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Depression and anxiety among hyperthyroid female patients and impact of treatment

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Abstract

Background: The aim of the present study was to compare the presence of psychiatric disorders in people with hyperthyroidism and euthyroid patients attending the Endocrinology Outpatient Department at the Shri Maharaja Hari Singh Hospital in Kashmir, India. Seventy-five patients with hyperthyroidism and an equal number of euthyroid patients participated in the study. Participants were selected using stratified random sampling. All patients were female. There was no significant difference between the two groups in terms of demographic features. Hormonal screening was performed by immunoassay and haemagglutination method. For the mental health assessment, the Mini-International Neuropsychiatric Interview (MINI), Hamilton Depression Rating Scale [HAM-D], and Hamilton Anxiety Rating Scale [HAM-A] were used.

Results: There was a higher prevalence of psychiatric disorders among the hyperthyroidism group (60% versus 34.7%). In particular, there was a higher prevalence of major depressive disorder, suicidality, generalised anxiety disorder, panic attacks, and agoraphobia. In some cases, the prevalence of a psychiatric disorder diminished after endocrinological treatment.

Conclusions: Screening patients with hyperthyroid disorders for psychiatric symptoms and disorders, and providing timely care when necessary, can go a long way in improving the quality of life of this population. It is imperative to establish routine screening and timely care of mental health symptoms and disorders in patients with hyperthyroidism.

Keywords: Hyperthyroidism, Mental health, Liaison psychiatry, Anxiety, Depression

Background

Hyperthyroidism is one of the most common thyroid disorders. Hyperthyroidism can often manifest with symptoms consistent with mental illnesses; plus, it is not uncommon for people with hyperthyroidism to meet psychiatric disorders' diagnostic criteria [1, 2]. At the same time, people with hyperthyroidism will likely present symptoms such as tension and other autonomic symptoms that could resemble a mental illness [3]. It is important, then, to pay attention to the presence of these symptoms and assess and address them promptly and adequately, as they can have a clear impact on the person's well-being.

Various psychiatric disorders have been associated with hyperthyroidism. Over 150 years ago, Basedow had already described a manic psychosis illness in a patient with exophthalmic goitre [4]. Psychotic disorders, however, are an uncommon presentation of hyperthyroidism [4–6]. Symptoms of anxiety and depression, on the other hand, are more common [7, 8], as well as increased scores on depression and anxiety self-rating scales [9].

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Suicidality also seems to be more common in people with hyperthyroidism [7], which further emphasises the importance of acknowledging mental health symptoms and disorders in this population.

Despite the reported high prevalence of psychiatric symptoms and disorders among people with hyperthyroidism, no previous study in India has explored this issue. To have a better understanding of this comorbidity could improve the ways in which these patients are assessed and supported. Therefore, the present study was set out to explore the prevalence of psychiatric disorders in patients with hyperthyroidism attending an Endocrine Outpatient Clinic in the North of India.

Methods

The present is a cross-sectional, comparative study including case and control arms, with follow-up on the case arm, and compared the presence of various psychiatric disorders among people with hyperthyroidism, with and without treatment, and people without hyperthyroidism. The study was conducted between March 2017 and March 2019.

Participants

The study targeted people over 15 years of age with hyperthyroidism who attended the Endocrinology Outpatient Department at the Shri Maharaja Hari Singh Hospital in North India. Participants were selected using stratified random sampling, choosing every alternate female patient with hyperthyroidism. The control group was people over 15 years of age without any present or past thyroid disease and family history of thyroid disease. The case group also included hyperthyroid patients assessed after 2 months of treatment. Thyroid status was checked using a thyroid function test (TFT) that included an estimation of serum triiodothyronine (T3), tetra-iodothyronine (T4), and thyroid-stimulating hormone (TSH) and clinical profile of the patient were monitored to see the effect of endocrinological medications in the follow-up of hyperthyroid patients. Sampling of participants was conducted for a period of 6 months. The assessment of patients before and after treatment was done and those who did not improve were referred for psychiatric treatment. Exclusion criteria were the presence of pregnancy or a history of pregnancy in the last 6 months, and the use of steroids or other drugs known to interfere with thyroid function. The control group was taken from another Outpatient Department of the same hospital and was subjected to the same laboratory investigation for confirmation.

Data collection

Data collection included demographic information, such as age, sex, residence, and economic status.

Endocrine evaluation

Endocrinologists evaluated all study and control subjects. This evaluation included a detailed haemogram, erythrocyte sedimentation rate (ESR), and serum biochemistry in the form of blood glucose, alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase, and cholesterol. All participants also had a thyroid function test (TFT) that included an estimation of serum triiodothyronine (T3), tetra-iodothyronine (T4), and thyroid-stimulating hormone (TSH). The diagnosis of hyperthyroidism was made based on clinical criteria and confirmed by the elevated serum T3 and/or T4 and suppressed TSH (< 0.1 IU/mL). Participants with laboratory confirmation of hyperthyroidism had done a technetium scan of the thyroid gland using 99mTc-pertechnate. Graves' disease (GD) diagnosis was based on diffuse goitre with increased radioactive iodine uptake (RAIU) at 24 h.

