ISSN: 3005-8449
IRABCS
https://irabcs.com
INNOVATIVE RESEARCH IN APPLIED, BIOLOGICAL AND CHEMICAL SCIENCES

Research Article

IRABCS, vol. 2, issue 2, pp. 199-204, 2024
Received: December 1, 2024
Revised: December 15, 2024
Accepted: December 19, 2024
https://doi.org/10.62497/IRABCS.2024.78

Assessment of Current Medical Management Approaches for Thyroid Nodules and Cancer in a Tertiary Care Setting

Asif Iqbal[1], Zahid Mehboob[2]* and Ihtisham ul Haq[3]

1. *Department of Microbiology, Hazara University, Mansehra KPK, Pakistan*
2. *Institute of Molecular Biology and Biotechnology (IMBB) The University of Lahore 53700, Pakistan*
3. *Department of Medical Lab Technology, Kohat University of Science and Technology, Kohat, Pakistan*
4. *E-mail any correspondence to: zahidmhboob1223@gmail.com*

How to cite: Iqbal A, Mehboob Z, Haq I. Assessment of Current Medical Management Approaches for Thyroid Nodules and Cancer in a Tertiary Care Setting. IRABCS. 2024. vol. 2, issue 2, pp. 199-204. DOI: https://doi.org/10.62497/IRABCS.2024.78. Available from: https://irabcs.com/ojs/article/view/78

Abstract

Background: Cancer and thyroid nodules are serious worldwide health issues that need accurate diagnosis and treatment to stop their development. Even with improvements in diagnostic techniques and therapeutic approaches, there are still unanswered questions about the best medical care.

Objective: This study aimed to assess current medical treatment approaches for thyroid nodules and cancer, identifying areas for improvement and suggesting interventions to enhance patient outcomes.

Methodology: The study's objective was to evaluate medical treatment modalities for thyroid nodules and cancer among hospitalized patients from January to December 2023. 290 patients in all were chosen depending on how often they visited the hospital. Standardized forms were used in the data gathering process to extract clinical and demographic information from databases and records. Descriptive statistics and multivariate logistic regression were used in the statistical analysis using SPSS 25.0.

Results: The research examined 290 individuals with cancer and thyroid nodules, most of them were female (62.07%) and varied in age. Sixty-five percent of the samples showed benign nodules, with papillary thyroid carcinoma being the most common kind (39.31%). The most common treatment (45.86%) was levothyroxine therapy, which was successful in 75.19% of patients. Levothyroxine was shown to be substantially related with favorable outcomes (odds ratio: 2.50) by multivariate logistic regression. Hypothyroidism (9.77%-18.18%) and hyperthyroidism (4.51%-6.06%) were among the side effects.

Conclusion: The study emphasizes the crucial role of levothyroxine in achieving positive outcomes and underscores the importance of effectively managing treatment-related complications to improve patient care.

Keywords: thyroid nodules, thyroid cancer, levothyroxine, therapy, papillary carcinoma, thyroid complications, diagnosis

Introduction

The rising frequency of thyroid nodules and thyroid cancer, together with the potential for severe health consequences, make them global health problems [1,2]. A significant percentage of people, especially women and the elderly, are affected by thyroid nodules, which are palpable or non-palpable masses within the thyroid gland [3]. Although most of these nodules are benign, a tiny proportion are malignant, and in order to stop thyroid cancer from progressing, a precise diagnosis and suitable treatment are required [4,5].

Thyroid cancer presents particular difficulties in terms of diagnosis, therapy, and long-term care, while being typically thought of as a less aggressive disease with a good prognosis when diagnosed early [6,7]. The four main forms of thyroid cancer are anaplastic, medullary, follicular, and papillary, and each has a unique biological behavior and course of therapy [8]. Due to the intricacy of these conditions, a multidisciplinary approach to their care and a sophisticated understanding of their pathophysiology are required [9].

