



## Effects of Hypothyroidism on Women

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### Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

**Background:** To determine the impact of treating clinical hypothyroidism during gestation on maternal depressive symptoms.

**Methods:** Females with singleton pregnancies identified clinical hypothyroidism were randomised to prenatal thyroxine medication or sample in an auxiliary study to a multicenter trial. At the end of the pregnancy, the treatment was stopped. Females with overt thyroid disorder, diabetes, autoimmune disorder, or depression were excluded from the study. Before taking the survey medicine (between 3-4 months of pregnancy), between 32 and 38 weeks of pregnancy, and at one year post-delivery, contestants were examined for forbidding symptoms with the help of the Center for Epidemiological Studies-Anxiety zone(CES-D). The primary result was a score on the CES-D for mother depressive symptoms.

**Results:** In individuals with schizophrenia spectrum disorders, imbalanced thyroid hormonal state in general, as well as hypothyroidism and hyperthyroidism, were found in 29.3, 25.17, and 4.08 percent, respectively. These figures were similar to those seen in patients with mental abnormalities (23.24, 21.62 and 1.62 percent, respectively). Anti TPO positivity was found in 11 of the 18 patients with schizophrenia scale illness. There were no distinctions based on gender.

**Conclusions:** Patients with schizophrenia-spectrum disease and mood swings both had thyroid abnormalities. Patients with schizophrenia-spectrum abnormalities were more probably to have

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autoimmune thyroid disease than those with mood swings. The results highlight the importance of evaluating individuals with schizophrenia-scale abnormalities for thyroid hormone abnormalities and how it affects hypothyroidism.

**Keywords:** Schizophrenia-scale; hypothyroidism; depression; anxiety.

## 1. INTRODUCTION

Hypothyroidism nowadays is frequently seen in laides. It is due to iodine deficiency. Hypothyroidism manifests itself in a variety of ways (obesity, arrhythmias, mood swings etc.). The study's goals were to [1] determine the occurrence of apprehension and misery in hypothyroid women cured with levothyroxine versus women without hypothyroidism, and [2] identify characteristics linked to anxiety and depression. Techniques: With 393 women, a case-control study was conducted. 153 hypothyroid ladies cured with levothyroxine were included in above survey. 240 women without hypothyroidism served as the control group [1].

The usage of levothyroxine is not always linked to the disappearance of hypothyroidism symptoms. The purpose of this survey is to analysis the health-related fate of life (HRQOL) of hypothyroid ladies were treated with levothyroxine to women who are not hypothyroid [2]. Objective in premenopausal women, even modest hypothyroidism causes problems with sexual function. The goal of the survey was to see how levothyroxine, given specifically or in conjunction with liothyronine, affected sexual function and depressed symptoms in premenopausal women who were being cured for hypothyroidism.

Ladies with evident thyroid disorder, diabetes, autoimmune disease, or depression were excluded from the study. Before taking the reading medicine (in the midst of 3 and 4 months of pregnancy), between 6 and 8 months of pregnancy, and at one year accomplices were examined for cheerless signs via the Center designed for Epidemiological Studies-Depression scale (CES-D) [3]. Hypothyroidism is diagnosed grounded on your warning cryptograms and the outcomes of blood tests that detect TSH and, in some cases, thyroxine, the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is since your pituitary gland creates extra TSH to encourage your thyroid gland to make extra thyroid hormone. Thyroid diseases may now be diagnosed far earlier than in the past, frequently

before symptoms appear. Your Physician would most probably prescribe a TSH test first, followed by a thyroid hormone examination if necessary, because the TSH test is the most accurate screening technique. TSH testing can also help in hypothyroidism therapy [4].

Hypothyroidism is diagnosed centred on your warning marks and the outcomes of blood tests that detect TSH and, in some cases, thyroxine, the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is for the reason that your pituitary gland creates more TSH to encourage your thyroid gland to make additional thyroid hormone. Thyroid diseases may now be diagnosed far earlier than in the past, frequently before warning signs appear. A TSH test would almost certainly be ordered first, followed by either a thyroid hormone test if appropriate, because the TSH test is the most absolute screening technique. TSH testing can also help in hypothyroidism therapy.

