

# Association between Thyroid Disorders with Depression and Anxiety: A Short Overview

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**Abstract**—Studies have shown that thyroid hormones influence central nervous system function, which in turn, have impact on our behaviors including depression and anxiety. The main aim of this short overview is to bring evidences demonstrating the association between thyroid gland disorders with depression and anxiety, and also physiological mechanisms involved in such association.

**Index Terms**— Thyroid disorders, Depression, Anxiety.

## I. INTRODUCTION

The thyroid gland produces thyroid hormone, which has clinically important actions practically in every system in the human body. [1] Thyroid hormones are essential for growth, neuronal development, reproduction and regulation of energy metabolism.

Thyroid disorders are mainly appeared as hyper- or hypothyroidism. Thyroid stimulating hormone which is a pituitary hormone is the main stimulator of thyroid gland to produce thyroid hormones, it binds to its receptor and triggers the initial steps in thyroid gland stimulation to produce the hormones (T3 and T4). The structural modification of receptors and alteration in the level of TSH - TSH receptor in the thyroid gland eventually lead to thyroid disorders either of hypothyroidism or hyperthyroidism. [2] Thyroid disease is the second most common endocrine disorder affecting women of reproductive age, and when untreated during pregnancy is associated with an increased risk of miscarriage, placental abruption, hypertensive disorders, and growth restriction. [3]

Hypothyroidism is a relatively common endocrine disorder usually accompanied with changes in many physiological and psychological aspects of human. [4] Hypothyroidism is a common disease in many areas.[5], [6] Hashimoto's thyroiditis is an autoimmune disorder and the most common cause of hypothyroidism. [7]

Hyperthyroidism (overactive thyroid) is a condition in which thyroid gland produces too much of the hormone thyroxine. Hyperthyroidism is a form of thyrotoxicosis in which there is excess thyroid hormone synthesis and secretion. Multiple etiologies can lead to a common clinical state of "thyrotoxicosis," which is a consequence of the high thyroid hormone levels and their action on different tissues of the body. The most common cause of thyrotoxicosis is Graves' disease, an autoimmune disorder in which stimulating thyrotropin receptor antibodies bind to thyroid stimulating hormone

receptors on thyroid cells and cause overproduction of thyroid hormones. [8]

Postpartum thyroiditis is also the most common form of thyroid dysfunction and may present as hyper- or hypothyroidism. [9]

Autoimmune thyroid diseases are also common thyroid diseases worldwide. [10] Environmental iodine influences the epidemiology of non-malignant thyroid disease. [11]

Thyroid tumors are generally regarded as rare malignancies. Nowadays, however, their global incidence is growing continuously partially due to western life style and utilization of more sensitive methods of early detection. It is approximately three times more prevalent in females than in males. Thyroid cancer burden had increased by about 14% during 1990 to 2010 in all ages. [12],[13]

Associations between thyroid diseases and depression have been described since the 1960s. Hypo- and hyperthyroid states, as well as functional abnormalities in the hypothalamic-pituitary-thyroid axis have been associated with psychiatric conditions like anxiety and depression. However, the nature of this relationship is poorly understood since it is difficult to ascertain the thyroid status of the brain in humans. [14]

Depression has repeatedly been linked to subclinical hypothyroidism, and thyroid hormones have successfully been used to augment antidepressant treatment. By contrast, the extent of thyroid dysfunction in anxiety disorders remains less clear. This is surprising, given that anxiety-related symptoms (e.g., nervousness, palpitations, increased perspiration) are highly prevalent in hyperthyroidism. Inverse relationship has also been observed between self-reported anxiety levels and TSH. [15]

It has also been shown that diagnosed untreated hypothyroidism is associated with depression and anxiety, and that diagnosed untreated hyperthyroidism is associated with depression. [16] The postpartum period is also well-known risk period for the first onset of autoimmune thyroid disorders as well as first onset of psychiatric disorders including anxiety and depression. It has been found that late pregnancy total and free thyroxine (TT4, FT4) concentrations were negatively related to greater pre and/or postpartum depressive symptoms. [17] Studies also show that a flattened course of maternal thyroid hormone concentrations during pregnancy was a better predictor of child anxiety/depression. [18]

Thyroid cancer patients also have high distress levels. Identification of thyroid cancer patients with high distress

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levels is important to offer additional support during cancer therapy. [19] Anxiety is a common, although partially hidden, problem in thyroid cancer survivors. [20] Research imply that euthyroid Hashimoto's thyroiditis might be related with depression and anxiety. [21]

In a recent research prevalence of anxiety and depressive symptoms among patients with hypothyroidism has been studied. In this study a total of 100 patients diagnosed as hypothyroidism were evaluated using Hamilton depression rating scale (HDRS) and Hamilton scale for anxiety (HAM-A). The results indicated that females constituted 70% of the sample. A total of 60% reported some degree of depression whereas about 63% out of the total patients screened showed some degree of anxiety. The most common depressive symptom among the males was depressed mood (73.33%) and among females was gastrointestinal somatic symptoms (68.54%). The most common anxiety symptom among the males was depressed mood (70.0%) and among females was anxious mood (92.85%). [22]

Bipolar affective disorder in women is also a challenging disorder to treat. Co-morbidity, particularly thyroid disease, migraine, obesity, and anxiety disorders occur more frequently in women while substance use disorders are more common in men. [23]

It seems that the existing link between thyroid disorders and depression and anxiety comes from the connection between thyroid hormones and central nervous system. It is widely accepted that there is a close relationship between the endocrine system and the central nervous system (CNS). Among hormones closely related to the nervous system, thyroid hormones (THs) are critical for the development and function of the CNS. Any impairment of TH supply to the developing CNS causes severe and irreversible changes in the overall architecture and function of the human brain, leading to various neurological dysfunctions. In the adult brain, impairment of THs, such as hypothyroidism and hyperthyroidism, can cause psychiatric disorders including schizophrenia, bipolar disorder, anxiety and depression. It has been also suggested a possible role of glial cells in the relationship between thyroid dysfunction and mental disorders. [24]

Animal experiments also suggest that hypothyroidism and hyperthyroidism have bidirectional effects on anxiety- and depression-like behaviors in rats, possibly by modulating hippocampal brain-derived neurotrophic factor (BDNF) levels. [25] It is also has been shown that thyroid hormones act via the thyroid hormone receptor (TR)  $\alpha$  and  $\beta$  isoforms, both of which are expressed in the limbic system. TR's modulate gene expression via both unliganded and liganded actions. It seems that the thyroid hormone receptor are involved in behaviors such as anxiety and depression. [26]

## II. CONCLUSION

Thyroid hormones are critical for the development and function of the central nervous system. Impairment of thyroid hormones, such as hypothyroidism and hyperthyroidism, can cause psychiatric disorders including anxiety and depression. Psychological aspects of thyroid disorders should be a

significant consideration that are to be dealt with and treated.

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