Due to developments in diagnostic tools and treatment strategies, the treatment of thyroid nodules and thyroid cancer has changed dramatically in the last few years. The examination of thyroid nodules has grown to rely heavily on fine-needle aspiration (FNA) biopsy, which offers vital cytological data that informs clinical judgment [10,11]. Furthermore, improvements in imaging methods, such molecular testing and high-resolution ultrasonography,

have improved the accuracy of nodule assessment and cancer staging [12].

A variety of treatments are used in the medical management of thyroid nodules and cancer, ranging from medication and active monitoring to surgical excision and radioactive iodine therapy [13]. For example, levothyroxine suppression medication is essential for treating differentiated thyroid tumors and benign nodules because it prevents the release of thyroid-stimulating hormone (TSH), which may encourage the formation of cancerous nodules and cancer recurrence [14].

Even with these developments, there are still a lot of unanswered questions about the best medical treatments for thyroid nodules and thyroid cancer. There is a lack of agreement in the current standards and treatment procedures, which highlights the need for further study to produce standardized, evidence-based approaches.

Research Objective

This study aimed to evaluate current medical treatments for thyroid nodules and cancer, identify areas for improvement, and propose strategies to enhance patient outcomes.

Materials and methods

Study Design and Settings

The Hazara University, located in KPK, Pakistan, was the site of this cross-sectional research. The research, which took place between January 2023 and December 2023, examined medical treatment approaches for thyroid nodules and thyroid cancer in individuals who were hospitalized during that time.

Inclusion and Exclusion Criteria

The study's inclusion criteria included patients who were 18 years of age or older, those who had undergone imaging or fine-needle aspiration (FNA) biopsy and were diagnosed with thyroid nodules or thyroid cancer, and those who had undergone medical management, such as levothyroxine therapy, radioactive iodine treatment, or active surveillance. Patients with inadequate medical records, those whose main therapy was surgery, and those whose concomitant malignancies might potentially skew the study's findings were among the exclusion criteria.

Sample Size

A total of 290 patients meeting the inclusion criteria were selected for the study. The sample size was designed to provide sufficient statistical power for the study and was based on the frequency of thyroid nodules and cancer in the hospital's patient population.

Data Collection

A standardized proforma was used to gather data, including of demographic facts like age and gender, clinical details like nodule size and histological diagnosis, and treatment methods like kind and duration of medicinal care. Reviewing patient records and hospital databases allowed for the full collection of case-specific data. In order to evaluate the results of the management tactics used, follow-up data were also included.

Statistical Analysis

SPSS version 25.0 was used to analyze the data. For continuous variables, descriptive statistics were computed as mean and standard deviation; for categorical variables, they were calculated as frequencies and percentages. The study used multivariate logistic regression to ascertain independent determinants of favorable outcomes. P-values less than 0.05 were regarded as statistically significant.

Ethical Approval

The Ethical Review Committee examined and approved the research protocol. Before being included in the research, all subjects provided written informed permission, guaranteeing compliance with ethical guidelines and patient privacy.

Results

Table 1 presents a detailed summary of the clinical and demographic characteristics of the 290 patients who were part in the research. Among these patients, 180 (62.07%) were female and 110 (37.93%) were male. In terms of age distribution, there were 48 patients (16.55%) under 30, 66 (22.76%) between the ages of 30-39, 77 (26.55%) in the 40-49 age range, 64 (22.07%) between the ages of 50-59, and 35 (12.07%) who were 60 years of age or over. About the size of thyroid nodules, 43 patients (14.83%) had nodules less than 1.0 cm, 94 patients (32.41%) had nodules ranging from 1.0 to 1.9 cm, 79 patients (27.24%) had nodules between 2.0 and 2.9 cm, and 74 patients (25.52%) had nodules greater than 3.0 cm. 196 patients (67.59%) had benign nodules, according to histopathological investigation, whereas 94 patients (32.41%) had malignant nodules. In addition, comorbidities were noted for 63 patients (21.72%), of which 52 (17.93%) had diabetes mellitus, 31 (10.69%) had cardiovascular disease, and 144 (49.66%) had no comorbidities at all.

