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Comparison of Health-Related Quality of Life, Psychological Symptoms, and Resilience in Patients With Hypothyroidism and Healthy Individuals

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ABSTRACT

The aim of the present study was to compare health-related quality of life, psychological symptoms, and resilience in patients with hypothyroidism and healthy individuals. This research employed a descriptive–analytical design within a causal-comparative framework. The statistical population consisted of patients with hypothyroidism who visited endocrine clinics in Rasht and their healthy companions in 2025. Using Cohen's power analysis criteria, the sample size for each group was determined to be 90 participants (a total of 180 individuals), and purposive sampling was applied. The research instruments included the Health-Related Quality of Life Questionnaire (1992), the Connor–Davidson Resilience Scale (2003), and the Lovibond Psychological Symptoms Scale (1995). Data were analyzed using SPSS-26 through multivariate analysis of variance (MANOVA) and one-way ANOVA. The findings indicated a significant difference between patients and healthy individuals in health-related quality of life, resilience, and psychological symptoms ($p < .05$). Healthy individuals reported higher resilience, whereas patients with hypothyroidism reported lower health-related quality of life and higher psychological symptoms ($p < .05$). The results of the study suggest that hypothyroidism, in addition to its physical aspects, is associated with psychological and social challenges. Therefore, psychological and supportive interventions alongside pharmacological treatment may help enhance resilience and improve the quality of life in these patients.

Keywords: Hypothyroidism, resilience, health-related quality of life, psychological symptoms.

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Introduction

Hypothyroidism is one of the most common endocrine disorders worldwide and represents a major public health concern due to its chronic course, multisystem involvement, and frequent underdiagnosis (1, 2). Epidemiological data indicate that both overt and subclinical hypothyroidism are highly prevalent, especially among women and older adults, with considerable regional variations driven by iodine intake, autoimmune patterns, and healthcare access (1, 3, 4). Beyond its well-known effects on metabolism, thermoregulation, and cardiovascular function, hypothyroidism has important implications for reproductive health, pregnancy outcomes, and sexual functioning, highlighting its systemic impact on individuals' life course and social well-being (5). From a pathophysiological perspective, thyroid hormones play critical roles in brain development,

neuronal differentiation, synaptic plasticity, and neurotransmitter regulation, such that both early-life and adult-onset thyroid dysfunction can disrupt central nervous system functioning and emotional regulation (6, 7). Consequently, hypothyroidism should be conceptualized not only as a hormonal deficiency state, but as a complex biopsychosocial condition that can profoundly shape individuals' health-related quality of life and psychological adjustment over time (8).

An increasing body of evidence shows that hypothyroidism is strongly associated with a range of psychiatric and cognitive manifestations, including depressive symptoms, anxiety, cognitive slowing, and executive dysfunction (9, 10). Neuroimaging and neuropsychological studies suggest that thyroid hormone deficiency in adults may contribute to white matter changes, altered cerebral blood flow, and impairments in attention, working memory, and processing speed, even in patients receiving levothyroxine replacement (10, 11). Clinically, patients frequently report low mood, irritability, apathy, and loss of interest in daily activities, which can resemble primary depressive and anxiety disorders and complicate differential diagnosis in routine practice (9, 12). Meta-analytic findings and large-scale studies have documented robust associations between thyroid dysfunction and depression, including in subclinical hypothyroidism, suggesting that even mild thyroid hormone abnormalities may increase vulnerability to mood disorders (13, 14). Recent work has also highlighted bidirectional links between thyroid dysfunction, depression, and anxiety, indicating that affective disturbances may persist despite biochemical euthyroidism, and that psychological symptoms may in turn affect illness perception, treatment adherence, and subjective recovery (15, 16). Together, this literature underscores that psychological symptoms are not merely secondary or transient complications of thyroid disease, but integral components of the clinical picture that require systematic assessment and management (16, 17).

