

Oral Manifestations of Thyroid Disorders

Aparna Achanta, Suwarna Dangore Khasbage*

Department of Oral Medicine and Radiology, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Medical Sciences, Sawangi Wardha, Maharashtra, India

ABSTRACT

The thyroxine hormone is a major metabolic regulator that has an impact on all body activities. Abnormality in thyroid functioning is the second most prevalent endocrine system abnormality, and it can affect any system in the body including the oral cavity. Nevertheless, the excess or shortage of these hormones has a negative impact on the oral cavity. The oral physician as well as the endocrinologist must be conversant with the oral symptoms of thyroid gland dysfunctions so as to provide appropriate treatment. Before considering dental treatment, a patient suffering from thyroid dysfunction that may or may not be on medication for the same should be adequately evaluated, so as to manage the risk accurately. A surprising fact that cannot be ignored is that even if the thyroid disorders are very common the dental manifestations of the same are less discussed about. Thus, the purpose of this review is to describe clinical features of thyroid disorders with a detailed emphasis on the oral manifestations and dental considerations in thyroid disorders.

Key words: Hypothyroid, Hyperthyroid, Hormone, Oral manifestations

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Corresponding author: Suwarna Dangore Khasbage

E-mail: Dangore_suwarna@rediffmail.com

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INTRODUCTION

The thyroid gland is the largest gland in the body, and it is located directly below the larynx in the neck. The thyroid gland during the third week of prenatal life, it arises from the pharyngeal epithelium and migrates downwards to its ultimate position, which is behind the cricoid and arytenoid cartilages and in the centreline of the neck. The thyroglossal duct develops at the junction of the tongue's anterior 2/3rd and posterior 1/3rd [1]. A 2 centimetre wide isthmus connects the mature gland to the anterior laryngeal cartilages, and it weighs between 15 and 20 grams. Its most important functions include the synthesis and secretion of the hormones triiodothyronine and tetraiodothyronine (thyroxine) which in turn determine the normal functioning of the human body. It also houses the parathyroid gland which releases the calcitonin hormone which determines the bone health. The thyroid hormone plays its role in the functioning of almost every cell and organ of the body which include:

- Control the pace at which calories are burnt, which might affect weight loss or growth.
- It has the ability to slow or speed up the heartbeat.
- It has the ability to raise or lower body temperature.

- Affect the rate with which food passes through the digestive system.
- Be able to control how your muscles contract.
- Manage how quickly dead cells are replaced.

Despite the fact that thyroxine is generated in the thyroid gland, the brain and pituitary are still in charge of its regulation. The hypothalamus releases Thyrotropin Releasing Hormone (TRH), which causes the pituitary to release Thyroid Stimulating Hormone (TSH), which boosts thyroxine synthesis. The normal levels of thyroxine in the blood serum is 5.0-11.0 mg/dl, Any alterations in this value may lead to either thyroid hormone excess (hyperthyroidism) or hormone deficiency (hypothyroidism) and these alterations in the hormone level produce various signs and symptoms. Amongst these the systemic effects are well known but the oral manifestations of the same are not very common and hence not very well mentioned in the literature.

LITERATURE REVIEW

Hypothyroidism

Thyroxine production and the gland functioning are both affected due to hypothyroidism. Severe iron deficiency, chronic thyroiditis, the absence of invigoration of radioisotope of iodine that destroys follicles, surgery, and pharmaceutical drugs such as lithium, are all the commonly observed causative agents [1]. The two kinds of hypothyroidism are primary hypothyroidism, in which the problem is intra-thyroid, and secondary hypothyroidism,

in which other illnesses may cause an indirect decline in circulating hormone (for example, surgical or pathological alteration of the hypothalamus). Hypercholesterolemia, hyponatremia, and anaemia are all medical disorders linked to hypothyroidism. TSH rises in the presence of normal FT₄ levels is considered to as mild or subclinical hypothyroidism. Subclinical hypothyroidism has recently been cited as a main risk factor for coronary heart disease in women [2]. Hypothyroidism is a very commonly occurring thyroid disorder in which there occurs thyroid hormone deficiency. It is believed that 42 million people in India currently suffer from this disorder, it is said that it affects one in every 10 adults in India. It is generally more commonly seen in women. Anemia, cardiomegaly, cold intolerance, constipation, and cretinism (in infants) are all symptoms of hypothyroidism. Hair that is dry, Lactate dehydrogenase, aspartate transaminase, and alanine transaminase levels are all elevated. Creatine levels have risen. Hyperlipidemia, hypertelorism, and hypertension are among conditions that can cause goiter [3]. Electrocardiogram with inverted T waves can also be a peculiar feature. Features of hypothyroidism include weight gain, lethargy, neck swelling, amenorrhea, diabetes in the later stages, cardiovascular disorders etc. There are three types of hypothyroidism which are

- **Primary:** Which generally occurs due to the failure of the thyroid gland to produce thyroxine hormone? This may either be autoimmune or may occur due to an inflammatory disorder.
- **Secondary:** This occurs when the deficit lies in the pituitary gland, *i.e.* there is increase in the TSH due to which the thyroid gland is stimulated to synthesize more of the hormone, but the gland fails to do so which causes the hormone deficiency.
- **Tertiary:** This type of hypothyroidism is the rarest of all and occurs due to the hypothalamic deficiency of TRH due to which the overall hormone production is reduced.