## 2. CAUSES

Inflammatory correlates of mental diseases, notably mood symptomatology, are increasingly being discovered in clinical study. In many circumstances, biological assessments may provide more accuracy and tackle medically important inflammation signs, such as central weight gain danger, inflammation-related co-morbid clinical disorders, or proinflammatory daily choices [5]. We suggest a more appropriate medical paradigm for tackling an inflammatory phenotype of despair by defining medically getting of the importance of inflammation in mood swings.

Chronic diseases and lifestyle habits linked to clinically increased inflammation in mood disorders are included in our model. Weight gain, low HDL levels, increased triglyceride levels, chronically raised blood pressure, medical treatment of hypothyroidism, migraines, rheumatoid arthritis, adult beginning diabetes, inflammatory bowel disorders, inflammatory skin types, and daily practices such as smoking and chronic pressure are all part of this "inflamed

depression" model [6]. Hypothyroidism is diagnosed based on your warning signs and the outcomes of blood tests that detect TSH and, in some cases, thyroxine, the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is for the reason that your pituitary gland creates more TSH to encourage your thyroid gland to make added thyroid hormone.

Thyroid diseases may now be diagnosed far past than in the earlier, frequently before warning signs appear. Since this TSH test has been the most effective screening method, your doctor will almost certainly prescribe one first, followed by a thyroid hormone test if appropriate [7].

TSH testing are also useful in the handling of hypothyroidism. Overt hypothyroidism is associated with neuropsychiatric impairment, which will improve (but not totally resolve) with treatment. Thyroid dysfunction deficits are usually mild in subclinical hypothyroidism, therefore realistic expectations about symptom reversibility with treatment should be set. Most patients with mild hypothyroidism and severe distress from neuropsychiatric symptoms have different illnesses that should be investigated independently [8].

Hashimoto's chronic autoimmune thyroiditis has a wide range of clinical symptoms, including psycho-neurological problems. Behavioral, motor, and other psychoneurological anomalies also bring euthyroid and quite hypothyroid conditions and time of Hashimoto's disease, trying to form the situation of so-called "Hashimoto's encephalopathy." Although hypothyroidism disrupts the additional role of the brain and spinal cord, resulting in deep impairment of cognitive facilities and even psychosis in severe cases of myxedema, behavioural, motor, and other psychoneurological abnormalities also accompany euthyroid." Because its aetiology and pathophysiology are unknown, the entity has remained a conundrum of thyroidology and psychiatry for more than 50 years since its earliest descriptions. The study discusses the evolution of contemporary perspectives on the function of the thyroid in brain also functioning, also traditional and recent theories about the aetiology and pathology of Hashimoto's encephalopathy [9]. Hypothyroidism can also be caused by one of the following conditions:

It's a congenital condition. Some newborns are born with a thyroid gland that isn't working or with no thyroid gland at all. The thyroid gland did not grow correctly in the majority of instances for strange reasons, however selected children have a hereditary type of the disease. Congenital hypothyroidism causes newborns to seem normal at birth. One of the reasons why most states now mandate neonatal thyroid screening is because of this.

Pituitary dysfunction is a condition that affects the pituitary gland. The inability of the hypophysis to generate adequate thyroid-stimulating hormone (TSH) is very uncommon reason of hypothyroidism, generally due to a benign pituitary tumour. Pregnancy. Hypothyroidism is a condition that affects certain women. Pregnancy Some women experience hypothyroidism after or during childbearing (postpartum hypothyroidism), which is caused by antibodies against each have their own thyroid gland If left untreated, hypothyroidism increases the risk of miscarriage, premature delivery, and preeclampsia, a disorder that causes a significant rise in a woman's blood pressure during the last three months of pregnancy. It may also have an adverse effect on the developing foetus [10].

Deficiency in iodine. Iodine, a Thyroid hormone production requires iodine, which may be obtained via fish, seaweed, plants growing in iodine-rich soil, and iodized salt. Iodine deficiency can induce hypothyroidism.

