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Assessment of Dental Caries Experience Among Patients with Thyroid Disorders Attending Different Hospitals in Baghdad City/Iraq

Rawaa Basel AL Meshaikhy*, Nadia Aftan Al Rawi

Department of Pedodontics and Preventive Dentistry, College of Dentistry, University of Baghdad

ABSTRACT

Background: Thyroid dysfunction is the second most common glandular disorder of the endocrine system. Thyroid gland regulates the metabolism and affects the body functions and affect any system of the body include the oral cavity which affected adversely by either an excess or deficiency of these hormones. The aim of the present study to investigate the occurrences of the dental caries and to evaluate the impact of disease and treatment on dental caries experience in different times intervals.

Subjects and methods: The study population consisted of (404) patients, with thyroid disorder (long duration and newly diagnosed patients), in addition, a symptomatic group with normal thyroid function test at time of diagnosis. Clinical examinations were conducted under standardized conditions for all the sample. Diagnosis and recording of dental caries were done according to the criteria of WHO, 1997.

Results: Results found a higher prevalence of thyroid disorders in females' patients than males, with a high prevalence at age group (40-49) years. Results showed a 100% occurrence of dental caries among all sample. The total mean values of DMFS among hyperthyroid group was (36.631±2.659), hypothyroid group (38.101±2.235), and symptomatic group (30.973 ± 3.830). Caries experience was found to increase with advancing age with highly statistically significant differences and increase in mean value of DMFT and DMFS by increase the duration of illness in both hypothyroid and hyperthyroid group without statistically significant differences.

Conclusion: the results of the current study revealed that, the patients with thyroid disorders (hypothyroidism and hyperthyroidism) are at risk of oral disease, patients with thyroid disorder had high level of caries experience increased by increase duration of illness and advancing age.

Key words: Thyroid gland, Hypothyroidism, Hyperthyroidism, Oral health, Dental caries

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Corresponding author: Rawaa Basel AL Meshaikhy
e-mail ✉ : ali.mario28@yahoo.com
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INTRODUCTION

Thyroid gland is a part of the endocrine system of the body and the largest organ specialized for endocrine function in human body [1], Thyroid follicular cells are responsible for the synthesis of thyroid hormones, of which there are generally two: tetra iodothyronine (T4), more commonly known as (thyroxine), and triiodothyronine (T3). The production and release of thyroid hormones are stimulated through the hypothalamic-pituitary axis. These hormones play an important role in the regulation of physiologic processes [2].

Thyroid diseases are amongst the most prevalent of medical conditions, iodine deficiency is the most universal cause of thyroid disorders and around one third of the world's population lives in iodine deficiency [3]. The prevalent types of thyroid disease are hypothyroidism and hyperthyroidism [4], they are more common in females than males [5-20]. Hypothyroidism is a condition in which the thyroid gland does not make enough functionally active thyroid hormones [21]. Hyperthyroidism is a disorder that occurs when the thyroid gland makes more thyroid hormone than the body needs [22]. Thyroid disease can lead to imbalance in the homeostasis of the body and affect the healing capacity of tissues [23].

Common oral manifestations associated with hypothyroidism include, salivary gland enlargement, compromised periodontal health, delayed bone resorption, macroglossia, micrognathia, dysgeusia, enamel hypoplasia, mouth breathing, anterior open bite, thick lips, While for hyperthyroidism, the oral manifestations include, increased susceptibility to caries and periodontal disease, burning mouth syndrome, development of connective tissue diseases like Sjogren's syndrome or Systemic lupus erythematosus, enlargement of extra glandular thyroid tissue , maxillary and mandibular osteoporosis [24].

Dental caries is a multifactorial disease of the teeth that causes a localised loss of tooth structure [25]. Which results by the interplay between the dietary carbohydrates, tooth substrate, and cariogenic bacteria in the dental biofilm results in formation of acid after fermentation of carbohydrates which cause fluctuations in the pH of the biofilm that results in mineral loss (demineralization) due to disturbances in the physiologic equilibrium between the biofilm and tooth [26,27].