Hyperthyroidism

Thyroid hormones are produced in an uncontrolled manner, resulting in hyperthyroidism. Thyrotoxicosis is a dangerous hyperthyroidism complication caused by an overabundance of circulating thyroid hormones in the tissues. Tremor, emotional instability, heat intolerance, sinus tachycardia, marked chronotropic and ionotropic effects, increased cardiac output (increased susceptibility to congestive heart failure), systolic heart murmur, hypertension, increased appetite, and weight loss are all symptoms of this condition. Excessive functioning of the thyroid gland, metabolic disturbances, or hormone production at sites other than the gland are all possible causes [1]. Graves' disease is a morbid combination of hyperthyroidism and diabetes. It is the hyperactivity of the thyroid gland with increase in the synthesis and release of thyroid hormones. Hyperthyroidism is often associated with a hypermetabolic condition called thyrotoxicosis, onycholysis, subtle tremors of the upper extremities, ocular symptoms such as swollen palpebral

fissures, bulging of the eye which causes the eyes to move out of the sockets, and frequent flickering of the eyes and marked reduction in weight are all physical markers of thyrotoxicosis [3]. The illness is characterized by periodic remission stages that are unpredictable. An outcome of the over bracing of the myocardial activity is that the people with high thyroid circulating hormones may develop cardiac abnormalities, including arrhythmias and atrial fibrillation. Unless there is a history of long-term thyrotoxicosis, this is uncommon in patients under the age of 40. It's worth noting that atrial fibrillation caused by hyperthyroidism can be resistant to digitalis. Flow murmurs and a strong point of maximal impulse were also discovered throughout the assessment. Abdominal pain is a symptom of hyperthyroidism. Cardiac murmur is a type of heart murmur that occurs as the heart beats, diplopia, dysrhythmias, alkaline phosphatase, aspartate transaminase, and alanine transaminase levels are all elevated. Exhaustion, Hair that is fine, goiter, Intolerance to heat, Hypercalcemia is a condition in which the body's calcium levels are elevated increased cardiac output, increased pulse, and increased appetite are all signs of hyperthyroidism. Palpitations, nervousness Proptosis, Psychosis, Tremor, Tachycardia Skin that is warm, Loss of weight are the other peculiar features [2].

- Grave's disease which is a type of autoimmune disorder in which antibodies produced by the immune system stimulate the thyroid gland to produce more T₃ and T₄ ultimately causing the increase in the serum levels of the hormone.
- Thyroiditis is a causative factor in near about 20% cases of hyperthyroidism which is a destructive release of the preformed thyroid hormone into circulation.
- Toxic multinodular goiter is yet another cause which leads to the increase in the hormone production and it generally occurs in the adult population especially in those patients with long standing goiter.
- The hormone levels are also increased in cases of the thyroid carcinomas which account for about three to 5% of the total cases.

Oral manifestations of thyroid disorder

The symptoms of the thyroid disorders are generally time and age dependent. The severity of the signs and symptoms depends on mainly two factors being:

- At what age the patient developed thyroid disorder.
- For how has the hormone dysfunction occurred?

Same is the scenario for the oral manifestations of the hormone imbalance. Hormonal imbalance during the fetal development in the uterus may cause severe developmental disturbances; hormone imbalance in early childhood may cause other problems with the developing and already developed structures. Thyroid problem is a silent condition with modest symptoms that are often neglected at the time of diagnosis; therefore, it is crucial to keep a close eye on it. Thyroid disorder has a significant impact on one's general health and well-being.

Access to high quality therapy and endocrinologists and others who specialize in thyroid diseases, medical incompetence in educating patients about such ailments, and a general lack of understanding in the community could all play a role [4-8]. Any systemic disorder can be identified in its initial or later stages by the dentist if the patient is examined carefully. Same is with thyroid disorders; it is a systemic disorder with major oral manifestations both in the cases of hypothyroid and hyperthyroid. Following are a few of the major manifestations.

Hypothyroidism

Macroglossia, dysguesia, poor periodontal health, aberrant tooth morphology, delayed wound healing, delayed eruption of teeth, burning mouth syndrome, and dry mouth are all common oral manifestations of hypothyroidism.