Health-related quality of life (HRQoL) has emerged as a central outcome for evaluating the burden of hypothyroidism and the effectiveness of treatment strategies beyond biochemical normalization (1, 8). Studies in both overt and subclinical thyroid dysfunction consistently demonstrate impairments in physical functioning, vitality, role limitations, and mental health compared with healthy controls, even when thyroid hormone levels are within reference ranges under replacement therapy (11, 18, 19). Hypothyroid patients often describe persistent fatigue, weight-related concerns, cognitive difficulties, and emotional distress, which collectively erode daily functioning and social participation (9, 18). Population-based and clinic-based research shows that comorbidities such as obesity, cardiovascular risk factors, and other chronic conditions further compound HRQoL limitations in this group (5, 8). Recent evidence suggests that psychological factors, particularly depressive symptoms, perceived stress, and illness beliefs, may be stronger predictors of thyroid-related quality of life than hormone levels or antibody titers in treated hypothyroidism (20). In female patients with thyroid disorders, HRQoL is closely intertwined with perceived social support and treatment adherence, indicating that interpersonal and behavioral dimensions are crucial determinants of subjective well-being (21). Moreover, Iranian and regional studies report significant reductions in HRQoL among patients with hypothyroidism compared to healthy individuals, corroborating the global pattern and emphasizing the need for context-sensitive psychosocial interventions (19, 22).

Beyond pharmacological management, several interventional studies have explored strategies to enhance quality of life in thyroid disorders. Continuous care and structured follow-up models have been shown to alleviate treatment-related side effects and improve HRQoL in patients with hyperthyroidism, suggesting

that systematic patient education and ongoing support are beneficial for endocrine populations more broadly (23). Exercise-based interventions and lifestyle modifications also appear promising; for instance, an eight-week moderate-intensity interval training program combined with selenium supplementation positively influenced thyroid hormone profiles, lipid parameters, and quality of life in women with hypothyroidism (24). Psychological interventions have likewise attracted attention. Mentalization-based therapy, for example, has demonstrated efficacy in improving mental state understanding and quality of life in women with hypothyroidism, pointing to the added value of structured psychotherapeutic approaches alongside medical treatment (25). These findings reinforce the view that HRQoL in thyroid disease is shaped by the dynamic interaction between physiological parameters, psychological functioning, health behaviors, and social resources, and that comprehensive care requires integration of medical and psychosocial components (8, 11).

The constructs of psychological resilience and adaptive coping are particularly relevant in understanding individual differences in how patients with hypothyroidism experience and manage their condition. Resilience is generally defined as the ability to maintain or regain psychological well-being in the face of adversity, stress, or trauma, encompassing processes of flexible adaptation, positive emotion regulation, and meaning-making (26). Contemporary models emphasize that resilience is not a fixed trait but a dynamic, context-dependent capacity that can be fostered through psychosocial resources, social support, and skill-building interventions (26, 27). Research involving caregivers and parents of children with disabilities shows that higher resilience is associated with better quality of life and lower psychological distress, demonstrating its protective role in long-term stress contexts (28). Clinical trials in patients with chronic medical conditions, such as hemodialysis, indicate that resilience training can significantly reduce stress, anxiety, and depression while improving HRQoL, thereby supporting the feasibility and effectiveness of resilience-focused interventions in medically ill populations (29). Moreover, comparisons of active and inactive older adults suggest that engagement, physical activity, and social participation are linked to lower stress and anxiety and better emotional functioning, which can be interpreted through a resilience lens (30). Collectively, these findings suggest that resilience may operate as a psychological buffer, attenuating the impact of disease-related stressors on mental health and quality of life.

Despite the conceptual relevance of resilience to hypothyroidism, empirical studies directly examining resilience in this population remain limited. Existing research on thyroid dysfunction and emotional states in Iranian patients shows that depressive symptoms, anxiety, and stress are closely associated with lower HRQoL, and that patients frequently report a combination of somatic and psychological complaints (22, 31). Comparative studies between hypothyroid patients and healthy individuals have documented poorer mental health and quality of life in the patient group, confirming that the burden of disease extends well beyond biochemical abnormalities (19). At the same time, global epidemiological data underscore the growing number of individuals living with thyroid disorders, making it increasingly important to identify modifiable psychological factors that could promote better long-term outcomes (1-4). Yet, most thyroid-focused studies have prioritized clinical indicators, hormone normalization, and physical symptoms, with far less attention to resilience as a potential mediator or moderator of the relationship between hypothyroidism, psychological symptoms, and HRQoL (8, 20). This gap is particularly prominent in low- and middle-income settings, where

patients may face co-occurring socioeconomic stressors, limited access to specialized care, and cultural barriers to mental health services.

