

Madonna L. Aujero, MD  
John Michael P. Tagsa, MD  
Gleno Lon Q. Llamera, Jr., MD

Department of Otolaryngology-Head and Neck Surgery  
Southern Philippines Medical Center

## Association of Clinicodemographic Factors and Tissue Biopsy Results Among Patients with Thyroid Nodules at the Southern Philippines Medical Center

### ABSTRACT

**Objective:** To compare selected clinicodemographic factors of patients with thyroid nodules who underwent thyroid surgeries with their tissue biopsy results and determine any association between clinicodemographic factors and tissue biopsy results.

#### Methods:

**Design:** Retrospective review of records  
**Setting:** Tertiary Government Training Hospital  
**Participants:** 251 patients with thyroid nodules

**Results:** Of 251 patients with thyroid nodules, the majority (218; 86.9%) were females while 33 (13.1%) were males. The average age in years was  $41.5 \pm 13.3$ . The same population also had malignant outcomes at 79.3%. Most of the patients did not have family history of thyroid malignancy (54%) and had no palpable cervical lymph nodes at presentation (75.9%). Furthermore, there was no distant metastasis at presentation for both lungs (97.7%) and bones (98.9%). There were no significant differences in tissue biopsy results when correlated with age ( $df=249$ ;  $t=-.144$ ;  $p=.886$ ), duration of goiter ( $df=249$ ;  $t=-.829$ ;  $p=.408$ ), and distant metastasis at presentation for lungs ( $Z=-5.977$ ;  $p=.052$ ) and bones ( $Z=-.457$ ;  $p=.648$ ). Significant differences were only evident for clinicodemographic factors such as sex ( $Z=-2.570$ ;  $p=.010$ ), family history ( $Z=-2.239$ ;  $p=.020$ ), palpable cervical lymph nodes at presentation ( $Z=-5.977$ ;  $p=.000$ ), and the following comorbidities: pulmonary tuberculosis ( $Z=-2.388$ ;  $p=.017$ ) and bronchial asthma ( $Z=-2.148$ ;  $p=.032$ ) and smoking history ( $Z=-3.455$ ;  $p=.001$ ). Furthermore, having no palpable cervical lymph nodes at presentation were associated with malignant tissue biopsy results ( $B=3.616$ ;  $p=.001$ ). Patients without palpable cervical lymph nodes at presentation were 37.204 times [OR=37.204] more likely to have benign biopsy results [95% CI: 4.705 – 294.168].

**Conclusion:** There are greater odds of having benign biopsy results for patients without palpable cervical lymph nodes at presentation.

**Keywords:** thyroid nodules; tissue biopsy; thyroid neoplasm; fine-needle aspiration biopsy

Correspondence: Dr. Gleno Lon Q. Llamera, Jr.  
Department of Otolaryngology- Head and Neck Surgery  
Southern Philippines Medical Center  
JP Laurel Ave., Bajada, Davao City 8000  
Philippines  
Phone: +63 922 889 8114  
Email: dmc\_ent@yahoo.com

The authors declared that this represents original material that is not being considered or publication or has not been published or accepted for publication elsewhere, in full or in part, in print or electronic media; that the manuscript has been read and approved by both authors, that the requirements for authorship have been met by each author, and that the authors believe that the manuscript represents honest work.

Disclosures: The authors signed disclosures that there are no financial or other (including personal) relationships, intellectual passion, political or religious beliefs, and institutional affiliations that might lead to a conflict of interest.