- **Macroglossia:** It's the abnormal growth of the tongue's musculature in comparison to the rest of the body's muscles. Manish Gutch et al stated that the thyroid hormone deficiency may lead to retarded development leading to delayed cranial development, macroglossia, thick lips etc. Macroglossia in childhood may lead to development of malocclusion [9].
- **Dysguesia:** It is the loss of taste and smell. It is not very clear whether it occurs due to the drug therapy or due to the hormone deficiency itself. It is believed that the loss of sensory actions can be associated with the synaptic delay of the impulse hence causing the delayed response. The altered taste sensation in patients with hypothyroid leads to disinterest in food [10].
- **Poor periodontal health:** It can be associated with hypothyroidism indirectly through its systemic effects. The pathogenesis can be the patients with hypothyroidism may develop cardiovascular and metabolic disorders which ultimately affect the periodontal health of the patients. One such example is when the thyroid hormone is reduced in the body, the basal metabolic rate is also decreased causing increased basal metabolic rate which is a great risk for diabetes and hence forward diabetes is a great risk for periodontal health. Other than that, the direct relation can be established such as delayed wound healing and there is a decrease in the activity of the fibroblasts which causes prolonged inflammation. There can be increased gingival bleeding, the mechanism behind which is the presence of excessive subcutaneous mucopolysacchrides which occurs due to failure in the degeneration of these tissues. As a result the ability of the blood vessels to constrict reduces thus causing increased bleeding from the tissues being infiltrated including both the mucosa and the skin [11].
- **Burning mouth syndrome:** It is a sensory disorder which is more commonly seen in women over the age of fifty years and is characterized by the burning sensation of the buccal mucosa. The interesting feature of this syndrome is that there

can be no evident clinical or pathological findings observed. The burning sensation is more commonly felt on the tongue especially the tip and the edges, followed by the hard palate, lips and the cheek rarely. The exact pathophysiology of this syndrome is not known but it is said that a patient with hypothyroidism has underdeveloped taste buds, papillae and poor mucosal health hence even a small stimulus causes inflammation which is nothing but the burning sensation [12].

- **Dry mouth:** Dry mouth or xerostomia is reported in Hashimoto's Thyroiditis (HT) which is one of the conditions in hypothyroidism. The reason for which could be the functioning of cytokines in the conditions occurring due to immunity against the host itself and thyroxine abnormality. Early detection of dry mouth is critical in preserving and promoting systemic and oral health [13].
- **Effect on bone health:** Delay in development of the bones, poor endochondral bone formation, small height and built, and defective development of the epiphysis are well-known clinical symptoms of severe untreated hypothyroidism that can be corrected, especially when replacement therapy is started early and promptly. Thyroxine is essential for cartilage synthesis and differentiation, as well as improving growth hormone response [14].

Cretinism also called as childhood hypothyroidism which is caused in early childhood may cause retarded development. The features of this disorder include thick lips, large protruding tongue, malocclusion and delayed eruption of teeth. The long term effects of severe or childhood hypothyroidism are retarded craniofacial development and dental development. It is said that one long term effect on dental development is the impaction of mandibular second molars which is caused by a disturbed growth and resorption ratio that is the inner aspect of the ramus fails to resorb while the outer surface of the mandible grows causing a reduced space for eruption ultimately causing impaction [2].

Hyperthyroidism

The oral disorders of hyperthyroid include increased sensitivity to caries, problems in and around the tooth, increased size of the thyroid gland, mandibular or maxillary osteoporosis, accelerated tooth eruption, early primary tooth exfoliation.

- **Increased susceptibility to caries:** The exact mechanism behind this is still not known but in an experiment conducted on rats by Joseph C Mulher and Willison G Shafer it was seen that desiccated thyroid decreased the risk of caries while propylthiouracil increased the caries susceptibility. Over the time due to improved health practices and better food habits now the prevalence has reduced but the fact cannot be denied that thyroid hormone does hamper the susceptibility of tooth to caries [15,16].