From a psychosocial and neurobehavioral standpoint, hypothyroidism may challenge resilience through multiple pathways. Fatigue, low energy, and psychomotor slowing can undermine motivation, goal-directed behavior, and engagement in rewarding activities, thereby limiting opportunities for positive reinforcement and mastery experiences that typically sustain resilience (9, 32). Cognitive difficulties, such as reduced attention and memory, may interfere with problem-solving and emotion regulation, while physical symptoms and body image concerns can compromise self-esteem and social interaction (10, 18). At the same time, hormonal changes related to thyroid dysfunction can interact with neurobiological systems implicated in stress responsiveness and affective regulation, potentially heightening sensitivity to stressors and negative emotional states (6, 7). Conversely, individuals with higher resilience may be more likely to reappraise illness-related challenges, mobilize social support, adhere to treatment, and maintain engagement in meaningful activities, which in turn may protect HRQoL despite persistent symptoms (21, 26, 27). Understanding how resilience relates to psychological symptoms and quality of life in hypothyroidism is therefore crucial for designing targeted interventions that go beyond symptom control.

The clinical management of hypothyroidism has traditionally centered on thyroid hormone replacement and biochemical monitoring, yet recent guidelines and expert reviews emphasize the need for a more holistic approach that integrates mental health assessment, patient education, and lifestyle counseling (9, 17). Educational materials from professional organizations and patient advocacy groups highlight the prevalence of psychological symptoms in thyroid disorders and encourage patients and clinicians to address mood, cognition, and fatigue as legitimate treatment targets rather than secondary or “functional” complaints (12, 16). Concurrently, research on mental health during the COVID-19 pandemic has illustrated that individuals differ markedly in their capacity to maintain psychological well-being under prolonged stress, and that resilience-related factors (such as flexible coping, social connectedness, and cultural resources) are key to these differences (27). Extrapolating these insights to chronic endocrine conditions suggests that enhancing resilience in patients with hypothyroidism could mitigate psychological symptoms and support better adaptation, but direct comparative evidence with healthy individuals remains scarce.

Given the high prevalence and chronic nature of hypothyroidism, the robust links between thyroid dysfunction, psychological symptoms, and HRQoL, and the theoretical and empirical importance of resilience for adaptation to chronic illness, there is a clear need for studies that simultaneously examine these constructs in clinical and non-clinical populations (1, 8, 20). While prior work has documented reduced HRQoL and increased mental health problems in hypothyroid patients, few investigations have directly compared health-related quality of life, psychological symptomatology, and resilience between patients with hypothyroidism and healthy individuals within the same cultural context, using validated instruments and rigorous analytic approaches (19, 22, 25). Addressing this gap can provide a more nuanced understanding of the psychosocial burden of hypothyroidism, identify resilience-related strengths and vulnerabilities, and inform the development of integrated medical–psychological interventions for this population (18, 28, 29). Therefore, the aim of the present study was to compare health-related quality of life, psychological symptoms, and resilience in patients with hypothyroidism and healthy individuals.

Methods and Materials

Study Design and Participants

The statistical population of this study included all patients with hypothyroidism who attended specialized endocrinology clinics in Rasht and their healthy companions in **2025**. Given the nature of the study (causal–comparative), the research was conducted in two groups: patients with hypothyroidism and healthy individuals. To estimate the sample size and based on Cohen's rules in power analysis, as well as similar causal–comparative studies in the field of health psychology, a sample size of 90 participants per group (a total of 180 individuals) was determined. This number was considered appropriate for achieving a test power of .80, a significance level of .05, and a medium effect size. In this study, purposive sampling was used. The process of selecting participants was carried out in collaboration with endocrinologists and psychologists working in the clinics. To do so, patients who met the inclusion criteria and were comparable to the control group in variables such as age and education level were selected from among the clinic visitors and invited to participate in the study. After explaining the purpose of the research and ensuring the protection of participant rights, written informed consent was obtained.