Creative Commons (CC BY-NC-ND 4.0)  
Attribution - NonCommercial - NoDerivatives 4.0 International



**In the general population**, the prevalence of goiter is estimated to be 15.8% worldwide, 4.7% in the Americas and 28.3% in Africa.<sup>1</sup> Iodine deficiency disorder (IDD) is the most common cause of goiter, affecting 30% of the world's population or more than 150,000 million people.<sup>2</sup> In the Philippines, the national prevalence of goiters was 3.7% in 1987 and 6.7% in 2019.<sup>3</sup>

To the best of our knowledge, based on a search of HERDIN Plus, the ASEAN Citation Index (ACI), Western Pacific Region Index Medicus (WPRIM), MEDLINE (PubMed; PubMed Central) using the keywords "thyroid nodules," "tissue biopsy," "thyroid neoplasm," "risk factors," and "fine-needle aspiration biopsy," there is a scarcity of research on the relationship between thyroid tissue biopsy results and such clinicodemographic factors as sex, age, duration of goiter, family history of goiter, palpable cervical lymph nodes at presentation, distant metastasis at presentation, associated comorbidities, and smoking history in the Philippines.

This study aims to compare the clinicodemographic profiles of patients with thyroid nodules who underwent thyroid surgeries with their tissue biopsy results and determine any association between selected clinicodemographic factors and tissue biopsy results.

## METHODS

With Department of Health XI Cluster Ethics Review Committee (DOH XI CERC) approval (CERC Protocol Number P21060701), this retrospective series reviewed records of patients with thyroid nodules who underwent thyroid surgery at Southern Philippines Medical Center, Department of ENT-HNS from January 2017 (the year the Department of Pathology of SPMC adapted Bethesda Scoring) to December 2019.

Considered for inclusion were all patients 19 years old and above with thyroid nodules who underwent thyroid surgeries between January 2017 and December 2019. Those with no tissue biopsy results and incomplete medical records (which include the demographic profile, history of illness, physical examination, and metastatic workup for known malignant cases) were excluded.

Complete enumeration of records of patients meeting inclusion and exclusion criteria was made, grouping the cases according to tissue biopsy outcomes as benign or malignant. Subsequently, selected clinicodemographic factors were rated according to the outcomes. The independent variables included in this study were sex, age, duration of goiter, family history of goiter, palpable cervical lymph nodes at presentation, distant metastasis in the bones and lungs, associated comorbidities (i.e., hypertension, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, food and drug allergies, hyper/hypothyroidism, and other malignancies), and smoking history. The dependent variable was the tissue biopsy result.

All data were encoded using Microsoft Excel version 16.66.1 2016 (Microsoft Corp., Redmond, WA, USA) and were transferred to Statistical Package for Social Sciences (SPSS) version 21 software (IBM Corp., Armonk NY, USA) for data treatment. All statistical treatments were administered below a .05% level of significance. Categorical data were presented in frequencies and percentages, while mean and standard deviation were used for interval/continuous data. Data were analyzed with independent samples, a t-test for the comparison of parametric data, and a Mann-Whitney test for the comparison of non-parametric data. The study measured the difference in each selected clinicodemographic factor versus clinical outcomes: benign and malignant. Data were analyzed with logistic regression analysis to determine the factors associated with the clinical outcome of biopsy results.

## RESULTS

A total of 251 patients with thyroid nodules who were operated on at Southern Philippines Medical Center during the study period, met inclusion and exclusion criteria. *Table 1* shows the clinicodemographic profile of the patients using frequencies and percentages for categorical data and means and standard deviations for interval data. Most of the patients were females (86.9%) and had an average age of  $41.5 \pm 13.3$  years old. The average duration of the goiter was  $104.4 \pm 100$  months.

Furthermore, most of the patients did not have family histories (63.7%), had no palpable cervical lymph nodes at presentation (90.8%), and no distant metastasis at presentation in the lungs (99.2%), and bones (99.2%). Most of the patients did not have hypertension (86.1%), had no diabetes mellitus (96%), no pulmonary tuberculosis (98.8%), no bronchial asthma (98%), no food and drug allergies (96%), no hypo/hyperthyroidism (96%), nor other malignancies (99.6%), and no smoking histories (92%).

