

Assessment of Oral Health Status and Treatment Needs among Individuals with Thyroid Dysfunction in Nashik City (Maharashtra): A Cross-Sectional Study

Abstract

Objectives: The objective of the study is to assess the prevalence of dental caries and periodontal health status among individuals suffering from thyroid dysfunction in Nashik. To compare the prevalence of thyroid dysfunction between males and females. **Materials and Methods:** The present study is cross-sectional in nature. The study group comprised of randomly selected 100 individuals diagnosed as suffering from thyroid dysfunction and fulfilling eligibility criteria, visiting endocrinology center in Nashik city. Type III clinical examination was used for the assessment of oral health status. Control group was selected from the neighborhood in general population who had matched with the eligibility criteria of the study group. Oral hygiene status was assessed by using the WHO pro forma, 2013. Collected data were compiled into MS-Excel and subjected to statistical analysis using appropriate statistical tests. **Results:** Severity of dental caries status and periodontal destruction was found more in study group as ($P < 0.05$). The prevalence of thyroid dysfunction, severity of dental caries status and periodontal destruction was seen more in females as compared to males. **Conclusion:** Thyroid dysfunction has an impact on general and oral health as well. It is necessary to identify it early so as to prevent further progression of disease and destruction of oral tissues. It is also necessary to modify treatment plan if the patient is diagnosed with thyroid dysfunction to prevent further complications.

Keywords: Goiter, hyperthyroidism, hypothyroidism, oral health, thyroid dysfunction

Introduction

The U.S surgeon general's office published its first report on oral health in May 2000, emphasizing that oral health means not only healthy teeth but also integral to general health.^[1] Infectious agents enter the body through various portals, which may include mucous membranes, skin, respiratory, and gastrointestinal tracts. The mouth can be the site through which micro-organisms enter the susceptible host and cause various diseases/infections. The presence of bacteria, viruses, parasites, and fungi challenges the mouth that may affect health status.

For the regulation of growth, development, metabolic functions of the body thyroid hormones play an important role and its dysfunction may lead to imbalance in maintaining internal stability or equilibrium of the body. Healing capacity

of tissues may get hampered also. Thyroid dysfunction has been considered as the second-most common glandular disorder of the endocrine system, and its prevalence is increasing predominantly among women, and sometimes, it may involve genetic and environmental factors for pathogenesis.^[2] Females have seven times more chances for developing thyroid problems^[3] and factors such as family history of thyroid problems; increasing age may be responsible for it.

It has been estimated that in India about 42 million people suffer from thyroid diseases.^[4] Early diagnosis and treatment can be the beneficial tool for management. It has been seen that on physical examination almost 15% of the general population may suffer from problems related to thyroid anatomy, and an unknown percentage of these do not complete a diagnostic evaluation, and the disease goes unnoticed.^[5] Previous literature suggests detected cases of thyroid dysfunction

Minal Madhukar Kshirsagar, Arun Suresh Dodamani¹, Gundbakhta Nagappa Karibasappa², Prashanth Yachrappa Vishwakarma¹, Jagdishchandra Bheemasain Vathar, Kapil Ramesh Sonawane³

Department of Public Health Dentistry, Government Dental College, Aurangabad, ¹Department of Public Health Dentistry, ACPM Dental College, Dhule, ²Department of Public Health Dentistry, Dr. D. Y. Patil Dental College, ³Department of Public Health Dentistry, Sinhgadh Dental College, Pune, Maharashtra, India

Address for correspondence:
Dr. Minal Madhukar Kshirsagar,
Department of Public Health
Dentistry, Government
Dental College, Aurangabad,
Maharashtra, India.
E-mail: minalk115@gmail.com

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may be the half of the undetected ones.^[6] Undiagnosed thyroid problems or dysfunction may affect various dental procedures.

Hyperthyroidism, hypothyroidism, and goiter are the major manifestations of thyroid dysfunction.^[2] Excess thyroid hormone secretion may lead to hyperthyroidism. While deficient thyroid hormone secretion may lead to hypothyroidism and enlargement of the thyroid gland may be referred to as goiter, there may or may not be abnormal thyroid hormone secretion. It has been well documented that patients with thyroid dysfunction have more possibilities of occurrence of dental caries and poor periodontal health^[2,7] Impact of the disease process itself, or surgical treatment (thyroidectomy), medications taken may lead deterioration of oral health.