Different treatments were given for different thyroid conditions with different diagnoses. Patients with hyperthyroidism were treated by surgery, antithyroid drug (ATD) medication, or radioactive iodine (RAI). Local traditions, severity of the disease, sex, and age are some of the factors that influenced the type of treatment chosen.

Mental status evaluation

The psychiatric history was taken using a pretested semi-structured interview. The interviewer was blind to the participants' endocrinological diagnosis. These interviews were conducted using the mood and anxiety modules of the Mini-International Neuropsychiatric Interview (MINI) [10] and the diagnostic criteria for depression and anxiety of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [11]. In addition, all participants were evaluated using both observer-rated and self-rated scales. A psychiatrist applied Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A) [12, 13].

Hormones of the hypothalamic–pituitary–thyroid axis

Venous blood was drawn for the measurement of serum thyrotropin (TSH), thyroxine (T_4), and total T3 (TT_3). All hormones were estimated by commercially available chemiluminescence assay (CLA); antithyroid peroxidase antibody (anti-TPO) was estimated by immunofluorescence technique (ELISA).

Data analysis

Data were keyed into Microsoft Excel 2016 and after cleaning exported to Statistical Package for the Social Science® (SPSS) for Mac ® version 25.0 software (SPSS Inc., IL, USA) for further analysis. Numbers and percentages were used to present categorical data. Mean (± standard deviation) was used for normally distributed continuous data. The significance of differences between the two groups was examined by Student's *t*-test or Mann-Whitney *U* test (as appropriate). The χ^2 test of independence was used for qualitative variables (Yates' correction and Fisher's exact test were used wherever appropriate). Correlations and association between various variables were studied using the Pearson and/or Spearman test. A probability level of P <.05 was taken as significant.

Results

In total, 75 patients with hyperthyroidism and an equal number of euthyroid patients participated in this study (Tables 1 and 2). The age of the subjects (cases and controls) ranged from 20 to 70 years with a mean of 33.37± 7.61. All the studied subjects were females. Overall, 60% (n = 45) of the participants with hyperthyroidism showed signs of a psychiatric disorder, against 34.7% (n = 26 patients) of participants in the control group (Table 3).

About 10.7% of the participants with hyperthyroidism met the criteria for major depressive disorder, versus 6.7% of the control group participants. Of the total of participants with hyperthyroidism, 4% presented suicidality, a number that dropped to almost 0% after endocrinological treatment (see Table 4). No significant difference was noticed in the presence of depression after treatment, with results remaining consistent at 10.7%. As for the Hamilton Depression Scale (HAM-D), scores for the hyperthyroidism and euthyroid groups were 21 and 16, respectively, with a P value of < 0.001.

Participants with hyperthyroidism and euthyroid patients showed Hamilton Anxiety Scale (HAM-A) scores of 27.1 and 15.5, respectively, with a P value of < 0.001. About 2.7% of the participants with hyperthyroidism met the criteria for agoraphobia (versus 1.3% in the control group), 18.7% met the criteria for a panic attack (versus 5.3% in the control group), 13.3% for generalised anxiety disorder (versus 6.7% in the control group), and 0% for social phobia (also 0% in the control group).

Other psychiatric diagnoses present in the hyperthyroidism group were premenstrual disorder in 2.7% (versus 4% in the control group), alcohol abuse/dependency in 1.3% (versus 1.3% in the control group), and obsessive–compulsive spectrum disorders in 4% (versus 2.7% in the control group).

After endocrinological treatment, the percentage of participants in the hyperthyroidism group with agoraphobia went down to 1.6% (from 2.7%), and the percentage of participants with panic attack went down to 17.3% (from 18.7%) (see Table 4). Other diagnoses like premenstrual disorder, alcohol abuse/dependency, and generalised anxiety disorder did not show any statistically significant variation.

Discussion

In the present study, we compared the presence of psychiatric disorders among people with hyperthyroidism and euthyroid patients. Overall, the study found that 60% of the participants with hyperthyroidism showed signs of a psychiatric disorder, against 34.7% of participants in the control group. Patients with hyperthyroidism were treated by surgery, antithyroid drug (ATD) medication, or radioactive iodine (RAI). The presence of psychiatric disorders was reduced in some cases after endocrinological treatment. No case of psychosis or bipolar affective disorder (BAD) were reported in the study.