Of 251 biopsy results, 164 (65.3%) were benign while 87 (34.7%) were malignant. *Table 2* shows the comparison of the clinicodemographic factors and benign and malignant biopsy results. The results were treated with independent sample t-tests for parametric data and Mann-Whitney tests for non-parametric data to determine whether there were significant differences in clinicodemographic profiles between biopsy results. Tested at a .05 level of significance, the results for age ( $df=249$ ;  $t=-.144$ ;  $p=.886$ ), duration of goiter in months ( $df=249$ ;  $t=-.829$ ;  $p=.408$ ), distant metastasis at presentation (lungs) ( $Z=-5.977$ ;  $p=.052$ ), distant metastasis at presentation (bones) ( $Z=-.457$ ;  $p=.648$ ), hypertension ( $Z=-1.478$ ;  $p=.139$ ), diabetes mellitus ( $Z=-.315$ ;  $p=.752$ ), food and drug allergies ( $Z=-.315$ ;  $p=.752$ ), and other malignancies ( $Z=-1.373$ ;  $p=.170$ ), all favored accepting the null hypotheses. Thus, there were no significant differences between benign and malignant results and these clinicodemographic factors.

**Table 1.** Clinicodemographic Profile of the Patients with Thyroid Nodules

		f	%
Sex	Male	33	13.1
	Female	218	86.9
Age ( $\bar{X}\pm SD$ )		41.5 ± 13.3	
Duration of goiter (in months) ( $\bar{X}\pm SD$ )		104.4 ± 100	
Family history	No	160	63.7
	Yes	91	36.3
Palpable cervical lymph nodes at presentation	No	228	90.8
	Yes	23	9.2
Distant metastasis at presentation (lungs)	No	249	99.2
	Yes	2	0.8
Distant metastasis at presentation (bones)	No	249	99.2
	Yes	2	0.8
<b>Associated Comorbidities</b>			0.0
Hypertension	No	216	86.1
	Yes	35	13.9
Diabetes mellitus	No	241	96.0
	Yes	10	4.0
PTB	No	248	98.8
	Yes	3	1.2
Bronchial asthma	No	246	98.0
	Yes	5	2.0
Food and drug allergies	No	241	96.0
	Yes	10	4.0
Hypo/hyperthyroidism	No	241	96.0
	Yes	10	4.0
Other malignancies	No	250	99.6
	Yes	1	0.4
Smoking history	No	231	92.0
	Yes	20	8.0

Note: n = 251

However, there were significant differences in biopsy results for sex ( $Z=-2.570$ ;  $p=.010$ ), family history ( $Z=-2.239$ ;  $p=.020$ ), palpable cervical lymph nodes at presentation ( $Z=-5.977$ ;  $p=.000$ ), presence of pulmonary tuberculosis ( $Z=-2.388$ ;  $p=.017$ ), bronchial asthma ( $Z=-2.148$ ;  $p=.032$ ), and smoking history ( $Z=-3.455$ ;  $p=.001$ ).

Table 3 shows the factors associated with biopsy results treated with logistic regression analysis. Having a model-fit logistic regression ( $p=.000$ ), the results revealed the following: sex ( $B=.305$ ;  $p=.552$ ), age ( $B=-.012$ ;  $p=.394$ ), duration of goiter ( $B=.001$ ;  $p=.405$ ), family history ( $B=.542$ ;  $p=.091$ ), distant metastasis at presentation (bones) ( $B=18.796$ ;  $p=.999$ ), distant metastasis at presentation (lungs) ( $B=3.482$ ;  $p=.079$ ), hypertension ( $B=.347$ ;  $p=.480$ ), diabetes mellitus ( $B=.857$ ;  $p=.456$ ), pulmonary tuberculosis ( $B=20.718$ ;  $p=.999$ ), bronchial asthma ( $B=2.187$ ;  $p=.058$ ), food and drug allergies ( $B=-.257$ ;  $p=.752$ ), hyper/hypothyroidism ( $B=-.021$ ;  $p=.979$ ), and other malignancies ( $B=17.416$ ;  $p=1.000$ ) favored accepting the null hypotheses. Hence, these abovementioned factors are not associated with biopsy results.

However, having no palpable cervical lymph nodes at presentation ( $B=3.616$ ;  $p=.001$ ) was associated with biopsy results. Patients without palpable cervical lymph nodes at presentation were 37.204 times ( $OR=37.204$ ) more likely to have benign biopsy results (95% CI: 4.705 – 294.168).