For the control group, purposive sampling was also conducted among the healthy companions of patients and other volunteers visiting health centers, while meeting the inclusion and exclusion criteria. Interviews and initial screening tests were performed by a specialist physician to examine physical health status regarding potential endocrine problems. This step was taken to minimize confounding variables and to increase homogeneity between the groups, thereby enhancing the validity of comparisons in the study.

Data Collection

The Health-Related Quality of Life Questionnaire was developed by Ware and Sherbourne in 1992 to assess quality of life and individuals' physical and psychological health status. This instrument was created to measure quality of life across multiple health domains, without age restrictions or specific disease conditions, and is considered one of the most widely used tools for evaluating quality of life in research and clinical settings. The questionnaire consists of 36 items and is designed to provide a comprehensive assessment of an individual's health status from physical and mental perspectives, measuring the impact of health status on daily life quality. The assessed dimensions include physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. The questionnaire uses various response scales, and scoring is performed such that each dimension receives a standardized score ranging from 0 to 100, with higher scores indicating better health and quality of life. The response formats vary across items, with some having two options, some three, and others five or six options. The questionnaire also contains reverse-scored items that must be scored accordingly. This tool does not provide a fixed cutoff score and is interpreted relatively, meaning that higher scores indicate better quality of life and health. In terms of psychometric properties, the questionnaire was translated and validated in Iran by Montazeri et al. (2005), and the results indicated good construct and content validity. Cronbach's alpha coefficients for the subscales ranged from .77 to .90, and test–retest reliability across studies has been acceptable. In the present study, the total Cronbach's alpha was calculated as .686.

The Resilience Scale was developed by Connor and Davidson in 2003 after an extensive review of research literature from 1979 to 1999 in the field of resilience. The primary purpose of designing this instrument was to measure the level of resilience as a psychological trait in individuals, particularly under stressful conditions and following exposure to adverse life events. The scale was initially designed for six groups, including the general population, primary care patients, psychiatric outpatients, patients with generalized anxiety disorder, and two groups of patients with post-traumatic stress disorder, and its psychometric properties were examined. The Connor–Davidson Resilience Scale consists of 25 items, each rated on a five-point Likert scale ranging from "0: Not true at all" to "4: True nearly all the time." Thus, total scores range from 0 to 100, with higher scores indicating higher levels of resilience. The scale encompasses five key factors: personal competence and tenacity, trust in one's instincts and tolerance of negative affect, positive acceptance of change and secure relationships, control, and spirituality. Although a shortened 10-item version exists, the 25-item version remains the most widely used and validated version in resilience research. The scale contains no reverse-scored items, and all statements are scored positively. Regarding psychometric features, Connor and Davidson (2003) reported a Cronbach's alpha of .89 and a two-month test–retest reliability of .87 in their original study. The instrument also demonstrated good convergent validity with stress-coping scales and positive and negative affect measures. In Iran, Hagh Ranjbar et al. (2011) validated the Persian version, reporting a Cronbach's alpha of .89. Additionally, Davidson (2003) found that the scale predicts higher quality of life and lower psychological symptoms in resilient individuals facing stress and life events. In the present study, the total Cronbach's alpha was calculated as .632.