### 3. DIAGNOSIS

Cognitive deficiencies are a significant source of functional incapacity in severe mental diseases such as major anxiety, bipolar dysfunction and schizophrenia. Pharmacological therapies, on the other hand, have a limited efficacy in treating cognitive deficiencies in these illnesses. Due to the absence of pro-cognitive pharmaceutical treatments, we wanted to see if thyroid hormones or medications that encounter prolactin could be used in repurposing studies to improve cognition. T3 and T4 and prolactin as prospective encounter for enhancing cognition in major mood swings or schizophrenia were the topic of a narrative review. T3 and T4 and prolactin's effects on cognition in non-psychiatric groups were also examined. Although medical happening these chemical messengers are insufficient especially in individuals with schizophrenia, bipolar illness, or significant trauma, observational studies show that these hormones play a role in cognitive processes.

Bipolar disorder individuals with subclinical hypothyroidism have lower cognitive performance than euthyroid ones less free thyroxine concentrations have been linked to bad attention in patients with early psychosis, whereas higher prolactin levels have been linked to slower processing speed. Only two short clinical trials looked into thyroid hormones' potential pro-cognitive effects, with encouraging products for triiodothyronine (T3) cure in individuals on lithium or electroconvulsive treatment. Thyroid hormones and prolactin, in general, may help people with significant mood swings and psychotic problems perform better cognitively. Hypothyroidism is diagnosed based on your signs and the conclusions of blood tests that detect TSH and, in some cases, thyroxine, the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is because your hypophysis creates more TSH to encourage your thyroid gland to make more thyroid hormone.

Thyroid diseases may now be diagnosed far earlier than in the past, frequently before symptoms appear. Your doctor would most likely prescribe a TSH test first, followed by a thyroid hormone test if necessary, because the TSH test is the most accurate screening technique. TSH testing can also help in hypothyroidism therapy. T3 and T4 and prolactin-reducing medicines (e.g., cabergoline, aripiprazole) are potential candidates for repurposing clinical trials aimed at improving the intellectual capacities of people with significant mental disorders and schizophrenia [11].

High FT4 levels (but neither TSH nor thyroid protective bodies) were linked to more appropriate cognitive presentation in attention/vigilance and general perception in patients with initial psychosis. After correcting for informative level, oldness, sex, element usage, and benzodiazepine and antipsychotic methods, the link amid FT4 levels and the attention/vigilance territory remained important in a various observation. In high school, there was no evidence of a link between FT4 and mental performance. Subjects with emotional exhibited higher FT4 levels and a improved mental outline than those with non-affective psychosis in the examining survey by psychotic subtypes [12].

#### 4. REASONS

Since some of the early information of thyroid disorder, there has been a connection between thyroid dysfunction and changes in mood and

cognition. Researchers have worked for years to better describe these properties across the scale of thyroid disease, in order to clearly explain the given scenario and refine treatment signs. More frequently, researchers have focused on the influence of changes in thyroid hormones within the appropriate position scale, predominantly in elder persons, bringing fresh perceptions into the thyroid hormone-cognitive decreasing relationship. During prenatal development, thyroid hormone has a significant impact on neural progenitor production, survival, maturation, and different. Thyroid hormone continue to now the direction of have an essential arranged progenitors throughout the neurogenic habitat of the matured mammalian brain, according to studies conducted over the last decade [13]. The goal of this survey is to critically assess and synthesise the present state of proceeding thyroid hormone's role in modifiable adult neurogenesis in the region of the hippocampus and the subventricular region that lines the lateral ventricles. We go over the findings that show thyroid secretion, specifically the TR1 receptor isoform, has a function in controlling ancestor survival and pledge to a neuronal result. We also look at the potential of T3 and T4 to react to genes that may subsidise T3 and T4's neurogenic effects, as well as prospective models for thyroid hormone/method TR1's of action on specific phases of subgranular and subventricular region precursor development. The effects of T3 and T4 on developed neurogenesis are discussed in light of a probable role for these features in the cognitive and mood-related consequences of T3 and T4 deficiency. Finally, we discuss previously undiscovered features of thyroid hormone's impact on matured neurogenesis, which will serve by means of a springboard for future research into the neurogenic effects of T3 and T4. Within various neurogenic niches, thyroid hormone control of adult neurogenesis in mammals has both distinctive and overlapping effects. Thyroid hormone controls subventricular region (SVZ) progenitor cell product, cell cycle end, and neuronal cell further acquire as well as regulating subgranular region (SGZ) progenitor cell existence and neuronal cell fate acquire. Thyroid hormone regulates of matured neurogenesis is summarised, critically discussed, and unanswered problems are highlighted in this review [14].