**DISCUSSION**

The purpose of this study was to determine which among selected clinicodemographic factors were associated with benign biopsy results in patients with thyroid nodules. Our analysis provided interesting information that suggest significant differences in various clinicodemographic factors when grouped according to biopsy results. Most of the patients were females, which reflects findings of previous studies like those of Mulder<sup>4</sup> and Russel<sup>5</sup> where thyroid diseases occur more commonly in women than men, in part because of the autoimmune nature of many thyroid disorders.

The average age of patients with thyroid nodules in our study was 41.5 years old, which is lower than the findings of Girardi<sup>6</sup> that thyroid problems were common among the elderly with peak occurrence between 51 to 60 years old. However, these results are consistent with statements of the American Society of Clinical Oncology (ASCO) that thyroid cancer can occur at any age, but about two-thirds of all cases are found between the ages of 20 and 55.<sup>7</sup> Our average duration of goiter was 104.4 months (8.6 years), much shorter than the findings of Medeiros-Neto<sup>8</sup> that the average duration of goiter was 17 years.

Most of the patients with thyroid nodules in our study did not have family histories. This neither denies nor confirms the findings of Bomeli *et al.*<sup>9</sup> that thyroid diseases are often hereditary. The more family members that have thyroid disease, the greater the likelihood that there is a hereditary root and the higher the chances the patient will experience a thyroid problem. At the very least, our findings reflect the American Cancer Society's information that several inherited conditions have been linked to different types of cancer, but most people who develop thyroid cancer do not have an inherited condition or a family history of the disease.<sup>10</sup>

Most of our patients had no palpable cervical lymph nodes at presentation. Our results are also consistent with the review of Bazemore and Smucker that the prevalence of malignancy is quite low among primary care patients with lymphadenopathy.<sup>11</sup>

Most of our patients had no distant metastasis at presentation for both lungs and bones, which is congruent with the findings of Song *et al.*<sup>12</sup> that distant metastasis is rare and diagnosed in only 1% to 4% of patients, and Nixon *et al.*<sup>13</sup> that lung lesions identified on postoperative chest computed tomography imaging are uncommon among patients with malignant thyroid nodules.

**Table 2.** Comparison of Clinicodemographic Factors and Biopsy Results

Clinicodemographic Profile		Tissue Biopsy Results				t, Z	p
		Benign (n = 164)		Malignant (n = 87)			
		f	%	f	%		
Sex	Male	15	9.1	18	20.7	-2.570	.010
	Female	149	90.9	69	79.3		
Age ( $\bar{X} \pm SD$ )		41.2 $\pm$ 12.5		41.7 $\pm$ 14.9		-1.144	.886
Duration of goiter (in months) ( $\bar{X} \pm SD$ )		100.6 $\pm$ 96.9		111.6 $\pm$ 105.9		-8.229	.408
Family history	No	113	68.9	47	54.0	-2.329	.020
	Yes	51	31.1	40	46.0		
Palpable cervical lymph nodes at presentation	No	162	98.8	66	75.9	-5.977	.000
	Yes	2	1.2	21	24.1		
Distant metastasis at presentation (lungs)	No	164	100.0	85	97.7	-1.946	.052
	Yes	0	0	2	2.3		
Distant metastasis at presentation (bones)	No	163	99.4	86	98.9	-4.57	.648
	Yes	1	0.6	1	1.1		
<b>Associated Comorbidities</b>							
Hypertension	No	145	88.4	71	81.6	-1.478	.139
	Yes	19	11.6	16	18.4		
Diabetes mellitus	No	157	95.7	88	96.6	-3.15	.752
	Yes	7	4.3	3	3.4		
PTB	No	164	100.0	86	95.4	-2.388	.017
	Yes	1	0.6	4	4.6		
Bronchial asthma	No	163	99.4	83	95.4	-2.148	.032
	Yes	1	0.6	4	4.6		
Food and drug allergies	No	157	95.7	84	96.6	-3.15	.752
	Yes	7	4.3	3	3.4		
Hypo/hyperthyroidism	No	158	96.3	83	95.4	-3.61	.718
	Yes	6	3.7	4	4.6		
Other malignancies	No	164	0	86	98.9	-1.373	.170
	Yes	0	0	1	1.1		
Smoking history	No	158	96.3	73	83.9	-3.455	.001
	Yes	6	3.7	14	16.1		