The Depression, Anxiety, and Stress Scale (DASS) is a self-report tool developed by Lovibond and Lovibond in 1995 in Australia. Its primary aim is to assess the severity of emotional symptoms and negative affective states related to depression, anxiety, and stress in adolescents and adults. The instrument was initially created with 42 items and later shortened to a 21-item version for ease of administration in research and clinical settings. The scale is based on the tripartite model of stress, anxiety, and depression and assesses symptom severity over the previous week. Its primary use is to measure the severity of psychological symptoms over time and evaluate changes during psychological or clinical interventions. The DASS-21 contains 21 items, with each of the three subscales—depression, anxiety, and stress—measured by seven items. Items are rated on a four-point Likert scale from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"), based on the respondent's experience over the prior week. The score for each subscale is calculated by summing the relevant item scores and then multiplying the total by 2 to match the original 42-item scale. Higher scores indicate greater severity of psychological symptoms, and no reverse-scored items are included. The score ranges for each subscale span from 0 to 42, and symptom severity is classified into five levels: normal, mild, moderate, severe, and extremely severe. For depression, 0–9 is normal, 10–13 mild, 14–20 moderate, 21–27 severe, and 28+ extremely severe. For anxiety, 0–7 is normal, 8–9 mild, 10–14 moderate, 15–19 severe, and 20+ extremely severe. For stress, 0–14 is normal, 15–18 mild, 19–25 moderate, 26–33 severe, and 34+ extremely severe. Psychometrically, Lovibond and Lovibond (1995) reported high internal consistency for the DASS-21, with Cronbach's alpha coefficients of .94 for depression, .87 for anxiety, and .91 for stress. Construct validity has been confirmed through confirmatory factor analysis and convergent validity with instruments such as the Beck Depression Inventory and the Beck Anxiety Inventory. In Iran, Arman (2014) examined the Persian version and reported

acceptable validity and reliability, with Cronbach's alpha values of .77, .79, and .78 for the three subscales, respectively. In a study by Gloster et al. (2008), the 21-item DASS was identified as a sensitive tool for detecting therapeutic changes in patients with anxiety and depressive disorders, emphasizing its clinical applicability in monitoring treatment progress. In the present study, the total Cronbach's alpha was calculated as .747, with .673 for anxiety, .648 for depression, and .661 for stress.

Data analysis

Data were analyzed using SPSS-26 through multivariate analysis of variance (MANOVA) and one-way ANOVA.

Findings and Results

In this section, the descriptive indices related to the research variables are presented.

An examination of the dispersion indices (mean and standard deviation) for the variable of psychological symptoms (stress, anxiety, and depression), resilience, and health-related quality of life in the two groups—the clinical group and the normal group—showed that the mean and standard deviation of psychological symptoms in patients with hypothyroidism were 41.06 ± 5.344, respectively. Additionally, the mean and standard deviation of psychological symptoms in healthy individuals were 24.08 ± 4.886, respectively. Moreover, the mean and standard deviation of the components of psychological symptoms —anxiety, stress, and depression—in patients with hypothyroidism were, respectively (from right to left): 13.75 ± 2.858, 13.43 ± 2.888, and 13.88 ± 3.286. The mean and standard deviation of the components of psychological symptoms—anxiety, stress, and depression—in healthy individuals were, respectively (from right to left): 8.23 ± 3.325, 7.95 ± 2.811, and 7.90 ± 2.890.

The descriptive findings examining the dispersion indices (mean and standard deviation) for the variable of resilience in the clinical and normal groups showed that the mean and standard deviation of resilience in patients with hypothyroidism were 39.62 ± 5.623, respectively. Furthermore, the mean and standard deviation of resilience in healthy individuals were 60.33 ± 4.538, respectively.

The descriptive findings examining the dispersion indices (mean and standard deviation) for health-related quality of life in the clinical and normal groups showed that the mean and standard deviation of health-related quality of life in patients with hypothyroidism were 40.65 ± 4.933, respectively. Additionally, the mean and standard deviation of health-related quality of life in healthy individuals were 59.42 ± 4.709, respectively.

Table 1. Descriptive Indices Related to the Research Variables

Group	Variable	N	Minimum	Maximum	Mean	SD
Clinical	Psychological symptoms	90	24	53	41.06	5.344
	Anxiety	90	6	19	13.75	2.858
	Stress	90	6	19	13.43	3.286
	Depression	90	4	22	13.88	2.888
Normal	Psychological symptoms	90	12	36	24.08	4.886
	Anxiety	90	1	15	8.23	3.325
	Stress	90	0	17	7.95	2.811
	Depression	90	1	15	7.90	2.890
Clinical	Resilience	90	28	54	39.62	5.623
Normal	Resilience	90	51	75	60.33	4.538
Clinical	Health-related quality of life	90	29	52	40.65	4.933

Normal	Health-related quality of life	90	46	71	59.42	4.709

To test the hypotheses, multivariate analysis of variance (MANOVA) was used. To assess the normality of the data distribution, skewness and kurtosis were examined. The results indicated that all data had a normal distribution (between +2 and −2).