#### 5. TREATMENT

Hypothyroidism is diagnosed based on your signs and results of blood tests that detect TSH

and, in some cases, thyroxine the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is because your hypophysis creates more TSH to encourage your thyroid gland to make more thyroid hormone.

Thyroid diseases may now be diagnosed far earlier than in the past, frequently before symptoms appear. Also because TSH test has been the most reliable screening method, your doctor will almost certainly prescribe one first, followed by a thyroid hormone test if appropriate.

TSH testing can also help in hypothyroidism therapy. With 393 women, a case-control study was conducted. 153 hypothyroid ladies given with levothyroxine were included in the case. 240 women without hypothyroidism served as the control group [1]. The importance of levothyroxine is not constantly linked to the disappearance of hypothyroidism symptoms. The goal of this survey is to evaluate the health-linked quality of life (HRQOL) of hypothyroid ladies treated with levothyroxine to that of no-hypothyroid ladies [2]. Objective In premenopausal women, even modest hypothyroidism causes problems with sexual function. The goal of the study was to see how levothyroxine, given alone or in conjunction with liothyronine, affected sexual function and depressed signs in premenopausal ladies who were being given for hypothyroidism. Methods This single-blind, quasi-randomized experimental included 39 young ladies who were taking levothyroxine and had clinical symptoms of hypothyroidism despite having normal thyrotropin and thyroid hormone levels [2].

Ladies with overt thyroid disorder, diabetes, autoimmune disorder, or depression were excluded from the study. Before taking the survey of medicine (between 11 and 20 weeks of pregnancy), between 32 and 38 weeks of pregnancy, and at long term postpartum, participants were examined for depression indications using the Center for Epidemiological Studies-Depression spectrum (CES-D) [3]. Hypothyroidism is diagnosed based on your symptoms and the results of blood tests that detect TSH and, in some cases, thyroxine, the thyroid hormone. Thyroid underactivity is indicated by a low thyroxine level and a high TSH level. This is because your pituitary gland creates more TSH to encourage your thyroid gland to make more thyroid hormone.

Thyroid diseases may now be diagnosed far earlier than in the past, frequently before symptoms appear. Because the TSH test is the most accurate screening tool, your doctor would most likely order a TSH test first and then a thyroid hormone test if necessary. TSH testing are also useful in the treatment of hypothyroidism.

## 6. RESULTS

There is indisputable proof that hypothyroidism causes affective sickness and psychic abnormalities, hence it has been connected to depression. Hypothyroidism is more common in depressive people, and hypothyroidism is more common in patients with depressive syndrome. In the brain, hypothyroidism causes significant changes in blood flow and glucose metabolism.

Since some of the previous reports of thyroid disorder, there has been a connection between thyroid malfunction and changes in mood and cognition. Researchers have worked for years to better identify these impacts throughout the scale of thyroid illnesses, in order to more effectively get the underlying impact and restore therapeutic indications [15-20]. More early, researchers have focused on the influence of changes in thyroid hormones within the proper range, specifically in elder persons, bringing fresh visions into the thyroid hormone-cognitive weakening relationship. This evaluation summarises the indication on the effects of thyroid hormone on mental well being and reasoning in evident and medical hypothyroidism, as well as subclinical and overt hyperthyroidism, within the reference range. Treatment of overt thyroid malfunction typically resolves concomitant mood and cognitive problems, however subtle adverse effects on reasoning may not be fully recovered in the case of overt hypothyroidism. Poorer cognitive outcomes have been linked to clinical hyperthyroidism and greater free thyroxine (FT4) levels with the appropriate scale. For suriety causation and controller the assessment of profits vs hazards of treatments in the growing number of elder persons with medical thyroid illness, more research, including randomised controlled trials, is needed [21-25].

