ORIGINAL ARTICLE

Impact of Adjustment Disorder and Psychological Factors in Hypothyroidism

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ABSTRACT

Introduction: Thyroid dysfunction is associated with a spectrum of psychological symptoms, from "myxoedematous madness" to adjustment disorders. Despite known impacts on cognition and mental health, research on the role of personality variables in Indian hypothyroid populations is limited. This study aims to evaluate the prevalence of adjustment disorder and personality profiles in relation to thyroid hormone levels. **Methods:** A case-control study was conducted at Saveetha Medical College, Chennai (May 2021–May 2022), comparing 63 hypothyroid cases with 77 controls. Standardized instruments were used to assess adjustment disorder, quality of life (QOL), and personality traits. **Results:** Adjustment disorder was significantly more prevalent in hypothyroid patients (56%) than in controls (21%; $p < 0.01$), with depressive subtypes being most common (33%). Cases exhibited significantly higher mean TSH (4.8 ± 1.2 mIU/ml) and lower T3 (2.3 ± 0.5 pg/ml) levels ($p < 0.01$). Additionally, hypothyroid patients reported lower physical (42 ± 5) and psychological (38 ± 6) QOL scores. A statistically significant negative correlation was noted between neuroticism and adjustment disorder ($p = 0.05$). **Conclusion:** Hypothyroidism is strongly linked to adjustment disorder, diminished QOL, and distinct personality traits. These findings emphasize the need for integrated psychiatric screening and further research into the interplay between personality and endocrine function in the Indian population.
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INTRODUCTION

A severe thyroid dysfunction can resemble nearly any profile of psychiatric symptoms (1-5) even before the determination of serum thyroid hormone concentrations and before suppressive and substitutive thyroid therapies became widely available, and there are reports about psychopathological syndromes associated with thyroid dysfunction such as "myxoedematous madness" (1). More or less subtle psychiatric abnormalities may be linked to mild or latent thyroid dysfunction (6).

Research has indicated that thyroid hormones improve cognition by increasing cholinergic activity in the frontal brain and the hippocampus. Psychological as well as physical symptoms may be caused by thyroid dysfunction. Thyroid problems can mimic nearly any profile of psychiatric symptoms in their clinical presentation. Furthermore, subtle, and nonspecific psychological problems can be presented by latent and modest abnormalities in thyroid functioning. Some general symptoms, such as restlessness and irritability, are also frequently seen. Therefore, it has long been believed that certain mental illnesses could be linked to changes in thyroid function (6,7).

A significant body of research reporting the findings of studies aiming to define the relationship between personality traits, thyroid illness, and life stress is available. Thyroid activity has also been observed to rise in response to cortical and hypothalamic stimulation in recent animal investigations. Therefore, it seems sense to assume that emotional disturbances may be the cause of thyroid diseases. As a result of this emotional instability, increased tiredness, and inadequate coping mechanisms, the affected individuals end up with adjustment disorder and a high frequency of interpersonal disputes. However, there are no studies that evaluate the role of personality in thyroid problems in the Indian population; as a result, more study in this area is needed.

The aim of this study was to estimate the occurrence and features of adjustment disorder in women diagnosed with

overt hypothyroidism and explore its association with psychological variables and quality of life. Additionally, the study sought to evaluate the characteristics of adjustment disorder in both hypothyroid and euthyroid individuals, along with its relationship to the sociodemographic profile, personality traits, and thyroid hormone levels. Furthermore, the study aimed to assess the association between personality profile and thyroid hormone levels, as well as the relationship of quality of life with stress levels, personality traits, and thyroid hormone levels.

MATERIALS AND METHODS

Study Design

The case control study was carried out between May 2021 and May 2022. The Saveetha Medical College and Hospital outpatient general medical departments served as the study's locations.

Sample Size

Sample size calculation was conducted based on literature reviews to determine the appropriate sample size. A total of 63 cases and 77 controls were recruited into the study.