To assess the normality of the dependent variables (resilience, health-related quality of life, and psychological symptoms) in the clinical group (patients with hypothyroidism) and the normal group, the Kolmogorov–Smirnov test was used. The null hypothesis assumed that the data were normally distributed at the 5% error level. Therefore, if the test statistic was greater than or equal to .05, there would be no reason to reject the null hypothesis, and the data distribution would be considered normal.

Table 2. Results of the Kolmogorov–Smirnov Test for Examining Data Normality

Group	Variable	N	Statistic	Sig.	Status
Clinical	Health-related quality of life	90	.076	.200	Normal
	Psychological symptoms	90	.079	.200	Normal
	Resilience	90	.054	.200	Normal
Normal	Health-related quality of life	90	.083	.174	Normal
	Psychological symptoms	90	.045	.200	Normal
	Resilience	90	.063	.200	Normal

Table 3. Correlation Coefficient Between the Dependent Variables (Health-related Quality of Life, Psychological Symptoms, Resilience) in the Clinical and Normal Groups (n = 180)

Variables	Health-related QoL	Psychological symptoms	Resilience
Health-related QoL	1		
Psychological symptoms	−.752**	1	
Resilience	.775**	−.781**	1

**p < .01

Table 3 examines the correlations between the dependent variables (health-related quality of life, psychological symptoms, and resilience) in the clinical group (patients with hypothyroidism) and the normal group at the significance level (p < .01). Pearson's correlation coefficient indicated that there was a strong negative correlation between health-related quality of life and psychological symptoms (r = −.752). Additionally, health-related quality of life had a strong positive correlation with resilience (r = .755). Finally, resilience had a strong negative correlation with psychological symptoms (r = −.781). These findings indicate that the dependent variables in this study have moderate to high correlations, fulfilling the assumption required to run multivariate analysis of variance.

A matrix scatterplot was also plotted to examine the linearity of the relationships and to provide an initial assessment of pairwise relationships among the dependent variables, as well as to assess clustering of data based on group. The plot demonstrated two distinct clusters across all scatterplots, indicating a clear separation between the two participant groups. This pattern showed that the groups were distinguishable based on the dependent variables, suggesting meaningful group differences.

The Box's M test was conducted to examine the homogeneity of the variance–covariance matrices for the dependent variables (health-related quality of life, psychological symptoms, and resilience) in the clinical and normal groups. The results indicated that the Box's M test was not significant; therefore, the assumption

of homogeneity of covariance matrices was not violated. Thus, the equality of variances across the dependent variables in the clinical and normal groups was confirmed, making it appropriate to perform the MANOVA.

Levene's test for homogeneity of variances also showed that the variables "health-related quality of life" (F = .143, sig. = .706), "psychological symptoms" (F = .405, sig. = .525), and "resilience" (F = 3.499, sig. = .063) met the homogeneity assumption (p > .05), fulfilling the assumptions required for ANOVA.

Table 4. Between-Group Results of MANOVA for Health-related Quality of Life, Psychological Symptoms, and Resilience in Patients with Hypothyroidism and Healthy Individuals

Source	SS	df	MS	F	p	η^2
Health-related QoL	15863.297	1	15863.297	682.216	.000	.793
Error	4138.961	178	23.253			
Psychological symptoms	12969.834	1	12969.834	494.747	.000	.735
Error	4666.287	178	26.215			
Resilience	19296.957	1	19296.957	739.255	.000	.806
Error	4646.377	178	26.103			

The results of Table 4 indicate that there is a significant difference between patients with hypothyroidism and healthy individuals in the variable of health-related quality of life. Additionally, comparing the mean scores of health-related quality of life in the two groups showed that patients with hypothyroidism had lower health-related quality of life than healthy individuals.

