

Association of Thyroid Diseases and Periodontitis: A Comprehensive Review

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ABSTRACT

Background: Thyroid hormones helps in the regulation of growth, development, and metabolic functions of the body. Thyroid disease can lead to imbalance in the homeostasis of the body. The influence of thyroid hormone dysfunction and its impact on periodontal disease progression, systemic health of the patient and the management of periodontal disease needed to be studied. This review summarizes the relationship between thyroid disease and periodontal status.

Keywords: Complete Denture Hygiene, Oral health, Oral hygiene practices.

INTRODUCTION

There are various systemic diseases associated with periodontitis such as diabetes mellitus, cardiovascular disease, cerebrovascular disease, respiratory disease, pregnancies, preterm delivery or low birth weight infants, stress, rheumatoid arthritis, obesity. Abnormality in thyroid hormone secretion is associated with disturbed maintenance of systemic health. It is well established that the endocrine system can modulate the immune system in a bidirectional manner.¹ It is a systemic condition in which gland shows diminished production of hormones resulting dysfunction in metabolism. Its clinical features are tiredness, mental depression, sluggishness, weight gain, constipation, menstrual irregularities.² The causes of hypothyroidism is autoimmune diseases like Hashimoto's diseases, treatment with radioactive iodine, dysfunction in pituitary gland and sometimes its congenital.³ It is a condition in which thyroid hormone production is increased leading to excess of T3 and T4 in circulation.⁴ There can be excessive release of preferred thyroid hormone or an endogenous or exogenous thyroidal source ⁵. Symptoms include

palpitation, heart intolerance, tread or, psychiatric symptoms ranging from anxiety to frank psychosis.⁵

Incidence and prevalence:

Thyroid dysfunction is one of the major endocrine disorders, where around 30% to 40% of patients seen in endocrine practice suffer from it.⁶ A survey was conducted by U.S. national Health & Nutrition examination where 13,344 were screened. The study found that 4.6% population has hypothyroidism and 1.3% had hyperthyroidism.⁶ In India, it has been estimated that about 42 million people suffer from thyroid diseases. A study conducted in Mumbai have suggested that congenital hypothyroidism occurs in 1 out of 2640 neonates when the value in worldwide is 1 in 3800 subjects. In adults, the prevalence of hypothyroidism has been recently studied in Cochin taking 971 subjects where the prevalence was found to be 3.9% whereas in men the value was 6.2%. An epidemiological study was conducted in Cochin where subclinical hyperthyroidism were

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present in 1.6% of population.⁷ In women, risk of developing hypothyroidism is more during pregnancy and menopausal period. The autoimmune reaction results in decreased production of hormone is 5 to 10 times more in women than man.⁸

Periodontitis and Hypo thyroidism

Periodontitis is a diseases of inflammation and infection of PDL and alveolar bone.⁹ Periodontal diseases is prevalent both in developed and developing countries affecting about 20% of population.¹⁰ Hypothyroidism and Periodontal Status 2 the common oral manifestations are delayed bone resorption, glossitis, thick lips, mouth breathing, enamel hypoplasia salivary gland enlargement.³ Soni et al(2005) studied a case of 42 year old man who had a history of gingival bleeding since 5 years. He suffered from acquired Von willebrand diseases & hypothyroidism.¹¹ He was under levothyroxine which connected gingival problem. When he stopped taking levothyroxine supplementation bleeding again started. So it was concluded that hypothyroidism should be consider as a differential diagnosis of gingival bleeding. Sharma et al in 2007 reported a patient suffering from pendred syndrome a genetic disorder. He noticed a bony hardening of ligaments in anterior maxillary region.¹² So, he speculated that it was related to hypothyroidism, which causes lower trabecular resorption and led thickness of cortical bone. Feitose et al in 2008 found that the impact of thyroid hormone on alveolar bone.¹³ Hypothyroidism was induced by blocking thyroid hormones synthesis using propylracil and hyperthyroidism was induced by ingestion of sodium tri-iod thyroxin and sodium thyroxine for four months. They show an increase in alveolar bone loss in hypothyroid rats because hypothyroidism affected the immune system leading to infection induced by experimental periodontitis.¹⁴ Molloy et al in 2004 studied the association between systemic medical condition and percentage of bone loss.¹⁵ He concluded thyroid disorder leads to mild alveolar bone loss (upto 25%) from crestal bone to CEJ. Scard in a Messine in 2008 conducted a comparative study on micro vascularity of inter-dental papilla in healthy individuals and Hashimoto thyroiditis patient. He demonstrated an increased in the capillary density and decreased in the capillary diameter in

thyroiditis patient.¹⁶ Hypothyroidism and diabetic relationship is highly prevalence due to involvement of metabolic processes and insulin production.