The previous literature showed that individuals suffering from thyroid dysfunction have aggressive oral diseases such as bone loss, root resorption, and exfoliation of teeth due to periodontal destruction. Hence, this population becomes more vulnerable and at higher risk to develop oral infections. Very few studies have been conducted considering oral health status of individuals with thyroid dysfunction, and there is scarcity of the literature. Previous studies primarily focused on oral health status and less attention has been paid on the treatment needs of these individuals. Hence, an attempt was made to assess the oral health status and treatment needs among individuals with thyroid dysfunction in Nashik city (Maharashtra).

Materials and Methods

Ethical clearance

Before the start of the present study, a well-defined protocol of the intended study was made and submitted to the Institutional Ethical Review Board and ethical clearance was obtained for the present study.

Selection of the center

For the present study, the renowned private endocrinology center was selected where exclusively patients suffering from thyroid dysfunction were treated. Permission from the head of the center was obtained after explaining the purpose and protocol of the study.

Sampling technique and sample size estimation

For the present individuals suffering from thyroid dysfunction visiting endocrinology center were selected randomly.

Sample size estimation was calculated using priori test in Statistical Package for Social Science version 20 (IBM, Armonk, NY, United States of America). It was based on the data obtained from the available literature of previous studies.^[3]

Analysis

A priori	Compute required sample size
• Effect size d	0.3677669
• α error	0.05
• Power (β)	0.80
• Non-centrality parameter δ	2.5078359
• Df (Degree of Freedom)	184
• Sample size group 1	93
• Sample size group 2	93
• Total sample size	186
• Actual power	0.8033768.

Sample size obtained for the present study was 93 in each (study and control) group. Hence, it was rounded off to 100 in each group.

Control group was selected randomly from the neighborhood in general population from the same city who had matched with the eligibility criteria of the study group. They were those accompanied with thyroid dysfunction patients. Hence, control group also consists of 100 participants.

Inclusion criteria

1. Subjects diagnosed as suffering from thyroid dysfunction at least for 6 months
2. Subjects willing to participate in the study
3. Subjects already diagnosed with thyroid dysfunction based on thyroid profile.

Exclusion criteria

1. Subjects suffering from any other systemic diseases
2. Subjects on any medications/therapy for any other chronic disease
3. Subjects not willing to participate in the study
4. Subjects having any adverse habit such as tobacco chewing and smoking
5. Subjects who had undergone any periodontal therapy in the past 6 months
6. Subjects who were pregnant.

Calibration and training

Before commencing the study, calibration was done which lasted for 1 week. The clinical examination of every patient was carried out by the principal investigator herself. Before the start of the study, the examiner was trained and calibrated at the Department of Public Health Dentistry, in the Dental College (Maharashtra), under the guidance of professor and Head of the department. The calibration was done on 25 individuals, but these individuals were excluded from the present study. To determine intra-examiner variability, the oral examination of 25 randomly selected individuals was repeated on different dates. The results so obtained were subjected to Kappa statistics.

Training of the assistant

Investigator was assisted by an alert and co-operative person who was able to follow instructions properly and enter the findings accordingly. Recording assistant was trained and calibrated for entering data at the Department of Public Health Dentistry, in the Dental College (Maharashtra).

Informed consent

Purpose and protocols of the study were explained to all the participants, voluntary informed consent was obtained for the present study.

Study design

The present study was a cross-sectional descriptive study.

Study population

The study group comprised of 100 (males and females) individuals diagnosed with thyroid dysfunction of the age group of 16–60 years visiting endocrinology center in Nashik (Maharashtra). Control group (100) was selected from neighborhood which was matched with the eligibility criteria of the study group.

Duration

The study was conducted over a period of 1 month.

Study pro forma (WHO oral health assessment form-2013)

Oral examination of the study individuals was done after collecting the required demographic information using the WHO Oral Health Assessment Form-2013. Sufficient sterilized instruments and materials were made available to have uninterrupted examination.

Type of examination

Type III clinical examination was carried out by the principal investigator. In Type 3 (Inspection) clinical examination mouth mirror, explorer and adequate illumination is required.

Assessment of dental caries and periodontal status

For the assessment of dental caries and periodontal status WHO (Dentition status) Oral 2013 Health Assessment form was used. The assessment of periodontal status was done by considering gingival bleeding, periodontal pocket, and loss of attachment scores.

Assessment of treatment needs

As treatment needs criteria excluded from the WHO Oral Health Assessment Form-2013; it was recorded separately.