## 7. CONCLUSION

It is concluded that the importance of evaluating individuals with schizophrenia-scale abnormalities for thyroid hormone abnormalities and how it affects hypothyroidism.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Romero-Gómez B, Guerrero-Alonso P, Carmona-Torres JM, Notario-Pacheco B, Cobo-Cuenca AI. Mood disorders in levothyroxine-treated hypothyroid women. *International journal of environmental research and public health*. 2019;16(23):4776. Romero-Gómez B, Guerrero-Alonso P, Carmona-Torres JM, Notario-Pacheco B, Cobo-Cuenca AI. Mood Disorders in Levothyroxine-Treated Hypothyroid Women. *Int J Environ Res Public Health*. 2019;16(23):E4776.
2. Romero-Gómez B, Guerrero-Alonso P, Carmona-Torres JM, Pozuelo-Carrascosa DP, Laredo-Aguilera JA, Cobo-Cuenca AI. Health-Related Quality of Life in Levothyroxine-Treated Hypothyroid Women and Women without Hypothyroidism: A Case-Control Study. *Journal of Clinical Medicine*. 2020;9(12):3864. Romero-Gómez B, Guerrero-Alonso P, Carmona-Torres JM, Pozuelo-Carrascosa DP, Laredo-Aguilera JA, Cobo-Cuenca AI. Health-Related Quality of Life in Levothyroxine-Treated Hypothyroid Women and Women without Hypothyroidism: A Case-Control Study. *J Clin Med*. 2020;9(12):E3864.
3. Costantine MM, Smith K, Thom EA, Casey BM, Peaceman AM, Varner MW, Sorokin Y, Reddy UM, Wapner RJ, Boggess K, Tita AT. Effect of thyroxine therapy on depressive symptoms among women with subclinical hypothyroidism. *Obstetrics & Gynecology*. 2020;135(4):812-20. Costantine MM, Smith K, Thom EA, Casey BM, Peaceman AM, Varner MW, et al. Effect of Thyroxine Therapy on Depressive Symptoms Among Women With Subclinical Hypothyroidism. *Obstet Gynecol*. 2020;135(4):812-20.
4. Ellis P, Kitay B, Schmidt CJ. Depression in the primary care setting. *The New England journal of medicine*. 2019;380(23):2278-8. Park LT, Zarate CA. Depression in the Primary Care Setting. *N Engl J Med*. 2019;380(6):559-68.
5. McKnight RF, Adida M, Budge K, Stockton S, Goodwin GM, Geddes JR. Lithium toxicity profile: a systematic review and meta-analysis. *The Lancet*. 2012;379(9817):721-8. McKnight RF, Adida M, Budge K, Stockton S, Goodwin GM, Geddes JR. Lithium toxicity profile: a systematic review and meta-analysis. *Lancet Lond Engl*. 2012;379(9817):721-8.
6. Munshi KR, Thampy A. The syndrome of irreversible lithium-effectuated neurotoxicity. *Clinical neuropharmacology*. 2005 Jan 1;28(1):38-49. Adityanjee null, Munshi KR, Thampy A. The syndrome of irreversible lithium-effectuated neurotoxicity. *Clin Neuropharmacol*. 2005; 28(1):38-49.
7. Allagui MS, Vincent C, Gaubin Y, Croute F. Lithium toxicity and expression of stress-related genes or proteins in A549 cells. *Biochimica et Biophysica Acta (BBA)-Molecular Cell Research*. 2007;1773(7):1107-15. Allagui MS, Vincent C, El feki A, Gaubin Y, Croute F. Lithium toxicity and expression of stress-related genes or proteins in A549 cells. *Biochim Biophys Acta*. 2007;1773(7):1107-15.
8. Samuels MH. Psychiatric and cognitive manifestations of hypothyroidism. *Current opinion in endocrinology, diabetes, and obesity*. 2014;21(5):377. Samuels MH. Psychiatric and cognitive manifestations of hypothyroidism. *Curr Opin Endocrinol Diabetes Obes*. 2014;21(5):377-83.
9. Churilov LP, Sobolevskaia PA, Stroev YI. Thyroid gland and brain: Enigma of Hashimoto's encephalopathy. *Best Pract Res Clin Endocrinol Metab*. 2019;33(6):101364.
10. Tost M, Monreal JA, Armario A, Barbero JD, Cobo J, García-Rizo C, et al. Targeting Hormones for Improving Cognition in Major Mood Disorders and Schizophrenia: Thyroid Hormones and Prolactin. *Clin Drug Investig*. 2020;40(1):1-14.
11. Barbero JD, Gutiérrez-Zotes A, Montalvo I, Creus M, Cabezas Á, Solé M, et al. Free thyroxine levels are associated with cognitive abilities in subjects with early psychosis. *Schizophr Res*. 2015;166(1-3):37-42.