Note: Significant at  $p < .05$ **Table 3.** Factors Associated with Biopsy Results

Clinicodemographic Profiles	B	95% CI	OR	p
Sex (male)	.305	.496 - 3.705	1.356	.552
Age	-.012	.962 - 1.015	.988	.394
Duration of goiter	.001	.998 - 1.005	1.001	.405
Family history (no)	.542	.917 - 3.227	1.720	.091
Palpable cervical lymph nodes at presentation (none)	3.616	4.705 - 294.168	37.204	.001
Distant metastasis at presentation (lungs)	18.761	0	1.4x108	.999
Distant metastasis at presentation (bones)	-3.482	.670 - 1578.225	.031	.079
Hypertension	.347	.540 - 3.705	1.415	.480
Diabetes mellitus	-.857	.045 - 4.033	.424	.456
Pulmonary tuberculosis	20.718	0	9.9x108	.999
Bronchial asthma	2.187	.927 - 85.672	.112	.058
Food & drug allergies	-.257	.157 - 3.819	1.293	.752
Hyper/hypothyroidism	-.021	.205 - 4.672	1.021	.979
Other malignancies	17.416	0	-	1.000
Smoking history	1.115	.775 - 11.994	.321	.111

Note: Significant at  $p < .05$ 

Most of our patients with thyroid nodules did not have hypertension. Our results differ from those of Malyszko *et al.*, that reported hypertension as one of the most common comorbidities in patients with malignancy, particularly in the elderly,<sup>14</sup> and Shimizu *et al.*,<sup>15</sup> that thyrotoxic problems cause hypertension usually through an increase in systolic blood pressure by decreasing systemic vascular resistance, increasing heart rate, and raising cardiac output.

Most of our patients did not have diabetes mellitus, unlike the findings of Zhang *et al.*<sup>16</sup> that nearly a quarter of the adult population with documented thyroid problems have diabetes. Luo *et al.* found that malignant thyroid nodules are not associated with diabetes.<sup>17</sup> Pulmonary tuberculosis was not prevalent either in our study, although Falagas *et al.* found that pulmonary tuberculosis is a risk factor for the development of a malignant tumor.<sup>18</sup>

Family history significantly varies between benign and malignant thyroid nodules. In the study of Kust *et al.*,<sup>19</sup> the difference between

benign and malignant thyroid diagnosis was found to be statistically significant. Family history plays a significant role in the development of thyroid cancer, and having first-degree relatives with not only medullary but also papillary thyroid cancer strongly predicts the risk of developing malignant thyroid disease. In contrast, benign thyroid disorders in family history do not lead to the development of thyroid cancer.

Palpable cervical lymph nodes at presentation significantly vary between benign and malignant thyroid nodules. The majority of thyroid nodules are asymptomatic and benign and most of the time, do not have palpable cervical lymph nodes at presentation.<sup>9</sup> However, the majority of malignant thyroid nodules have palpable cervical lymph nodes at presentation.<sup>20</sup> These are consonant with the findings of Mohseni *et al.*, that cervical lymph nodes are involved more often than the other lymphatic regions. Generally, it is due to infections, but most of the supraclavicular lymphadenopathies are associated with malignancy.<sup>21</sup> Having no palpable cervical lymph nodes at presentation was associated with benign biopsy results.