Study Tool

Patient data collection used validated assessment tools, including a semi-structured proforma for demographic variables, the WHO Quality of Life (QOL) BREF scale, and measures for adjustment disorder and personality traits. The WHOQOL BREF assessed four domains—physical, psychological, social interactions, and environmental—scored on a five-point scale. Adjustment disorder was classified by an emotional or behavioral reaction to stressors within three months, with severity gauged by the degree of impairment in functioning. Subtypes of adjustment disorder included depressive, anxious, and conduct-related reactions, specified as acute or chronic based on symptom duration. The NEO Five-Factor Inventory-3 (NEO-FFI-3) assessed personality traits, measuring neuroticism, extraversion, openness, agreeableness, and conscientiousness, to provide a comprehensive profile of each participant's psychological attributes.

Classification and Subtyping of Adjustment Disorders

Adjustment disorder subtypes include presentations with depressed mood (characterized by depression, tearfulness, or hopelessness), anxiety (nervousness or worry, and separation anxiety in children), mixed anxiety and depressed mood, conduct disturbances (e.g., truancy or vandalism), and mixed emotional and conduct disturbances. An unspecified subtype may include stress reactions like physical complaints or social withdrawal. Symptoms are classified as acute if lasting under six months and chronic if they persist longer due to ongoing or lasting stressors. Personality was assessed using the NEO Five-Factor Inventory-3 (NEO-FFI-3), which evaluates five personality traits: neuroticism (emotional instability and stress sensitivity), extraversion (sociability and optimism), openness (creativity and intellectual curiosity), agreeableness (altruism and empathy), and conscientiousness (self-control and responsibility).

Data Collection

From the outpatient department of General Medicine, individuals diagnosed with hypothyroidism, confirmed through biochemical analysis, were chosen. Each participant was briefed about the study's goals and provided with an information sheet before obtaining their written consent. The study included solely female patients between the ages of 20 and 65 who had recently been diagnosed with hypothyroidism, had not previously received medication for it, and agreed to give written consent. Meanwhile, control participants, women within the same age range and exhibiting no signs of thyroid issues, were selected from those accompanying patients with normal thyroid function, provided they agreed to participate. Exclusion criteria encompassed anyone with severe physical or mental health issues, a history of thyroid medication use, other drugs known to trigger psychiatric symptoms, subclinical hypothyroidism, substance abuse, or those reluctant to join the study.

Comprehensive sociodemographic data were gathered, and the existence of psychiatric conditions was determined based on the ICD-10 classification system. Assessments to measure adjustment disorder, life quality, and personality traits were carried out using recognized instruments, administered in the local language and evaluated by established protocols. Participants identified as needing psychiatric care received treatment as necessary, ensuring conditions like premenstrual stress, which could skew results, were excluded. Thyroid treatment was provided where needed. Those diagnosed with psychiatric disorders, aside from adjustment disorder, received targeted treatment without the need for specific assessments. The same methodology was applied to the control group, sourced from accompanying attendants.

Statistical Analysis

Data were meticulously transferred to and organized within a Microsoft Excel spreadsheet, followed by a thorough examination to identify and rectify any inaccuracies in data entry. Subsequent analysis was conducted utilizing the SPSS (Statistical Package for the Social Sciences) software, version 16.0, under its licensed agreement. To present an overview of both the demographic and clinical profiles of the participants and their counterparts, descriptive statistical methods were employed. For the purpose of drawing comparisons between the psychological aspects of both the subjects under study and the control group, inferential statistical tools, including t-tests, chi-square tests, and logistic

regression analyses, were designated. Additionally, both correlation and regression analysis were employed to delve into the potential relationships amongst psychological indices, thyroid hormone concentrations, and additional variables within the subject group. The assessment of demographic variables, alongside the mean ratings on various scales and the presence of psychiatric conditions, was performed for both subject and control groups. The entire statistical process was facilitated through the SPSS software, now upgraded to version 20.0, with a confidence interval steadfastly established at 95%.

Ethical consideration

The paper was presented before the ethical committee and approval was obtained from the expert panel held on 03-03-2021. The approval and ethical clearance from the Instituitional Ethics Committee (IEC) was attained upon commencement of the study [Reference No: 578/03/2021/IEC/SMCH].

RESULTS

Socio demographic characteristics

No statistically significant disparities were observed in terms of age and educational level between the case group and the control group (Fig.1). Statistically, the baseline sociodemographic characteristics such as age, education, average monthly income, marital status, and occupation showed no significant variance between the case and control groups. Independent t-tests were utilized to compare age and education level (measured in years) between cases and controls, while differences in marital status and occupation were analyzed using Chi-square tests (Table I).