Most investigations have found an increase in the prevalence of dental caries among patients with thyroid dysfunction [8,28-32]. Which caused either from the impact of the disease process itself, or because of the surgical treatment (thyroidectomsy), as well as to medication taken leading to increase in the severity of oral and dental diseases [33]. In addition, salivary changes found among patients with thyroid dysfunction, which include "increase, decrease or no difference in the salivary pH, flow rate in addition to some salivary organic and inorganic constituents" [34].

There is no previous Iraqi epidemiological study that include the oral health condition, in both gender and different age groups in addition to the duration of illness, among patients with thyroid disorders , (the current study , include the newly diagnosed " without medications " and long duration illness " with medications " in different times of hypothyroid and hyperthyroid groups. Therefore, this study was designed.

SUBJECTS AND METHODS

Four hundred and four patients, with confirmed diagnosis of thyroid disorders (long duration and newly diagnosed hypothyroidism and hyperthyroidism) or with symptoms of thyroid disorders but with normal thyroid function tests at time of diagnosis, were collected from different hospitals and centres in Baghdad city (Consultation clinic/Baghdad teaching hospital in Medical city, Al-kindy specialist centre for endocrinology and diabetes, Al-Yarmouk teaching hospital) for check-up or for follow up during the period from the first of November 2019 till middle of march 2020. with an age range (20-79) years, of both genders. Also, the long duration hypothyroid and hyperthyroid groups divided according to duration of illness and medication taking into 3 subgroups (less than six months duration, six months to one-year duration, more than one-year duration). An approval was obtained from Ministry of health to examine these patients. Also, A pre-study ethical approval was assigned, in addition, the informed consent was taken from the patients before starting the study. Information regarding type of thyroid dysfunction, duration of illness, type of medications and medical history were taken from medical record of each patient.

The general information including name, age, gender, dental and medical histories, were all recorded in a special form, in this study, the samples were fulfilling the following criteria: They were with confirmed diagnosis with thyroid disorder or with symptoms of these diseases, they should be without any other serious systemic disease or taking any medications other than those used for thyroid dysfunction, they shouldn't be pregnant or smokers. In addition, they should not undergo any periodontal surgery for at least three months ago.

Examination was carried out for each patient under standardized conditions following the criteria of WHO (1997) [35]. Artificial light (60 w) was used for illumination. Oral examination was carried out using plane mouth mirror and CPI probe, for the detection of dental caries experience. The assessment of oral health status was registered in a special form designed.

Data description, analysis and presentation were performed using Statistical Package for social Science (SPSS version 21) Statistical analyses can be classified into two categories:

Descriptive Analysis

Frequency and percentage for qualitative variables, mean and standard error (SE) for quantitative variables.

Inferential analysis

Levene test: test the homogeneity of variance among groups.

One Way Analysis of Variance (ANOVA): examines the influence of k independent groups on the quantitative variable

Paired T test: examine the change of the quantitative variable between two related times. p-value of <0.05 was considered as statistically significant.

RESULTS

Table 1 illustrates the distribution of the total sample by age and gender. The highest number of samples found at age group (40-49) years. In regarding to gender, females exhibit the higher number than males.

Table 1: The distribution of the total sample by age and gender.

Variables	Age (y)	N.	%
Age (y)	20-29	72	17.82
	30-39	69	17.08
	40-49	112	27.72
	50-59	111	27.48

	60-69	33	8.17
	70-79	7	1.73
Gender	Males	31	7.67
	Females	373	92.33

The distribution of sample according to groups and the duration of illness is shown in table 2. The long duration hypothyroid group (more than 1 years) recorded the highest number among other groups.

Table 2: The distribution of total sample according to groups and the duration of illness.