Statistical procedures

Data compilation, presentation, and analysis

The data obtained from the present study were compiled systematically, transformed from the WHO pro forma

to a computer and a master table preparation was done using Microsoft-Excel sheet. Statistical Package for Social Science version 20 (IBM, Armonk, NY, USA), was used for statistical analysis and data were compared using appropriate statistical tests to find out the statistical significance of the obtained results; at 5% level of significance, i.e., $P < 0.05$ was considered as statistically significant. Gender-wise distribution (dentition status score, bleeding score, pocket score, loss of attachment score, treatment need score); comparison between study and control group was done by Unpaired “*t*”-test. Comparison of dentition status score, bleeding score, pocket score, loss of attachment score, and treatment needs score among three groups with thyroid dysfunction was done by ANOVA test. *Post hoc* Tukey test was used for pair-wise comparisons.

Results

The prevalence of thyroid dysfunction was seen more in females comparatively [Table 1].

The severity of dental caries status and periodontal destruction were more in the study group as compared to control group ($P < 0.05$). On comparison of dental caries experience and periodontal status in between males and females, it was seen that the severity is more in females ($P < 0.05$) [Tables 2-4]. Comparison of oral health status among subgroups of thyroid dysfunction (mean number of teeth affected) showed no statistically significant difference (ANOVA test).

Table 1: Distribution of subject based on gender

Groups	Gender		Total
	Male	Female	
Study	30	70	100
Hypothyroidism	16	23	39
Hyperthyroidism	7	34	41
Goiter	7	13	20
Control	42	58	100
Total	72	128	200

Table 2: Comparison of oral health status between study and control groups across all age groups (mean number of teeth affected)

Age groups	Parameter	Study group	Control group	<i>P</i>
18-25	Gingival bleeding	1.05	0.10	0.018*
26-35	Caries	1.38	0.21	0.004*
26-35	Gingival bleeding	1.00	0.24	0.038*
26-35	LOA (36/37)	0.11	0.00	0.044*
36-45	LOA (41)	0.15	0.00	0.038*
46-60	Caries	1.67	0.11	0.040*

$P < 0.05$ was considered as statistically significant. LOA: Loss of attachment

Table 3: Comparison of oral health status between males and females suffering from thyroid dysfunction (mean number of teeth affected)

Parameter	Male	Female	P
Missing teeth due to caries	0.00	0.10	0.034*
Crown required	0.00	0.17	0.017*

$P < 0.05$ was considered as statistically significant. Differences in remaining parameters of oral health were nonsignificant among males and females suffering from thyroid dysfunction

Table 4: Comparison of oral health status in between study and control group (mean number of teeth affected)

Parameter	Study group	Control group	P
Decayed teeth	1.04	0.48	0.019*
Filled teeth	0.07	0.00	0.033*
Fixed dental prosthesis/crown abutment, veneer, implant	0.38	0.09	0.008*
Gingival bleeding	1.27	0.64	0.021*
LOA (36/37)	0.09	0.01	0.009*
Pulp care and restoration required	0.07	0.00	0.007*

$P < 0.05$ was considered as statistically significant. LOA: Loss of attachment

On comparison of dentition status, periodontal status and treatment need scores among subgroups of thyroid dysfunction, i.e., hyperthyroidism, hypothyroidism, and goiter showed statistically no significant difference for any score.

Discussion

Oral diseases such as dental caries, periodontal diseases are major public health problems worldwide. For oral health-care providers gaining proper and adequate knowledge of thyroid gland function and dysfunction is of great importance as they can be the first to identify a case of thyroid disorder and help in early diagnosis and prompt treatment. Modifications of dental care must be considered when treating patients who have thyroid disease.

The present study is cross-sectional in nature. This study design was selected because it is usually used to conduct for estimation of the prevalence of outcome of interest for a given population and commonly for the purpose of public health planning. More information can be obtained about potential risk factors in a cross-sectional study. Furthermore, it is inexpensive and takes up little time to conduct relatively.^[8,9] Based on the previous literature available, in most studies, the control group was taken to compare the findings of the study group.^[1,5,10] So the control group, equal in number and matched with the eligibility criteria of study group, was selected. In Type 3 (Inspection) clinical examination mouth mirror, explorer and adequate illumination is required. This is the most used method in public health surveying. Hence, for the present study, Type 3 clinical examination was selected.^[11]