Smoking histories significantly varied between benign and malignant thyroid nodules. Most of the patients with malignant thyroid nodules had smoking histories. Current smokers had a 36% lower risk of thyroid cancer than nonsmokers; the risk was lower, especially if they were less than 65 years old. Past smokers and never smokers had a

similar risk. The amount or duration of smoking did not affect the risk.<sup>22</sup>

Our study has many limitations. As a review of records, our data was secondary and may not reflect the actual histories, physical exam findings, and laboratory results of the actual patients. Inter-recorder variability and issues of recall and interpretation must therefore be considered, and inaccuracies in our data allowed for. Our sampling of patients with thyroid nodules who underwent surgery reflects a sampling bias that discounts patients with thyroid nodules who did not undergo surgery, thereby preventing the generalizability of our findings to all patients with thyroid nodules. Our sample size itself was based on convenience – with preset temporal parameters rather than a sample size calculation. Our study focused on selected factors associated with biopsy results among patients with thyroid nodules admitted to a tertiary hospital. We recommend other risk factors such as exposure to radiation, insulin dependence, visceral obesity, and nodule size be considered in future studies. Finally, we recommend expanding the sample size through multicenter research by collaborating with other major hospitals in the Davao Region.

In conclusion, our study suggests that there are greater odds of having benign biopsy results for patients without palpable cervical lymph nodes at presentation.