12. Carvalho AF, Dimellis D, Gonda X, Vieta E, McIntyre RS, Fountoulakis KN. Rapid cycling in bipolar disorder: a systematic review. *J Clin Psychiatry*. 2014;75(6):e578-586.
13. Galvez JF, Bauer IE, Sanches M, Wu HE, Hamilton JE, Mwangi B, et al. Shared clinical associations between obesity and impulsivity in rapid cycling bipolar disorder: a systematic review. *J Affect Disord*. 2014;168:306–13.
14. Cipriani A, Reid K, Young AH, Macritchie K, Geddes J. Valproic acid, valproate and divalproex in the maintenance treatment of bipolar disorder. *Cochrane Database Syst Rev*. 2013;(10):CD003196.
15. Ritchie M, Yeap BB. Thyroid hormone: Influences on mood and cognition in adults. *Maturitas*. 2015;81(2):266–75.
16. Kapoor R, Fanibunda SE, Desouza LA, Guha SK, Vaidya VA. Perspectives on thyroid hormone action in adult neurogenesis. *J Neurochem*. 2015;133(5):599–616.
17. Kelly T. A hypothesis on the mechanism of action of high-dose thyroid in refractory mood disorders. *Med Hypotheses*. 2016; 97:16–21.
18. Kombe, Pooja, Vaishali Kuchewar. Evaluation of Effect of Kanchar Guggul in Sub-Clinical Hypothyroidism with Respect to Agnimandya. *International Journal of Ayurvedic Medicine*. 2019;10(4): 310–16.
19. Acharya, Sourya, Samarth Shukla, Amol Andhale, Vidyashree Hulkoti. "Hashimoto's Encephalopathy (HE) - Early Manifestation of Impending Thyroid Storm." *Journal of Evolution of Medical and Dental Sciences-Jemds*. 2020;9(30):2164–65. Available:<https://doi.org/10.14260/jemds/2020/471>.
20. Morey, Amruta, Bhushan Madke, Adarshlata Singh. "Effect of Isotretinoin on Thyroid Function Test in Acne Patients." *Journal of Clinical and Diagnostic Research*. 2020;14:9. Available:<https://doi.org/10.7860/JCDR/2020/43032.14012>.
21. Talwar, Dhruv, Sunil Kumar, Amrutha Garikapati, and Anuj Chaturvedi. "Sub Clinical Disease Presenting with Serious Clinical Manifestations - Blame Thyroid." *Journal of Evolution of Medical and Dental Sciences-JEMDS*. 2020;9(33):2392–93. Available:<https://doi.org/10.14260/jemds/2020/518>.
22. Balwani, Manish R, Amit Pasari, Amol Meshram, Anil Jawahirani, Priyanka Tolani, Hansini Laharwani, and Charulata Bawankule. An Initial Evaluation of Hypokalemia Turned out Distal Renal Tubular Acidosis Secondary to Parathyroid Adenoma." *Saudi Journal of Kidney Diseases and Transplantation*. 2018;29(5): 1216–19. Available:<https://doi.org/10.4103/1319-2442.243965>.
23. Dixit, Anubhuti, Mahalaqua Nazli Khatib, Shilpa Gaidhane, Abhay M. Gaidhane, and Zahiruddin Quazi Syed. Assessment of Serum Lipid Profile in Patients with Thyroid Disorders in a Rural Backdrop of Central India. *Medical Science*. 2020;24(101): 1–11.
24. Kombe, Pooja, and Vaishali Kuchewar. "Evaluation of Effect of Kanchar Guggul in Sub-Clinical Hypothyroidism with Respect to Agnimandya." *International Journal of Ayurvedic Medicine*. 2019;10(4): 310–16.
25. Agrawal A, Kedia A, Manchanda A, Bhake A, Vagha S. Primary Swellings of Thyroid with the Cytodiagnosis of Invasive Squamous Cell Cancer - A Case Report. *Journal of Evolution of Medical and Dental Sciences-Jemds*. 2021;10(3):161–3.

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