Periodontitis and Hyper thyroidism

Alveolar bone destruction were results of the cytokines that can stimulate the resident cells of the periodontium to produce metalloproteinases, molecules that mediate connective tissue destruction and induce the differentiation, and activation of osteoclast. Also the endotoxin produced by bacteria in dental plaque increases the destruction of the periodontium. Also, Zeigler et al conducted an cross sectional study in 2015 which showed positive association between high TSH levels and PD (5 mm and more).²¹

Binderman et al (1968) conducted an animal study using Guinea pigs by intake of thyroid through diet.^{17,18} He found marked changed in tooth, alveolar bone and periodontal health though the changes were not described. Vazquez-Land a vende et al in 2002 conducted a study on Sprague-Dawley rats by ingestion of low dose thyroid hormones on root surface resorption during orthodontic treatment.^{18,19} He found that animals receiving hormone either orally or intraperitoncally had less root resorption than controls. Adriana monea et al in 2014 found that Serum and salivary levels of TNF- α and IL-6 were potent indicators of development of periodontitis in subjects with thyroid dysfunction.¹⁹ Bhankhar et al in 2017 showed positive association between hypothyroidism and CAL around 5 mm.²⁰

Thyroid diseases and Implants:

Dental implants²¹ are surgical component that interfaced with the bone of the jaw or skull to support a dental prosthesis such as crown, bridge and denture. It is also known as endosseous implant. A study was conducted in²⁷ female patients with history of hypothyroidism who were on replacement medication at the time of implant surgery and matched with²⁹ controlled subjects. It was found that they are not at higher risk of implant failure when compared to matched control. De Souza et al. in 2013 showed no association between hypothyroidism and peri-implantitis.²² Alsaadi et al in 2008 evaluated 720 implants in thyroid diseases.

However, there was no statistically significant difference between the success rates for patient groups with or without thyroid conditions.²³

Dental Management:

While practicing dentistry thyroid dysfunction is one of the major medical emergencies. So before treating that patient proper history on age, sex, menstrual cycle, medical status, pregnancy history, drug history must be taken. Patient with hypothyroidism are sensitive to CNS depressant drugs whereas patients with hyperthyroidism are sensitive to catecholamine drugs such as epinephrine which can induce high blood pressure, tachycardia thyroid diseases has a total effect on CVS owing to direct action of hormones on myocardium.²⁴ So, if LA is required, minimal dose of epinephrine should be administered.²⁵ Patient with hypothyroidism demonstrate elevated TSH (5.5 mIU/mL) and low circulating free T₄ level. Patients with long standing hypothyroidism may result in increased bleeding. Local pressure is applied to achieve homeostasis in such case.³ Patient may show delayed wound healing due to denture fibroblast activity with an increased risk of infection. Patients with hypothyroidism are found to be more susceptible to arteriosclerosis and elevated LDL.¹³ In such cases antibiotic prophylaxis must be assessed. Exposure to iodine (Iodine) may increase the complication in case of hypothyroidism.³ Hyperthyroidism patients taking PTU can cause hemorrhage during surgeries.²⁶

CONCLUSION

Dental treatment modification is necessary for patients under medical management. Stress reduction, awareness of drug side effects, signs and symptoms of diseases are must be known to the dentist. The main concern should be to implement preventive and therapeutic treatment to emergency cases to handle. Hypothyroidism has adverse effects on periodontium such as tooth mobility to bone loss. Periodontal therapies are safe with no risk while treatment however further studies are needed to explore the core of relationship between thyroid diseases and periodontitis.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Klein, J. R. (2006). The immune system as a regulator of thyroid hormone activity. *Experimental Biology and Medicine* (Maywood, N.J.), 231(3), 229–236
2. Laura A. G. Armas, Bruce W. Hollis, Robert P. Heaney, Vitamin D2 Is Much Less Effective than Vitamin D3 in Humans, *The Journal of Clinical Endocrinology & Metabolism*, Volume 89, Issue 11, 1 November 2004, Pages 5387–5391
3. Roberts, C.G., & Ladenson, P.W. (2004). Hypothyroidism. *Lancet*, 363(9411), 793–803.
4. Yen PM. Physiological and molecular basis of thyroid hormone action. *Physiol Rev.* 2001; 81: 1097-1142.
5. Pattnaik N, Rajguru JP, Pattanaik SJ, Bardhan D, Nayak B, Islam MM. Coexistence of hyperparathyroidism and peripheral giant cell granuloma of the jaw: A rare case report. *J Family Med Prim Care* 2020;9:3142-6.
6. Chandna S, Bathla M. Oral manifestations of thyroid disorders and its management *Indian J Endocr Metab* 2011; 15, Suppl S2: 113-6.
7. Ane Garmendia Madariaga, Silvia Santos Palacios, Francisco Guillén-Grima, Juan C. Galofré, The Incidence and Prevalence of Thyroid Dysfunction in Europe: A Meta-Analysis, *The Journal of Clinical Endocrinology & Metabolism*, Volume 99, Issue 3, 1 March 2014, Pages 923–931.
9. Nazir, Muhammad Ashraf. "Prevalence of periodontal disease, its association with systemic diseases and prevention." *International journal of health sciences* vol. 11,2 (2017): 72-80.
10. Moore WE, Moore LV. The bacteria of periodontal disease. *Periodontology* 2000. 1996;5:66.
11. Mealey BL. Influence of periodontal infections on systemic health. *Periodontology* 2000. 1999;21:197–209.
12. Soni, S., Singh, G., Yasir, S., and Hatipoglu, B. An unusual presentation of hypothyroidism. *Thyroid* 2005; 15:289-291