REFERENCES

- Andersson M, Takkouche B, Egli I, Allen HE, de Benoist B. Current global iodine status and progress over the last decade towards the elimination of iodine deficiency. *Bull World Health Organ.* 2005 Jul; 83(7): 518–525. PubMed PMID: 16175826; PubMed Central PMCID: PMC2626287.
- World Health Organization. Goitre as a Determinant of the Prevalence and Severity of Iodine Deficiency Disorders in Populations. Geneva, Switzerland: World Health Organization. [Technical Document] 2014 Sep 24. [Cited 2023 Nov 1] Available from: <https://www.who.int/publications/i/item/WHO-NMH-NHD-EPG-14.5>.
- Carlos-Raboca J, Jimeno C, Kho S, Andag-Silva A, Jasul G, Nicodemus N, et al. The Philippine thyroid diseases study (PhilTiDeS 1): Prevalence of thyroid disorders among adults in the Philippines. *Journal of the ASEAN Federation of Endocrine Societies.* 2014; 27(1):27–33. Available from: <https://asean-endocrinejournal.org/index.php/JAFES/article/view/9/400>.
- Mulder JE. Thyroid disease in women. *Med Clin North Am.* 1998 Jan;82(1):103–25. DOI: 10.1016/s0025-7125(05)70596-4; PubMed PMID: 9457153.
- Russell J. Thyroid Cancer: What Women Should Know (Interview). Johns Hopkins Medicine Health Blog. 2022. [Cited 2023 Nov 1] Available from: <https://www.hopkinsmedicine.org/health/conditions-and-diseases/thyroid-cancer/thyroid-cancer-what-women-should-know>.
- Girardi FM. Thyroid Carcinoma Pattern Presentation According to Age. *Int Arch Otorhinolaryngol.* 2017 Jan;21(1):38–41. DOI: 10.1055/s-0036-1585095; PubMed PMID: 28050206; PubMed Central PMCID: PMC5205525.
- American Society of Clinical Oncology. Thyroid Cancer: Risk Factors. Cancer.Net [website] 2021. [Cited 2023 Nov 1] Available from: <https://www.cancer.net/cancer-types/thyroid-cancer/risk-factors>.
- Medeiros-Neto G. Multinodular Goiter. [Updated 2016 Sep 26]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. *Endotext* [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. [Cited 2023 Nov 1] Available from: <https://www.ncbi.nlm.nih.gov/books/NBK285569/>.
- Bomeli SR, LeBeau SO, Ferris RL. Evaluation of thyroid nodule. *Otolaryngol Clin North Am.* 2010 Apr; 43(2): 229–238. DOI: 10.1016/j.otc.2010.01.002; PubMed PMID: 20510711; PubMed Central PMCID: PMC2879398.
- American Cancer Society. Thyroid Cancer Risk Factors. Thyroid Cancer: Causes, Risk Factors, and Prevention [Website] 2020 Jan 16. [Cited 2023 Nov 1] Available from: <https://www.cancer.org/cancer/thyroid-cancer/causes-risks-prevention/risk-factors.html>.
- Bazemore AW, Smucker DR. Lymphadenopathy and malignancy. *Am Fam Physician.* 2002 Dec 1;66(11):2103–2110. PubMed PMID: 12484692.
- Song W, Liu S, Yu Y, Xu Q, Liu S, Chen J. Lung metastasis from thyroid cancer: A case report of unusual imaging presentation of lung metastases. *Medicine (Baltimore).* 2023 Aug 11; 102(32): e34733. DOI: 10.1097/MD.00000000000034733; PubMed PMID: 37565894; PubMed Central PMCID: PMC10419426.
- Nixon IJ, Whitcher MM, Palmer FL, Tuttle RM, Shaha AR, Shah JP, et al. The impact of distant metastases at presentation on prognosis in patients with differentiated carcinoma of the thyroid gland. *Thyroid.* 2012 Sep;22(9):884–9. DOI: 10.1089/thy.2011.0535; PubMed PMID: 22827579; PubMed Central PMCID: PMC3714454.
- Malyszko J, Malyszko M, Kozłowski L, Kozłowska K, Malyszko J. Hypertension in malignancy—an underappreciated problem. *Oncotarget.* 2018 Apr 17;9(29):20855–20871. DOI: 10.18632/oncotarget.25024; PubMed PMID: 29755695; PubMed Central PMCID: PMC5945504.
- Shimizu Y, Kawashiri SY, Noguchi Y, Nagata Y, Maeda T, Hayashida N. Association between thyroid cysts and hypertension by atherosclerosis status: a cross-sectional study. *Sci Rep.* 2021; 11: 13922. DOI: 10.1038/s41598-021-92970-x; PubMed PMID: 34230513; PubMed Central PMCID: PMC8260587.
- Zhang HM, Feng QW, Niu YX, Su Q, Wang X. Thyroid Nodules in Type 2 Diabetes Mellitus. *Curr Med Sci.* 2019 Aug;39(4):576–581. DOI: 10.1007/s11596-019-2076-5; PubMed PMID: 31346993.
- Luo J, Phillips L, Liu S, Wactawski-Wende J, Margolis K. Diabetes, Diabetes Treatment, and Risk of Thyroid Cancer. *J Clin Endocrinol Metab.* 2016 Mar;101(3):1243–1248. DOI: 10.1210/nc.2015-3901; PubMed PMID: 26760177; PubMed Central PMCID: PMC4803153.
- Falagas ME, Kouranos VD, Athanasa Z, Kopterides P. Tuberculosis and malignancy. *QJM.* Jul 2010 Jul;103(7):461–487. DOI:10.1093/qjmed/hcq068; PubMed PMID: 20504861.
- Kust D, Stanicic J, Matesa N. Bethesda thyroid categories and family history of thyroid disease. *Clin Endocrinol (Oxf).* 2018 Mar;88(3):468–472. DOI: 10.1111/cen.13538; PubMed PMID: 29266384.
- Machado NO, Chopra PJ, Al Hamdani A. Papillary Carcinoma of the Thyroid Presenting Primarily as Cervical Lymphadenopathy: An approach to management. *Sultan Qaboos Univ Med J.* 2009 Dec;9(3):328–32. [Epub] 2009 Dec 19. [Cited 2023 Nov 1] Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074800/>.
- Mohseni S, Shojafard A, Khorgami Z, Alinejad S, Ghorbani A, Ghafouri A. Peripheral lymphadenopathy: approach and diagnostic tools. *Iran J Med Sci.* 2014 Mar;39(2 Suppl): 158–170. PubMed PMID: PMC3993046; PubMed Central PMCID: 24753638.
- American Thyroid Association. Thyroid Cancer: Are “bad habits” good for thyroid cancer? Smoking, alcohol and thyroid cancer risk. [Website] 2022 Sep. [Cited 2023 Nov 1] Available from: <https://www.thyroid.org/patient-thyroid-information/ct-for-patients/september-2022/vol-15-issue-9-p-3-4/>.