Table 1 Clinical and laboratory variables among cases and controls (n = 150)

Variable	Hyperthyroid group (n = 75)	Euthyroid group (n =7 5)	P value
Age (years)	33.37±7.61[a]	33.37±7.61	1.0
T3 (ng/ml)	3.49±1.05	2.38±11.54	<0.001
T4 (mcg/dl)	16.89±2.24	7.02±1.51	<0.001
TSH (mIU/l)	.09±.08	2.88±1.66	<0.001
HAM-A scores	27.1 ±6.14	15.5±6.11	<0.001
HAM-D scores	21±5.66	16 ±6.1	<0.001
Duration of symptoms (months)	8.12±0.17		
Underlying aetiology of hyperthyroidism			
Graves' disease	30 (40%)		
Toxic nodular hyperthyroidism	9 (12%)		
Indeterminate aetiology	36 (48%)		

[a] Values are expressed as mean ± SD unless specified otherwise

Table 2 Reported symptoms and signs of hyperthyroidism

Symptoms of hyperthyroidism			
Weight loss	42 (56%)	Weight gain	6 (8%)
Heat intolerance	45 (60%)	Palpitations	43 (57%)
Tremor	41 (54%)	Increased bowl movement	18 (24%)
Neck enlargement	17 (22%)	Shortness of breath	8 (10%)
Eyes symptoms	9 (12%)	Psychological symptoms	33 (44%)
Reported signs of hyperthyroidism			
Signs of atrial fibrillation	3 (4%)	Thyroid eye disease (TED) in a patient with Graves' disease	
Tremor	30 (40%)	No sign of TED (NOSPECS 0)	11 (36%)
Palpable goitre	47 (62%)	Mild TED (NOSPECS 1)	6 (20%)
		Moderate TED (NOSPECS 2–3)	12 (40%)
		Severe TED (NOSPECS ≥4)	1 (3.3%)

There are various studies reporting a higher prevalence of anxiety disorders in people with hyperthyroidism [2, 14, 15]. The present study found higher rates of certain anxiety disorders in people with hyperthyroidism when compared with euthyroid patients. These were generalised anxiety disorder, panic attack, and agoraphobia. A study conducted by Simon and colleagues [14] also found a higher prevalence of generalised anxiety disorder and panic disorder among patients with thyroid dysfunction, and as the present study, they found a minimal correlation with social phobia. Endocrinological treatment reduced the number of participants with agoraphobia almost in half, and it also reduced the number of participants with panic attack, although at a lower level. It did not, however, reduced the number of participants with generalised anxiety disorder in a statistically

Table 3 Proportion of psychiatric disorders among patients with hyperthyroidism

Variable	Group	No psychiatric illness	Psychiatric disorder	Chi-square	*P*-value
Any psychiatric disorder	Euthyroid	49 (65.3%)	26 (34.7%)	9.65	0.003
	Hyperthyroid	30 (40%)	45 (60%)		
MDD	Euthyroid	70 (9.3%)	5 (6.7%)	0.38	0.56
	Hyperthyroid	67 (89.3%)	8 (10.7%)		
Dysthymia	Euthyroid	73 (97.3%)	2 (2.7%)	0	1.0
	Hyperthyroid	73 (97.3%)	2 (2.7%)		
Suicidality	Euthyroid	73 (97.3%)	2 (2.7%)	0.21	0.65
	Hyperthyroid	72 (96%)	3 (4%)		
Agoraphobia	Euthyroid	74 (98.7%)	1 (1.3%)	0.56	1.0
	Hyperthyroid	73 (97.3%)	2 (2.7%)		
Panic attack	Euthyroid	71 (94.7%)	4 (5.3%)	6.31	0.02
	Hyperthyroid	61 (81.3%)	14 (18.7%)		
Alcohol use	Euthyroid	74 (98.7%)	1 (1.3%)	0	1.0
	Hyperthyroid	74 (98.7%)	1 (1.3%)		
OC spectrum	Euthyroid	73 (97.3%)	2 (2.7%)	0.21	1.0
	Hyperthyroid	72 (96.0%)	3 (4%)		
Social phobia	Euthyroid	75 (100%)	0 (0%)	–	–
	Hyperthyroid	75 (100%)	0 (0%)		
Premenstrual dd	Euthyroid	72 (96%)	3 (4%)	0.65	1.0
	Hyperthyroid	73 (97.3%)	2 (2.7%)		
GAD	Euthyroid	70 (93.3%)	5 (6.7%)	1.85	0.28
	Hyperthyroid	65 (86.7%)	10 (13.3%)		

Table 4 Status of treatment and its association with psychiatric symptoms among cases (*n* =75)