13. Sharma N., Maiti S. K., & Sharma K. K. (2007). Prevalence, Etiology and Antibigram of Microorganisms Associated with Sub-clinical Mastitis in Buffaloes in Durg, Chhattisgarh State (India). *International Journal of Dairy Science*, 2(2). February 2007, *International Journal of Dairy Science* 2(2)
14. Feitosa Dda, S., Bezerra Bde, B., Ambrosano, G. M., Nociti, F. H., Casati, M. Z., Sallum, E. A., and de Toledo, S. Thyroid hormones may influence cortical bone healing around titanium implants: a histometric study in rats. *Journal of Periodontology* 2008; 79:881-887.
15. Montesinos MM and Pellizas CG (2019) Thyroid Hormone Action on Innate Immunity. *Front. Endocrinol.* 10:350. doi: 10.3389/fendo.2019.00350
16. Molloy, J., Wolff, L.F., Lopez-Guzman, A. and Hodges, J.S. The association of periodontal disease parameters with systemic medical conditions and tobacco use. *Journal of Clinical Periodontology* 2004; 31:625-632
17. Scardina GA, Messina P. Modifications of interdental papilla microcirculation: a possible cause of periodontal disease in Hashimoto's thyroiditis? *Ann Anat.* 2008;190(3):258-63. doi: 10.1016/j.aanat.2007.12.004. Epub 2008 Mar 4. PMID: 18407481.
18. Binderman, A., Goldman, H. M., Ruben, M. P., and Gould, B. S. Modification of the effects of hyperthyroidism by concurrent ascorbic acid supplementation. *Journal of Periodontology* 1968; 39:42-43.
19. Vázquez-Román V, Utrilla JC, Fernández-Santos JM, Conde E, Bernabé R, Sampedro C, Martín-Lacave I. Postnatal fate of the ultimobranchial remnants in the rat thyroid gland. *J Morphol.* 2013 Jul;274(7):725-32.
20. Monea, Adriana & Nagy, Előd & Sitaru, Alexandru & Stoica, Alexandra & Monea, Monica. (2014). Can thyroid dysfunction induce periodontal disease?. *European Scientific Journal*.
21. Bhankhar RR, Hungund S, Kambalyal P, Singh V, Jain K. Effect of nonsurgical periodontal therapy on thyroid stimulating hormone in hypothyroid patients with periodontal diseases. *Indian J Dent Res.* 2017;28(1):16-21.
22. Kawahara H, Kawahara D. The history and concept of implant [Internet]Tokyo: AQB Implant System; [cited 2014 Apr 22].
23. Klein I, Ojamaa K. Thyroid hormone and the cardiovascular system. *N Engl J Med.* 2001. February 15; 344 7: 501– 9.
24. Alsaadi, G., Quirynen, M., Komarek, A., and van Steenberghe, D. Impact of local and systemic factors on the incidence of late oral implant loss. *Clinical Oral Implants Research* 2008; 19:670-676.
25. Anne R. Cappola, Paul W. Ladenson, Hypothyroidism and Atherosclerosis, *The Journal of Clinical Endocrinology & Metabolism*, Volume 88, Issue 6, 1 June 2003, Pages 2438–2444.
26. Kokatnur L, Rudrappa M, Mittadodla P. Acute airway obstruction due to spontaneous intrathyroid hemorrhage precipitated by anticoagulation therapy. *Indian J Crit Care Med* 2014;18:825-7.
27. Pearce EN, Farwell A, Braverman LE. Current concepts: thyroiditis. *N Engl J Med.* 2003;348:2646–55.