

Effect of Thyroid Dysfunction on Memory and Cognitive Function

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Abstract

The relationship between thyroid dysfunction and cognitive and mental disorders is a long been recognized and researched issue at present. Individuals with thyroid dysfunction have a great chance to have mental illness and cognitive disorders and they are very much prone to have depression symptoms, memory loss, and even dementia and all those problems are due to abnormalities in the function of thyroid hormones and imbalance in thyroid hormone levels. Normally main issues related to thyroid dysfunctions means an increase in the T4 hormone level, a decrease in T3 hormone level, positive anti-thyroid antibodies, and many other things relating to hormonal imbalance. On the other hand, there are still some confusion related to the cognitive disorders with the thyroid dysfunctions and it needs to be analyzed and researched further.

Keywords: *Thyroid Dysfunction; Memory; Cognitive Function*

Introduction

Background

Thyroid dysfunction or thyroid disorders can be defined as such abnormal conditions that affect the thyroid gland, a butterfly-shaped gland of the human body situated in the front side of the neck [1]. This gland controls and normalizes various metabolic processes in our human body and in case of different sorts of thyroid dysfunctions their functions or structures seem to behave in a different way. There are various kinds of thyroid dysfunctions which may happen due to such disorders like thyroid nodules, hypothyroidism, hyperthyroidism, goiter, and even thyroid cancer [2]. Sufficient thyroid capacity is basic for ordinary improvement and maintenance of psychological capacity all through life. The relationship between thyroid hormones and cognition has been perceived since the showing that cretinism stems from iodine and thyroid insufficiencies. Low thyroid capacity at any age causes discernment to break down on the grounds that hypothyroidism keeps the mind from enough managing the vitality- devouring procedures required for neurotransmission, memory, and other higher cerebrum capacities [3].

Problem Statement

Since the last couple of years several studies and researches have been performed in order to find out the relationship between the difference in the thyroid functions from thyroid capabilities and cognitive discrepancies. Various researchers studied to find out if there is a relationship with the cognitive deficits or memory function degradation with the abnormality in the thyroid function. From various sources it is being found that cognitive performance, in other way normal memory and human brain function can be affected by thyroid dysfunction which can be defined as Hypo-or hyperthyroidism to some extent [4]. But there are no strong bases on this context and a very short of information is available to support this case that thyroid dysfunction may affect cognitive and memory functions. On the other hand, some researches stated that there is a relationship between the thyroid dysfunction or thyroid disorder with slight cognitive deficiency and memory loss or Alzheimer's disease in people, mostly in aged people [5].

Rationale of the study

There are a considerable amount of confirmation is available to support the relationship amongst thyroid dysfunction and psychological weakness of cognitive functional deficits, yet there is no certain clarification for these affiliations. On the other hand, there is no firm proof that thyroid dysfunction or disorders may promote memory loss and cause dementia. More and more point by point imminent longitudinal or randomized controlled trials are required to build better understanding and firm concepts on this issue. The main reason of this study is to find out the relation between the effect of thyroid dysfunction on the human memory and cognitive functions and for this reason researches from different scientists will be critically evaluated.

Objectives

The aim of this study is to review the growing literature on the relationship between cognitive performance and thyroid function. In doing so, the characteristics of the association between thyroid function and cognition will be described. The main objectives in this study are as follows:

- Importance of thyroid function over cognitive and mental health.
- To find out the neurocognitive dysfunction with thyroid dysfunction.
- To find out the psychological and cognitive illness due to thyroid disorders.
- To find out the relation between hypothyroidism/hyperthyroidism with dementia or memory loss.

Literature Review

Importance of Thyroid function over cognitive and mental health

The thyroid organ is a little, butterfly-formed organ situated in the base of the neck just beneath the Adam's apple. Even though this gland is little in size, the thyroid organ assumes a tremendous part in our body, affecting the capacity of a large portion of the body's most vital organs, including the heart, mind, liver, kidneys and skin [6]. Guaranteeing that the thyroid organ is solid and working appropriately is imperatively essential to the body's general prosperity even for good cognitive health [7]. The thyroid is a piece of the endocrine framework, which is comprised of organs that deliver, store, and discharge hormones into the circulatory system so the hormones can achieve the body's cells.

Researchers now consider thyroid hormone as one of the significant gland in cerebrum related problems. Additionally with any cognitive and brain related issue, until treated accurately, thyroid hormone awkwardness affects the patient's feelings and conduct significantly [3]. In case of metabolic, nervous, and immune system in human body, thyroid hormones like thyroxine (T4) which is mainly treated as a storage hormone and triiodothyronine (T3) which is a direct active hormone, plays an important role (Promberger, 2013). According to Brady [8], for proper function, it is very crucial that neither T3 OR T4 hormones are at a very high or low levels and in maintaining the balance of these two hormones both hypothalamus and pituitary glands in the brain work together. The hypothalamus gland creates thyroid-stimulating hormone (TSH). Then this THS provides signal to the pituitary glands in order to produce T3 and T4 hormones more or less through decrease or increase of the hormone release. When hormone levels are too low then pituitary gland releases more THS to send signal to the thyroid gland to produce more thyroid hormone and vice versa [8].