Discussion and Conclusion

The findings of the present study revealed significant differences between patients with hypothyroidism and healthy individuals in health-related quality of life, psychological symptoms, and resilience. Patients with hypothyroidism reported lower quality of life, higher levels of depression, anxiety, and stress, and lower resilience compared with healthy individuals. These results align with a large body of evidence indicating that hypothyroidism is not merely a hormonal disorder but a multifaceted condition that exerts profound physical, psychological, and social consequences (1, 8). The robust association between thyroid dysfunction and impaired physical and psychological well-being has been highlighted in numerous epidemiological and clinical studies, confirming that many patients continue to experience symptoms even with hormone replacement therapy (18, 19). These patterns underscore the need to conceptualize hypothyroidism within a biopsychosocial framework rather than exclusively a biochemical one.

The significant elevation in psychological symptoms among hypothyroid patients found in this study is consistent with prior research documenting strong links between thyroid dysfunction and mood disturbances. Neuroendocrine evidence indicates that thyroid hormones influence serotonergic and noradrenergic pathways, cognitive functioning, and neural networks implicated in emotion regulation (6, 7). This biological vulnerability offers an explanatory mechanism for the heightened depression and anxiety observed in hypothyroid patients. Clinical studies have demonstrated that both overt and subclinical hypothyroidism are associated with increased depressive symptoms, irritability, cognitive slowing, and anxiety (9, 10). Meta-analytic reviews similarly confirm that the prevalence of depression is significantly higher in patients with thyroid dysfunction compared with the general population (13, 14). The present

findings therefore provide further evidence that psychological symptoms are an integral component of the hypothyroid experience, not secondary or incidental manifestations.

Another key finding of the study was the substantial reduction in health-related quality of life among hypothyroid patients relative to healthy individuals. This is consistent with clinical and epidemiological research demonstrating persistent fatigue, reduced vitality, diminished physical functioning, and psychological burden in hypothyroid patients (11, 18, 19). Even in patients receiving levothyroxine, many continue to report residual symptoms, treatment dissatisfaction, and impaired subjective well-being (8). Recent evidence suggests that psychological factors may play a larger role in determining thyroid-related quality of life than hormone levels alone. For instance, depressive symptoms, illness perception, and emotional distress were better predictors of quality of life than TSH or T4 levels in treated hypothyroid individuals (20). This aligns with the present study's findings, where psychological symptoms and resilience showed strong correlations with quality of life, highlighting the interconnected nature of emotional well-being and functional health outcomes.

The reduced resilience observed among hypothyroid patients in the current study is also supported by literature indicating that chronic endocrine disorders can undermine psychological coping resources and adaptive functioning. Resilience, conceptualized as the capacity to maintain psychological stability in the face of stress, is influenced by neurobiological, cognitive, and social factors (26, 27). Hypothyroidism, with its constellation of fatigue, cognitive impairment, and psychological symptoms, may compromise individuals' ability to engage in adaptive coping, problem-solving, and emotional regulation. This is consistent with research suggesting that chronic illness can erode resilience by limiting participation in meaningful activities and reducing opportunities for mastery experiences (32). The present study's findings therefore highlight the need to consider resilience not only as an outcome but also as a potentially modifiable factor that may buffer against the psychological burden of hypothyroidism.

Moreover, studies in chronic disease populations, including those undergoing hemodialysis or caring for children with disabilities, demonstrate that resilience is strongly associated with lower psychological distress and higher quality of life (28, 29). These findings support the interpretation that reduced resilience in hypothyroid patients may contribute to worse psychological outcomes, whereas enhancing resilience could improve coping capacities and subjective well-being. The significant positive correlation between resilience and quality of life, and the significant negative correlation between resilience and psychological symptoms observed in the present study, reinforce the relevance of resilience as a key psychological determinant in this population.

The present study also aligns with Iranian research evidencing psychological vulnerability and impaired quality of life in individuals with thyroid disorders. Studies among Iranian patients with hypothyroidism have shown significant reductions in mental health, emotional functioning, and vitality compared with healthy groups (19, 22). Additionally, intervention studies demonstrate promising effects of psychological therapies on improving psychological well-being in thyroid patients. For example, mentalization-based therapy improved emotional understanding and quality of life in women with hypothyroidism (25), suggesting that integrating psychological interventions into endocrinology settings may yield meaningful improvements beyond hormone regulation.

