hyperthyroidism, Sub C Hypo = Subclinical Hypothyroidism, Sub C Hyper = Subclinical Hyperthyroidism, Discord = Discorant.

Of the total cases 68.5% were euthyroid cases, followed by discordant (11.8%), subclinical hypothyroidism (6.5%), hyperthyroidism (5.3%), subclinical hyperthyroidism (4.0%) and hypothyroidism (3.7%) (Table 2).

Among male 71.8% were euthyroid, followed by discordant (10.3%), subclinical hypothyroidism (5.6%) with equal representation among hypothyroidism, hyperthyroidism and subclinical hyperthyroidism (4.1%). Females consist majority of euthyroid (63.5%), followed by discordant (14.3%), subclinical hypothyroidism (7.9%), hyperthyroidism (7.1%), subclinical

hyperthyroidism (4.0%) and hypothyroidism (3.2%). (Table 2).

Unipolar cases were more euthyroid (67.7%) followed by discordant (13.7%), hyperthyroidism (7.5%), equal number of hypothyroidism and subclinical hypothyroidism (4.3%) and subclinical hyperthyroidism (2.5%). Bipolar cases euthyroid (69.4%) followed by discordant (10.0%), subclinical hypothyroidism (8.8%), subclinical hyperthyroidism (5.6%), equal hypothyroidism and hyperthyroidism (3.1%) (Table 2).

Age wise, in < 20 years euthyroids were the majority (81.2%), followed by equal numbers of hyperthyroidism, sub clinical hyperthyroidism and discordant (6.2%), hypothyroidism and subclinical hypothyroidism nil. In age group 20-40 years, euthyroid 70.6%, followed by discordant (10.6%), subclinical hypothyroidism (7.8%), hyperthyroidism (5.0%), hypothyroidism (3.9%) and subclinical hyperthyroidism (2.2%). Similarly, in the age group >40 years euthyroids comprised the majority (64.0%), followed by discordant (14.4%), subclinical hyperthyroidism (6.4%), equal number of hyperthyroidism and subclinical hypothyroidism (5.6%) and hypothyroidism (4.0%) (Table 2).

However, there was no any significant association of various characteristics as gender, age and depressive character with thyroid function status among the patients with depression.

## DISCUSSION

From our study the prevalence of depression was found to be more common among the male cases, almost two-third of the study population. Comparatively more unipolar cases were female and bipolar were male, which is in concordance with few other clinic-based studies but contradictory to many other studies which were basically population based.<sup>18-22</sup> Majority of the cases were of the productive age group, which might had led to a tremendous loss for the societal development.

Among the depression cases 68.5% were euthyroid or normal, as evidenced in almost all the studies carried so far on thyroid status and depression. 11.8% of our findings were discordant, which hinted towards tests repetitions for such samples. Subclinical hypothyroidism prevalence in this study was 6.5% which is bit more than the findings of Sham et al, 2014 but in concordance with studies carried out in other part of the globe.<sup>9,10,23,24</sup> Overt hypothyroidism was as per the findings from earlier studies with a prevalence rate of 3.2%.<sup>9,10,23,24</sup> The prevalence of both overt and subclinical hyperthyroidism was lower than those observed by previous studies.<sup>25,26</sup> These variations in our results might be due to the fact that most of those studies were based only on serum TSH level, whereas our interpretation was more accurate, based on TSH, T3, T4 and free T4 level estimation.

Comparison of the thyroid profiles among unipolar and bipolar reveals that overt hyperthyroidism was more prevalent among unipolar (7.5%) compared to bipolar group (3.1%). Overt hypothyroidism was also more among the unipolar (4.3%) than to bipolar (3.1%). However, the distribution of subclinical hypothyroidism was less (4.3%) in unipolar, with bipolar being more (8.8%). Subclinical hyperthyroidism was also less (2.5%) in unipolar group compared to bipolar group (5.6%).

Psychiatric disorders such as depression, anxiety, psychosis, and even cognitive dysfunction were found to

occur with varying frequency in individuals with thyroid dysfunction.<sup>8,14</sup> Our study was also one among those which is attempted to find out such variations among two different categories of depression- unipolar and bipolar groups. It confirmed that there might be higher prevalence of thyroid dysfunction in patients with both unipolar and bipolar depression and that those two diagnostic groups differed in terms of direction and frequency of thyroid dysfunctions. Findings of our study suggest the need for inclusion of few more other related thyroid markers T3, T4 and FT4, along with TSH level monitoring, so as to obtain even more accurate and reliable information on thyroid status of the depressive patients for their proper diagnosis and treatment.

There were some limitation in our study, that we had no data for subtypes of bipolar disorder type I and type II and rapid cycling of the disease. The study was based only on the current medical condition without any prior information on past thyroid disorders and their treatment. The bipolar study group particularly was not homogenous in terms of gender, with dominantly more male patients. The samples with discordant results were had to be repeated and included. These factors obviously affect the results of inter and intra group comparisons. Most important part of our study was that we had included estimation of all TSH, T3, T4 and FT4 in our analysis making our findings more accurate.

## CONCLUSION

This study concludes that differences exist in the thyroid response among the unipolar and bipolar depression group, more prominent numbers of hypothyroidism in unipolar group.

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