- **Periodontal disease:** By elevating serum and salivary cytokine levels, which activate multiple mechanisms determining alveolar bone and conjunctive tissue deterioration, it may cause periodontal disease. Two important pro-inflammatory cytokines, Interleukin-6 (IL-6) and Tumour Necrosis Factor (TNF) are generated locally in different tissues in diverse clinical circumstances, including thyroid dysfunction. These locally created substances make their way into the bloodstream and spread throughout the body, including periodontal tissues. Cytokines are thought to encourage periodontal resident cells to create metalloproteinase which are chemicals that cause alveolar bone loss by mediating connective tissue breakdown and inducing osteoclast differentiation and activity [17].
- **Loss of taste:** Thyroid hormones play a role in taste buds maturation and specialisation. The thyroid can be affected by oxidative stress (excess free radicals). Ordinary T_3 can be degraded by oxidative stress to create reverse T_3 (rT_3), which has the hormonal impact of T_3 . rT_3 has no effect on the cell other than binding to receptor sites and blocking T_3 function hence causing loss of taste [10].
- **Mandibular and maxillary osteoporosis:** The rate of the bone re-sorption is highly increased whereas the rebuilding time shortens in hyperthyroidism. The difference between bone production and absorption creates a negative equilibrium, resulting in net bone loss which ultimately causes osteoporosis of the jaw bones, that is the bone re-sorption rate is increased thus weakening the jaw bones and may also cause the sockets which house the teeth to re-sorption and enlarge causing early exfoliation. As a result of bone weakening, fracture of the jaw bones due to trauma may also occur [18].
- **Accelerated tooth eruption:** It is a well-known fact that the thyroxine hormone regulates the BMR. Therefore, in hyperthyroidism if the metabolism is increased the process of the eruption of teeth also accelerates. Baume LJ, et al. concluded that thyroxin injections improved the pace of eruption (by 27%) more than dental dimensions in their study on rats. The vascularization of dental structures increased significantly, as did the proliferation and histodifferentiation of epithelial tissues. However, calcification, particularly of the enamel matrix, was lacking [19].
- **Early primary tooth exfoliation:** The rate of root re-sorption in primary dentition in cases of hyperthyroidism significantly increases due to increased metabolism and increased calcitonin thus leading to early loss of teeth which may lead to the development of malocclusions [20].

Dental considerations in thyroid disorders

It is vital for the dentist to have a solid understanding of thyroid dysfunction for two reasons. For starters, the dentist may be the first to notice signs of thyroid disease and can help with early diagnosis. As a result, the dentist's role as a part of a health care team is critical in recognising thyroid issues. The second goal is to prevent any oral problems that may emerge as a result of thyroid

treatment. When treating thyroid illness patients, dental care modifications must be considered. Using a thyroid collar while taking patient X-rays is one way the dental professional can safeguard the thyroid gland. Excessive radiation exposure is a known risk factor for many thyroid problems since the thyroid is particularly sensitive to radiation. During an examination of the orofacial complex, many indications and symptoms of thyroid illness can be seen. Furthermore, thyroid gland under or over activity might result in life threatening cardiac episodes. As a result, the dental health care giver must understand thyroid pathologies and how to handle thyroid disease. Dental treatment adjustments may be required for dental patients under medical care and follow-up for a thyroid condition. If a suspicion of thyroid disease arises for an undiagnosed patient, any dental treatment which can be avoided for a while should be postponed until a proper and adequate medical evaluation is done. In order to avoid any complications on the dental chair the dentist must be well aware of all the consequences of any systemic disorder and be able to diagnose a hidden or unknown pathology as well [2].

DISCUSSION

The thyroid hormone is a major metabolic regulator that has an impact on all body activities. Thyroid dysfunction is the second most prevalent endocrine system abnormality, and it can affect any system in the body including the oral cavity. Hormonal imbalance during the fetal development in the uterus may cause severe developmental disturbances; hormone imbalance in early childhood may cause other problems with the developing and already developed structures. Thyroid problem is a silent condition with modest symptoms that are often neglected at the time of diagnosis; therefore, it is crucial to keep a close eye on it. Thyroid disorder has a significant impact on one's general health and well-being. Access to high-quality therapy and endocrinologists and others who specialize in thyroid diseases, medical incompetence in educating patients about such ailments, and a general lack of understanding in the community could all play a role [4-8]. Macroglossia, dysphagia, poor periodontal health, aberrant tooth morphology, delayed wound healing, delayed eruption of teeth, burning mouth syndrome, and dry mouth are all common oral manifestations of hypothyroidism [1]. The oral manifestations of hyperthyroid include increased susceptibility to caries, periodontal disease, enlargement of the thyroid gland, mandibular or maxillary osteoporosis, accelerated tooth eruption, early primary tooth exfoliation [15-17]. A surprising fact that cannot be ignored is that even if the thyroid disorders are very common the dental manifestations of the same are less discussed about. Thus, the purpose of this review is to describe clinical features of thyroid disorders with a detailed emphasis on the oral manifestations and dental considerations in thyroid disorders.

CONCLUSION

It is rightly said that the oral cavity is the window to the systemic illness. Any disease can be easily diagnosed through the oral manifestations if carefully observed. It is very necessary that the clinician must be able to give a thorough diagnosis to provide a good prognosis. If a systemic pathology is detected then it becomes very necessary that all the elective procedures are temporarily ceased and the underlying pathology is first treated. Even if there are no concomitant illnesses, dental treatment changes may be required for dental patients who are under medical management and follow-up for a thyroid disease. One primary role of the dental care provider is to reduce stress, be aware of medicinal adverse effects or interactions, and be on the lookout for indications or symptoms of hormone toxicity.

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