Comparison of thyroid values between cases and controls

In the case group, Thyroid Stimulating Hormone (TSH) levels were observed to be elevated compared to those in the control group, as depicted in Figure 2, with measurements taken in milli-international units per milliliter (mIU/ml). This difference was identified as statistically significant, analyzed through the use of an Independent t-test.

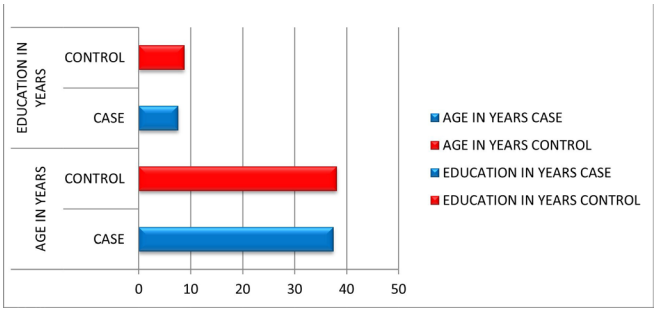

Figure 1: Comparison of age and education profile between cases and controls

Table I: Comparison of sociodemographic profile between cases and controls

	GROUP	Mean	Std. Deviation	p-value
AGE IN YEARS	CASES	37.44	10.289	0.713
	CONTROLS	38.12	11.075	
EDUCATION IN YEARS	CASES	7.59	5.025	0.173
	CONTROLS	8.78	5.198	
AVERAGE INCOME OF FAMILY PER MONTH	CASES	7373.02	2277.11	0.088
	CONTROLS	6779.22	1814.585	
MARITAL STATUS	CASES	1.79	1.427	0.611
	CONTROLS	1.68	1.312	
OCCUPATION	CASES	3.97	1.892	0.123
	CONTROLS	3.53	1.429	

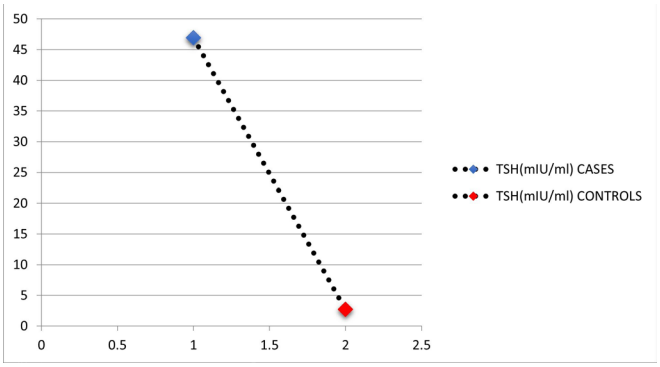

Figure 2: Comparison of TSH levels between cases and controls

Regarding thyroid hormone levels (table II), the case group exhibited lower free Triiodothyronine (T3) levels and higher free Thyroxine (T4) levels than the control group. The concentrations of T3 and T4 were quantified in picograms per milliliter (pg/ml) and nanograms per milliliter (ng/ml), respectively. Given that twice the standard deviation exceeded the mean value, a non-parametric test, specifically the Mann-Whitney test, was employed to calculate the p-value, confirming the statistical significance of these differences.

Comparison of individual symptoms in adjustment disorder between cases and controls

The analysis revealed a statistically significant disparity in specific symptoms of adjustment disorder—namely, depressed mood, fearfulness, and hopelessness—which were more pronounced in the case group than in the control group. Conversely, symptoms such as nervousness and worry did not exhibit a statistically significant difference between the two groups (table III).