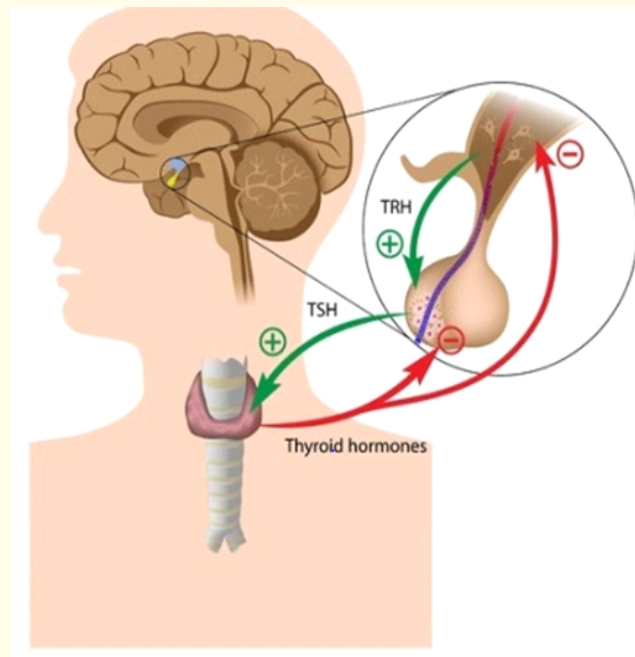


Figure 1: Thyroid gland and its working principle [8].

Ariachery [9] stated that in human brain cell unlike any other tissues we have more T3 receptors which simply implies that proper uptake of thyroid hormone is very much needed for the brain cells to active and works in a proper way. Again Chirila [10] emphasized that if an individual don't have T3 hormones which should have in the thyroid gland then the action will be hampered and the whole nervous system will be collapsed. As a result people will lose control over emotional actions, and they will have mood swings, energy changes and often turns into depression [10].

Thyroid dysfunction and psychological problems

Individuals with thyroid dysfunctions frequently have cognitive or emotional health related side effects and additionally physical indexes. This is particularly the case for individuals with hyperthyroidism (an over-dynamic thyroid), hypothyroidism (an under-dynamic thyroid), thyroid related eye ailment, or even thyroid cancer [11]. Ariachery [9] studied that people can have different types of emotional problems like anxiety, depression, mood swings, and they might have difficulties in sleeping. Additionally, individuals with thyroid disorders may have cognitive symptoms like lack of interest on a particular things, mental alertness, short term memory losses, and problems with having focuses on things. On the other hand, these symptoms due to thyroid dysfunctions may turn into permanent memory losses for aged people to some extent as severe as dementia [12].

According to Bizzi, *et al.* [13], the real cause is some of the time due to imbalance in thyroid hormone levels. In their study Bizzi, *et al.* [13] stated that hyperthyroidism can bring about uneasiness, peevishness and emotional damages, while hypothyroidism can bring about mental moderating and memory issues and additionally mental deterrence. Patients now and then report they have put on weight or that they think that it's hard to get in shape amid treatment which may add to sentiments of low self-regard and state of mind. Moreover, quick changes in thyroid hormone levels can unsettle emotional feelings [14]. Fast and powerful control of the hyperthyroidism is basic to bal-

ance out the disposition, and it is vital to ensure that the thyroid stays stable. On the other hand, thyroid dysfunction can likewise bring about changes in appearance such as changes because of thyroid eye illness, sudden weight gain, or loss of hair [15].

Thyroid deficiency and cognitive health

There are nearly 13 million people in the USA who are suffering from thyroid dysfunction and among them around 80% of the people are suffering from hypothyroidism which occurred due to underactive thyroid gland. This condition is very much common for women and aged people over 65. This hypothyroidism mainly occurred due to a very high level of TSH hormones while thyroid hormones seem to be very low in range and caused different problems like fatigue, lack of energy and concentration, depression and memory lapses to some extent [16]. From a study conducted by University of Iowa among 7000 young people it is found that people with varying level of TSH and thyroid hormones are prone to cognitive disorders and bad memory health [17]. Again from another German study it is found that due to thyroid deficiency and disorders people tend to have mild depression and it affects their mental health [15]. According to Uricoechea [18] it can be said that it is quite difficult to conclude the association of cognitive and mental health with thyroid dysfunction due to lack of enough evidence while there are enough researches to study this issue in future to find out the relationship between the cognitive and mental health of human with thyroid disorders and dysfunctions.

Effect of Thyroid dysfunction on mental health: memory loss

There are various causes for memory loss where some of the issues are directly related to dementias and Alzheimer's disease while there are some other reversible causes like thyroid dysfunction or thyroid disorders [19]. Ramsay [1] stated that the most common two thyroid dysfunctions which may cause mental illness and memory lapses are referred as hyperthyroidism (overactive thyroid gland) and hypothyroidism (underactive thyroid gland). People with hypothyroidism may have experienced lack of interest, poor memory, depression, intellectual degradation, speaking or hearing problems, dementia, sleeping problems, slowing down mental processes and even serious madness while people with hyperthyroidism may have faced emotional lability, distraction, fluctuating depression, anxiety, impaired concentration, insomnia, tremor, and nervousness [20,21]. According to Maeda and Akaji [22], memory problems and lack of concentration are the cognitive symptoms and found in those people with hypothyroidism. Moreover, researches suggested that verbal memory can be affected by this underactive thyroid dysfunction [7,23].

Conclusion

Thyroid function has been considered as an important factor in retaining optimal cognition and many studies suggested that there may be an association with thyroid dysfunction and cognitive dysfunction and mental health disorders due to the increase and decrease in the concentrations of the thyroid hormones. Moreover, if the thyroid hormone and TSH levels exist within low to normal ranges it will influence the cognitive performance in such a way that low to normal thyroid function will reduce the cognitive performance over time. Similarly thyroid dysfunction influences memory performance by decreasing blood flow in the brain in case of hypothyroidism. Again high concentration of TSH may also reduce the cerebral blood flow and glucose metabolism which in turns cause memory dysfunction and damaging mental health. So finally it can be concluded that thyroid dysfunction affects cognitive and memory performance and further studies and researches need to be conducted to find out the real cause and influence of thyroid dysfunction over cognitive and mental health in human body.

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