Furthermore, lifestyle and combined interventions such as structured exercise and selenium supplementation have shown positive effects on thyroid hormone levels and quality of life (24), supporting the multidimensional nature of treatment approaches. The present study, by identifying marked deficits in resilience among hypothyroid individuals, underscores the potential value of resilience-focused or strength-based interventions for supporting psychological and functional recovery.

In the broader context of thyroid disease, global epidemiological studies emphasize that hypothyroidism is both highly prevalent and frequently associated with comorbid conditions that worsen psychosocial outcomes (1, 3). As the prevalence of chronic conditions rises globally, attention has increasingly turned to psychological determinants of health and their role in shaping treatment outcomes. This study contributes to that growing discourse by showing that psychological symptoms and resilience are important correlates of HRQoL and by reinforcing the need to integrate psychological screening and support into standard hypothyroidism care.

Collectively, the results of the present study expand the existing literature by providing a combined comparison of psychological symptoms, resilience, and quality of life between hypothyroid and healthy individuals within the same cultural setting. Consistent with previous findings, hypothyroid patients exhibited greater psychological burden, diminished resilience, and lower subjective well-being. At the same time, the observed correlations between variables suggest that resilience plays an important mediating or moderating role in overall functioning. These findings support a shift toward more holistic and integrated models of care, addressing not only hormonal imbalance but also mental health, behavioral engagement, and psychosocial resources.

The present study has several limitations that should be considered when interpreting its findings. First, the cross-sectional nature of the research restricts the ability to infer causal relationships between hypothyroidism, psychological symptoms, resilience, and quality of life. Longitudinal studies would provide more robust insights into how these variables interact over time and whether changes in thyroid status lead to parallel changes in psychological functioning. Second, the sample was drawn from clinical centers in a single geographical region, which may limit the generalizability of the findings to broader populations with differing socioeconomic, cultural, or healthcare characteristics. Third, although validated self-report instruments were used, self-report measures are inherently subject to response biases such as recall inaccuracies or social desirability effects. Additionally, the study did not control for potential confounding factors such as medication adherence, duration of illness, comorbid chronic conditions, or lifestyle characteristics, which could influence psychological and quality-of-life outcomes. Finally, biomarkers such as thyroid autoantibodies, inflammatory markers, and detailed thyroid hormone profiles were not included, which restricts the ability to link psychological outcomes to specific biological pathways.

Future studies should consider utilizing longitudinal or experimental designs to better clarify the directionality and causal pathways among psychological symptoms, resilience, and quality of life in hypothyroidism. Incorporating biological markers alongside psychological variables would offer a more comprehensive understanding of the neurobiological mechanisms underlying emotional and functional impairments in this population. Additionally, future research should include more diverse samples across different regions, socioeconomic strata, and cultural backgrounds to improve generalizability. Comparative studies involving other chronic endocrine disorders may also help determine whether the observed patterns

are specific to hypothyroidism or reflect broader biopsychosocial processes. Finally, intervention studies targeting resilience enhancement, emotion regulation, or integrated biopsychosocial treatment models could help determine whether improving psychological resources leads to better long-term outcomes in hypothyroid patients.

Clinical care for patients with hypothyroidism should incorporate routine screening for psychological symptoms, including depression, anxiety, and stress, given their high prevalence and strong association with quality of life. Healthcare providers should consider implementing multidisciplinary approaches that incorporate psychological counseling, resilience training, lifestyle modification programs, and patient education alongside hormone replacement therapy. Interventions aimed at enhancing coping strategies, strengthening social support networks, and improving illness perception may help bolster resilience and improve daily functioning. Providing psychoeducation on the interaction between thyroid function and emotional well-being may also empower patients to seek support earlier and adhere more effectively to treatment. Ultimately, integrating psychological care into standard endocrine practice may contribute significantly to improving the overall quality of life of patients with hypothyroidism.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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