Table II: Comparison of thyroid hormone and TSH levels between cases and controls

THYROID HORMONES	GROUP	N	Mean	Std. Deviation	P value
T3	CASES	63	3.1429	0.89277	0.017
	CONTROLS	77	3.5366	1.01196	
T4	CASES	63	5.759	3.8888	0.0001
	CONTROLS	77	1.403	0.3825	
TSH	CASES	63	46.9394	26.66693	0.0001
	CONTROLS	77	2.673	1.55442	

Table III: Comparison of individual symptoms in adjustment disorder between cases and controls

SYMPTOMS OF ADJUSTMENT DISORDER		GROUP		Total	p-value
		CASE	CONTROL		
DEPRESSED MOOD	PRESENT	21	8	29	0.001
	ABSENT	42	69	111	
FEARFULLNESS	PRESENT	17	6	23	0.002
	ABSENT	46	71	117	
HOPELESSNESS	PRESENT	12	2	14	0.001
	ABSENT	51	75	126	
NERVOUSNESS	PRESENT	7	3	10	0.099
	ABSENT	56	74	130	
WORRY	PRESENT	2	2	4	0.838
	ABSENT	61	75	136	

Correlation between sociodemographic profile and adjustment disorder

The association between adjustment disorder and the initial sociodemographic characteristics revealed no statistically significant link, with the exception of marital status. Marital status exhibited a notable negative correlation with adjustment disorder, underscored by a p-value of .004, indicating its statistical significance (table IV).

Correlation between personality profile and adjustment disorder

The relationship between adjustment disorder and the personality profile was analyzed through Kendall's tau-b test, revealing a statistically significant negative correlation specifically between adjustment disorder and the trait of neuroticism, marked by a p-value of 0.05. Correlations with other personality traits did not reach statistical significance (table V).

Table V: Correlation between personality profile and adjustment disorder

PERSONALITY PROFILE	Kendall's tau-b test	ADJUSTMENT DISORDER
NEUROTICISM	Correlation Coefficient	-.140*
	Sig. (2-tailed)	0.05
EXTROVERTISM	Correlation Coefficient	-0.054
	Sig. (2-tailed)	0.45
OPENNESS	Correlation Coefficient	0.035
	Sig. (2-tailed)	0.62
AGREEABLENESS	Correlation Coefficient	.179*
	Sig. (2-tailed)	0.013
CONSCIENTIOUSNESS	Correlation Coefficient	0.058
	Sig. (2-tailed)	0.414

Correlation between thyroid levels and adjustment disorder

T3 and TSH levels were found to inversely correlate with adjustment disorder, showing a statistically significant difference as determined by Kendall's tau-b test. However, T4 levels did not exhibit a statistically significant relationship with adjustment disorder. Correlation between stress scale and adjustment disorder The correlation analysis between adjustment disorder and various domains of the stress scale, conducted via Kendall's tau-b test, indicated that all domains exhibited a statistically significant negative correlation with adjustment disorder, with the exception of the occupational domain, which did not show statistical significance.

DISCUSSION

The investigation revealed a significant occurrence of adjustment disorder in individuals with hypothyroidism, linked with particular symptoms and categories. The association between sociodemographic variables and adjustment disorder appeared to be slight, hinting at the

Table IV: Correlation between sociodemographic profile and adjustment disorder

	Kendall's tau-b test	AGE	EDUCATION IN YEARS	OCCUPATION	MARITAL STATUS	AVERAGE INCOME PER MONTH
ADJUSTMENT DISORDER	Correlation Coefficient	-0.122	0.055	-0.024	-.231**	0.02
	Sig. (2-tailed)	0.084	0.461	0.764	0.004	0.785

possibility that alternate factors could be more influential in the emergence of adjustment disorder among those suffering from hypothyroidism.

In a Global perspective, Prior research has illuminated the connection between thyroid dysfunction and psychiatric conditions. A study by Kato et al.(8) highlighted the higher incidence of adjustment disorder among patients with hypothyroidism compared to those with euthyroid conditions. Further research by Kato et al. (8) demonstrated a similar trend in patients with subclinical hypothyroidism, aligning with the outcomes of the present study which indicates a pronounced prevalence of adjustment disorder in individuals suffering from hypothyroidism, marked by specific symptoms and subtypes. Moreover, Bunevicius et al. (9) identified an association between hypothyroidism and an increased risk for depression and anxiety, while Hage and Azar (3) identified an association between hypothyroidism and an increased risk for depression and anxiety.