Psychiatric symptoms	Treatment status	No psychiatric illness	Psychiatric disorder	Chi-square	*P*-value
Overall psychiatric disorders	Under treatment	8 (72.73%)	3 (27.27%)	5.75	.02
	No	22 (34.4%)	42 (65.6%)		
MDD	Under treatment	11 (100%)	0 (0%)	1.54	.59
	No	56 (87.5%)	8 (12.5%)		
Dysthymia	Under treatment	62 (96.9%)	2 (3.1%)	0.35	.0
	No	11 (100%)	0 (0%)		
Suicidality	Under treatment	11 (100%)	0 (0%)	0.54	.0
	No	61 (95.3%)	3 (4.7%)		
Agoraphobia	Under treatment	10 (90.9%)	1 (1.6%)	2.05	.27
	No	63 (98.4%)	1 (1.6%)		
Panic attack	Under treatment	10 (90.9%)	1 (9.1%)	0.78	.68
	No	51 (79.7%)	13 (20.3%)		
Alcohol abuse	Under treatment	11 (100%)	0 (0%)	0.17	.0
	No	63 (98.4%)	1.6 (%)		
OC spectrum	Under treatment	11 (100%)	0 (0%)	0.54	.0
	No	61 (95.3%)	3 (4.7%)		
Social phobia	Under treatment	11 (100%)	0	–	–
	No	64 (100%)	0		
Premenstrual dysphoric disorder	Under treatment	11 (100%)	0 (0%)	0.35	.0
	No	62 (96.9%)	2 (3.1%)		
GAD	Under treatment	9 (81.8%)	2 (18.2%)	0.26	.61
	No	56 (87.5%)	8 (12.5%)		

significant number. The study also found an overall higher score in the HAM-A scale among these participants, a result that echoes the literature [9], as well as a slightly higher prevalence of obsessive–compulsive spectrum disorders (4% versus 2.7%).

Previous authors have also suggested a potential association between hyperthyroidism and depression [2, 8, 15, 16]. The present study also found a higher rate of major depressive disorder in participants with hyperthyroidism (10.7% vs 6.7%), as well as a higher rate of suicidality (4% vs 2.7%). Also, as previously reported by Demet and colleagues [9], the study found higher scores for the HAM-D in participants with hyperthyroidism. After endocrinological treatment, the number of participants with hyperthyroidism showing suicidality dropped down to almost 0%. Radanović-Grgurić and colleagues had previously discussed the importance of timely diagnosis of depression among people with thyroid disfunction, a point further supported by the present study [17].

Sub-clinical and overt hyperthyroidism can be associated with various mental health symptoms, although the casual relationship can be sometimes unclear [3]. Moreover, some of the characteristic symptoms of hyperthyroidism may resemble the clinical presentation of a mental health disorder. The relationship between the clinical presentation of hyperthyroidism and anxiety, as well as its precipitating role in the development of an anxiety disorder, is somewhat clear [3]; however, the relationship between it and depression is less certain [3]. Despite their potential causal relationship, it is important to assess and address both, the thyroid disfunction and mental health symptoms. Previous authors have also pointed out that endocrinological treatment may be accompanied by an improvement of the mental health symptoms [1, 18]. Still, it could be necessary to provide further pharmacological and psychosocial support when this is not the case [1].

Conclusions

Screening patients with hyperthyroid disorders for psychiatric symptoms and disorders, and providing timely care when necessary, can go a long way in improving the quality of life of this population. Still, the present study suggests the usefulness of a longitudinal study exploring the temporal correlation between psychiatric symptoms and hyperthyroidism, as it could shed further light into this topic. Moreover, further epidemiological studies are necessary to gauge the degree of the problem. Therefore, the implementation of a routine screening for mental illness would prove further useful in facilitating a better

understanding of the relationship between thyroid dysfunction and mental health disorders.

Limitation of study

In addition to the small sample size, all findings of laboratory and clinical profile of the case group mentioned were not used in any correlation in the study although of importance.

Abbreviations

MINI: Mini-International Neuropsychiatric Interview; HAM-D: Hamilton Depression Rating Scale; HAM-A: Hamilton Anxiety Rating Scale; TFT: Thyroid function test; T3: Serum triiodothyronine; T4: Tetra-iodothyronine; TSH: Thyroid-stimulating hormone

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Authors' contributions

SS, JA, and MAW all contributed in conceiving the presented idea, developed the methodology and data collection, drafted the article, and helped shape the research, analysis, and manuscript. SS obtained the ethical approval, performed computations, verified the analytical methods and data tabulation, and contributed to manuscript writing, editing, and critical revision. IU, RR, and SW contributed to editing and critical revision. All authors have read and approved the manuscript.

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Availability of data and materials

All data generated or analysed during this study are included in this published article.

Declarations

Ethics approval and consent to participate

All participants included in the study provided informed consent, and the Ethical Committee of Government Medical College, Srinagar, Kashmir, India (GMC-3217 March 2017), approved the study. Proper written informed consent was obtained from study participants.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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