In the present study, there were 42% males and 58% females in control group. In the study group, patients suffering from hypothyroidism, hyperthyroidism, or goiter were selected. In the study group, 53% males and 33% females were suffering from hypothyroidism, 23% males and 49% females were suffering from hyperthyroidism, 23% males and 19% females were suffering from goiter. This is probably because thyroid dysfunction is one of the most common disorders of the endocrine system and more prevalent in females, also females have 7 times more chances of developing thyroid dysfunction than males. In many instances, it is an autoimmune disease and it has been known that most autoimmune disorders are more common in women. Depending on this fact, the sample of the present study was composed of more females. This is in accordance with the previous studies conducted where the female population was more than male.^[2,12,13] Also study conducted by Bose *et al.* showed that prevalence of thyroid disorders are high in females between 19 and 45 years of their age.^[13]

On comparison of study and control groups for dental caries and periodontal status from 18 to 60 years of age group, there was statistically significant difference for parameters such as dental caries, gingival bleeding, and loss of attachment (for teeth 36/37 and 41). This might occur due to there are salivary changes as age increases, improper diet, gingival recession thereby root surface exposure, or xerostomia as a side effect of drug therapy for thyroid problems.^[14,15] There is decrease in salivary flow rate also which might be associated with decrease in buffer action capacity and salivary pH which affects oral sugar clearance negatively.^[16-18] There might be an interference with the transmission of signals at the parasympathetic neuroeffector junctions, interference of actions at the adrenergic neuro-effector junctions which causes depression of the connections of the autonomic nervous system so medications can cause xerostomia.^[19] Hence, it may lead to the increase in the prevalence of dental caries. It is still unclear that why there is an increase in initiation or progression of periodontal diseases in patients with thyroid dysfunction; reasons may be decrease in serum level of thyroid hormones which may enhance periodontal destruction, increase number of resorbing cells, also alveolar bone surrounding the tooth seem to be less sensitive to change in hormonal level.^[20] This is in accordance with the study conducted by Yamama *et al.* who showed that there are significant differences in the study (thyroid dysfunction) and control groups in case of occurrence of dental caries and periodontal destruction.

In the present study, on comparison oral health status between males and females suffering from thyroid dysfunction, it was seen that there was statistically significant difference for dentition status scores (missing due to caries and crown required) whereas other parameters showed no statistically significant difference. This finding

of the present study is contradictory to the study conducted by Zahid *et al.* who showed that females suffering from thyroid dysfunction had worse periodontal status compared to control group.^[21]

On comparison of dentition status, periodontal status, and treatment needs scores among subgroups of thyroid dysfunction, i.e., hyperthyroidism, hypothyroidism, and goiter showed statistically no significant difference for any score. This is contradictory to the study conducted by Monea *et al.* showed that hyperthyroid patients had worse periodontal status and more gingival inflammation than hypothyroid ones,^[22] and Hanau *et al.* showed that in hypothyroidism group Score 3 (4–5 mm pockets) was statistically significant as compared to control group and highly significant to hyperthyroidism group.^[23] Furthermore, an animal study conducted by Toledo *et al.*^[24] concluded rats with hypothyroidism showed more periodontal changes involving alveolar bone resorption and degeneration in periodontal ligament. Feitosa *et al.* showed the effect of thyroid hormones on periodontal destruction including bone loss in rats and concluded that when there is a decrease in serum level of thyroid hormones, it may enhance periodontal bone loss.^[20]

Dental Public health significance

The treatment of patients suffering from thyroid dysfunction can give an opportunity to increase referral base of oral health-care providers. Regular bidirectional communication of oral health-care providers and endocrinologist is an important component for the treatment of thyroid dysfunction suffering patients. The endocrinologist must be aware of oral manifestations of the disease, and oral health-care providers must be updated on thyroid control medications to help them to maintain patient's oral health.

Limitations

The present study has its own limitations. Cross-sectional studies are carried out at one-time point, and there is no follow-up. Further studies on large sample size are required.

Recommendations

Oral health education is necessary for patients suffering from thyroid dysfunction to maintain their oral health properly. All the elective dental procedures should be put on hold in suspected cases. Thyroid gland is very sensitive to radiation; excess radiation exposure may cause various thyroid problems. Hence, dental professional should protect the thyroid gland with a thyroid collar while taking X-rays of such patients. Patients on anticoagulation therapy sometimes can require antibiotic prophylaxis before invasive dental procedures. The duration from disease onset to the treatment of thyroid disorders might be critical, since uncontrolled thyroid diseases may result in abnormalities in alveolar bone remodeling. Further research should be done on the effect of disease duration on oral health.

Conclusion

From the present study, the relationship of thyroid dysfunction and oral health showed that the prevalence of dental caries was more in study group compared to control group. The assessment of periodontal health status showed that study group was affected more than control group. The prevalence of thyroid dysfunction was more in females compared to males.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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