Groups	N.	%
Newly hypothyroid	32	7.92
Newly hyperthyroid	33	8.17
Long duration hypothyroid (less than 6 months)	30	7.43
Long duration hypothyroid (6 months-1 year)	39	9.65
Long duration hypothyroid (more than 1 year)	127	31.44
Long duration hyperthyroid (less than 6 months)	15	3.71
Long duration hyperthyroid (6 months-1 year)	19	4.7
Long duration hyperthyroid (more than 1 year)	36	8.91
Symptomatic group	73	18.07

Table 3 illustrates the distribution of dental caries status among sample according to the age group. The highest number of dental caries experience found among (40-49) years age group. Concerning caries free status, the results found that age group (20-29) years recorded the highest number.

Table 3: The distribution of dental caries status among total sample according to the age.

			Age (years)					Total
			20-29	30-39	40-49	50-59	60-69 & 70-79	
Caries	with	N.	62	67	112	111	40	392
		%	15.82	17.09	28.57	28.32	10.2	100
		% T	15.35	16.58	27.72	27.48	9.9	97
	free	N.	10	2	0	0	0	12
		%	83.33	16.67	0	0	0	100
		% T	2.48	0.5	0	0	0	2.97
Total		N.	72	69	112	111	40	404
		%	17.82	17.08	27.72	27.48	9.9	100
		% T	17.82	17.08	27.72	27.48	9.9	100

Table 4 illustrates the distribution of dental caries status among all groups. The results found that total sample with caries was 392 (97.03%), while caries free sample only 12 (2.97%). The highest number of dental caries found among patients with long duration hypothyroid (more than one year). While caries free status found to have the highest number in symptomatic group.

Table 4: The distribution of dental caries status among all groups.

Groups		N.	%
Newly hypothyroid	with	30	93.75

	free	2	6.25
	with	31	93.94
Newly hyperthyroid	free	2	6.06
Long duration hypothyroid (less than 6 months)	with	30	100
	with	38	97.44
Long duration hypothyroid (6months-1 year)	free	1	2.56
	with	125	98.43
Long duration hypothyroid (more than 1 year)	free	2	1.57
Long duration hyperthyroid (less than 6 months)	with	15	100
Long duration hyperthyroid (6months-1year)	with	19	100
Long duration hyperthyroid (more than 1 year)	with	36	100
	with	68	93.15
Symptomatic	free	5	6.85
	with	392	97.03
Total	free	12	2.97

The mean and standard error of dental caries experience (DMFS and DMFT) among total sample by age groups found in table (5). The highest mean value of DMFS and DMFT was recorded in age group (60-69 & 70-79) years, while the lowest mean found in age group (20-29) years, and the differences were statistically highly significant (p=0.000).

Table 5: Descriptive and statistical analysis of dental caries experience among total sample by age groups.

	Caries experience	N	Mean	SE	F	P value
	20-29	72	10.514	1.267		
	30-39	69	20.652	1.663		
	40-49	112	36.598	2.498		
	50-59	111	50.973	3.292		
DMFS	60-69 & 70-79	40	69.55	5.596	47.34	0.000 **
	20-29	72	4.75	0.442		
	30-39	69	7.174	0.456		
	40-49	112	9.893	0.579		
	50-59	111	12.279	0.641		
DMFT	60-69 & 70-79	40	16.725	1.477	33.66	0.000 **

The mean value and standard error of caries experience (DMFS and DMFT) among hypothyroid and symptomatic groups by duration of illness found in table 6. The highest mean value of (DMFS) and (DMFT) component of caries experience was found in long duration hypothyroid (more than one year), while long duration hypothyroid (less than 6 months) had the lowest mean value. However, statistically no significant difference was recorded.

Table 6: Descriptive and statistical analysis of caries experience among sample (hypothyroid and symptomatic groups) by duration of illness.