In an Indian perspective, to the extent of our knowledge, the interrelation between adjustment disorder and thyroid dysfunction within the Indian demographic has not been thoroughly explored. A pivotal study by Srinivasan et al.(4) has drawn a connection between hypothyroidism and an elevated risk of depression and anxiety among the Indian population, highlighting a gap in research that necessitates further investigation into the nuanced relationship between adjustment disorder and thyroid dysfunction in India. Complementarily, research conducted by Grover et al.(10) points to a significant occurrence of adjustment disorder within the Indian context, marked by distinctive symptoms and types. Additionally, a study by Chaturvedi et al. (11) reveals that adjustment disorder is particularly prevalent among women, linking its occurrence to sociodemographic variables such as marital status and education level. These insights provide a foundational understanding of the prevalence and contributing factors of adjustment disorder in the Indian population.

In the present study, a rigorous statistical analysis was employed to compare sociodemographic data, thyroid hormone levels, and psychological variables between the case group and a control set. It was observed that there were no notable differences between the two groups concerning age, educational background, monthly income, marital status, and occupational status. However, distinct variations were found in thyroid hormone levels, with the case group displaying elevated Thyroid Stimulating Hormone (TSH) levels, reduced free Triiodothyronine (T3) levels, and increased free Thyroxine (T4) levels compared to the control group. Additionally, significant differences were noted in the duration and specific subtypes of adjustment disorder between the affected individuals and controls, as determined by chi-square tests. These analyses revealed a statistically significant divergence, especially in symptoms such as depressed mood, fearfulness, and hopelessness, which were more prominent in the case group. This comprehensive assessment underscores the intricate relationship between thyroid dysfunction and adjustment disorder within the Indian demographic, meriting further scholarly inquiry.

The study found that the prevalence of adjustment disorder was significantly high in hypothyroid patients than in the general population. Neuroticism was high in hypothyroid patients, but agreeableness, openness, and conscientiousness were low in hypothyroid patients compared to the general population with euthyroid state, thus indicating more neurotic traits in the hypothyroid patients which lead to poor coping to stressful life events. Baseline comparison was not statistically significant with regards to age, socioeconomic status and education, marital status, average income per month between cases and controls. Quality of life in physical health, psychological and social relationships domain was low in the hypothyroid patients, thus indicating difficulty in reacting to stressors and thus compromising the quality of life. High occurrence of stressful life events and poor coping was observed in hypothyroid disorder patients. The relationship domain was more compromised. TSH correlated more accurately with the quality of life and the stressful life event scale and adjustment disorders. TSH and T4 levels correlated well with the neuroticism, agreeableness, openness, and conscientiousness. Adjustment disorder also correlated significantly with the quality of life and stressful life event scale both having a positive correlation, suggesting as the QOL and H/R scales scores increase the presence of adjustment disorder also increases. The study emphasizes the need for further research to understand the relationship between thyroid dysfunction, personality factors, and adjustment disorder in the Indian population and globally.

The exclusion of patients with subclinical hypothyroidism and hyperthyroidism from this study restricts a broader understanding of psychiatric morbidity prevalence across thyroid disorders. The investigation did not explore other psychiatric conditions, such as psychosis or cognitive impairments. The present study is a hospital based study and hence applying the same to the general population in the community may have its own demerits. Conducting the research at a single center could impact the external validity of the results, limiting the generalizability to other settings. Despite these constraints, the research offers significant insights into the prevalence and attributes of adjustment disorder among women with overt hypothyroidism, shedding light on its association with psychological variables and overall quality of life.

Patients with thyroid disorders need to be screened frequently for psychiatric morbidity. The study also highlights the need for further research to understand the

relationship between hypothyroidism and psychiatric morbidity, including adjustment disorder.

CONCLUSION

This research demonstrates a significantly higher prevalence of adjustment disorder and stressful life events in hypothyroid patients compared to euthyroid controls. Despite similar socio-demographic profiles, hypothyroid individuals exhibited markedly lower quality of life (QOL) across physical, psychological, and social domains, reflecting impaired stress-response mechanisms. Personality assessments revealed a distinct profile characterized by elevated neuroticism and diminished agreeableness, openness, and conscientiousness, which appears to hinder effective coping. Statistical analysis confirmed that TSH and Free Thyroxine (T4) levels correlate significantly with these personality traits, QOL scores, and the severity of adjustment disorder. These findings highlight the profound impact of thyroid dysfunction on psychological health and underscore the necessity for integrated psychiatric screening and further research into the neurobiological interplay between endocrine function and personality dynamics.

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