	Caries experience	N	Mean	SE	F	P value
	newly hypo	32	33.719	5.881		
	<6m hypo	30	29.433	4.847		
DMFS	6-1m hypo	39	33.872	4.704	1.996	0.095

	> 1year hypo	127	42.551	3.211		
	Total hypo long duration	196	38.816	2.419		
	symptomatic	73	30.973	3.83		
	newly hypo	32	9.406	1.326		
	<6m hypo	30	8.4	1.078		
	6-1m hypo	39	9.256	0.961		
	> 1year hypo	127	10.661	0.59		
	Total hypo long duration	196	10.036	0.461		
DMFT	symptomatic	73	9.37	1.039	0.881	0.475

The mean and standard error of caries experience (DMFS and DMFT) among sample (hyperthyroid and symptomatic) groups by duration of illness found in table (7). The highest mean value found among long duration hyperthyroid (more than one year). While the newly hyperthyroid had the lowest mean value among other groups. However, statistically no significant difference was recorded.

Table 7: Descriptive and statistical analysis of caries experience among sample (hyperthyroid and symptomatic groups) by duration of illness.

	Caries experience	N	Mean	SE	F	P value
	newly hyper	33	29.455	3.98		
	<6m hyper	15	34.2	6.296		
	6-1m hyper	19	37.368	7.206		
	>1y hyper	36	43.833	4.698		
	Total hyper long duration	70	40.014	3.376		
DMFS	symptomatic	73	30.973	3.83	1.457	0.218
	newly hyper	33	8.788	1.07		
	<6m hyper	15	8.867	1.257		
	6-1m hyper	19	10.632	1.595		
	>1y hyper	36	11.111	1.049		
	Total hyper long duration	70	10.5	0.74		
DMFT	symptomatic	73	9.37	1.039	0.605	0.66

DISCUSSION

This study was considered to evaluate dental caries experience among patients with thyroid disorders (hypothyroidism and hyperthyroidism) to evaluate the impact of disease and treatment on oral variables in different time intervals, different age group and both genders.

The current study revealed that dental caries experience increased among patients with thyroid disorder with advancing age, which is agreed by many studies [8,28,30,36-41]. This findings may be attributed to the irreversible and accumulative nature of dental caries, it might be suggested that, the development of dental caries is a long term process, but the people usually don't attend dentist unless they feel unbearable pain in the mouth. In addition, more factors prone to change with age, like oral hygiene and microbiologic qualitative and quantitative changes, salivary flow and buffering capacity are associated with caries experience [42].

Regarding duration of illness, this study revealed increased in dental caries (DMFS and DMFT) in long duration hypothyroid and hyperthyroid groups than newly diagnosed group and increased with increase the duration of illness. Which is agreed by Al-Rubbaey, et al. [28] for the hypothyroid group. These results may be related to increase exposure to medication due to the increased duration of illness which may affect oral health status. In addition, reduction in the salivary flow rate due to Anti-thyroid drug (thyroxine) which is used for treatment of hypothyroidism, also, it affects the composition of saliva which may explain the increase in dental caries experience with increased duration of illness [43,44].

In comparison between groups, this study revealed that hypothyroid and hyperthyroid groups had higher mean of (DMFS) and (DMFT) than the symptomatic group which agreed with many studies [28-32] which may related to disease process or the medication used affected certain factors (risk factors) which cause

increase in the severity of dental caries. Thyroid hormones regulate the effects of neurotransmitters and autonomic drugs on salivary glands [45], which explain the reduction in the rate of salivary flow rate among thyroid groups [46-48] in addition, cause a reduction in the buffer capacity [49-51], which may related to increase in the acidity of saliva of the thyroid groups, that affects oral sugar clearance negatively [28], all these factors may give the explanation of the increase in dental caries experience among subjects with thyroid dysfunction [52,53].

CONCLUSION

Higher percentage of dental caries experience was found among patients with thyroid gland disorders. In addition, the results of current investigation revealed that the duration of illness and medication taking is potentially associated with dental caries experience of the study group.

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