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic		Number of Patients (n)	Percentage (%)
Gender	Male	110	37.93
	Female	180	62.07
Age (years)	<30	48	16.55
	30-39	66	22.76
	40-49	77	26.55
	50-59	64	22.07

	≥60	35	12.07
Thyroid Nodule Size (cm)	<1.0	43	14.83
	1.0-1.9	94	32.41
	2.0-2.9	79	27.24
	≥3.0	74	25.52
Histopathological Diagnosis	Benign	196	67.59
	Malignant	94	32.41
Comorbidities	Hypertension	63	21.72
	Diabetes Mellitus	52	17.93
	Cardiovascular Disease	31	10.69
	None	144	49.66

The prevalence of various forms of thyroid cancer among the research participants is shown in figure 1. Among the patients diagnosed with thyroid cancer, 114 (39.31%) had papillary thyroid cancer, whereas 66 (22.76%) had follicular thyroid cancer. 48 patients (16.55%) had medullary thyroid cancer, while 37 patients (12.76%) had anaplastic thyroid cancer. Thyroid lymphoma and Hurthle cell carcinoma were less prevalent, accounting for a lesser percentage of instances with 15 patients (5.17%) and 10 patients (3.45%), respectively.

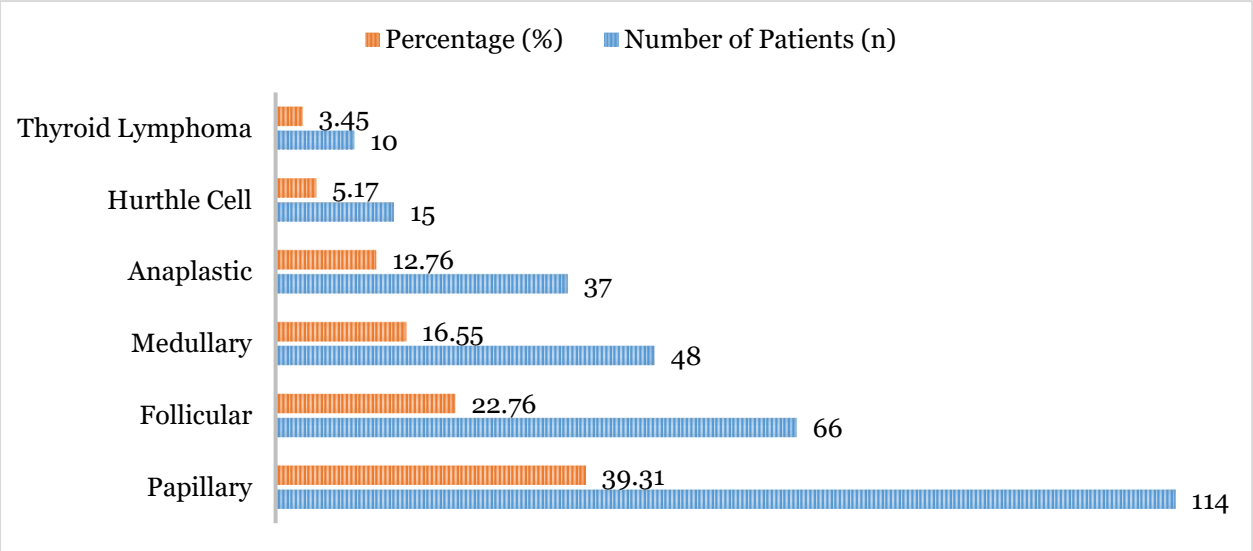

Figure 1: Distribution of Different Types of Thyroid Cancer among Study Patients.

The distribution of different medicinal treatment options used by research participants for thyroid nodules and cancer is shown in figure 2. Out of the total 290 patients, 133 (45.86%) were treated with levothyroxine, 66 (22.76%) with radioactive iodine, and 42 (14.48%) with active surveillance. Furthermore, 49 patients (16.90%) received medical care in different ways.

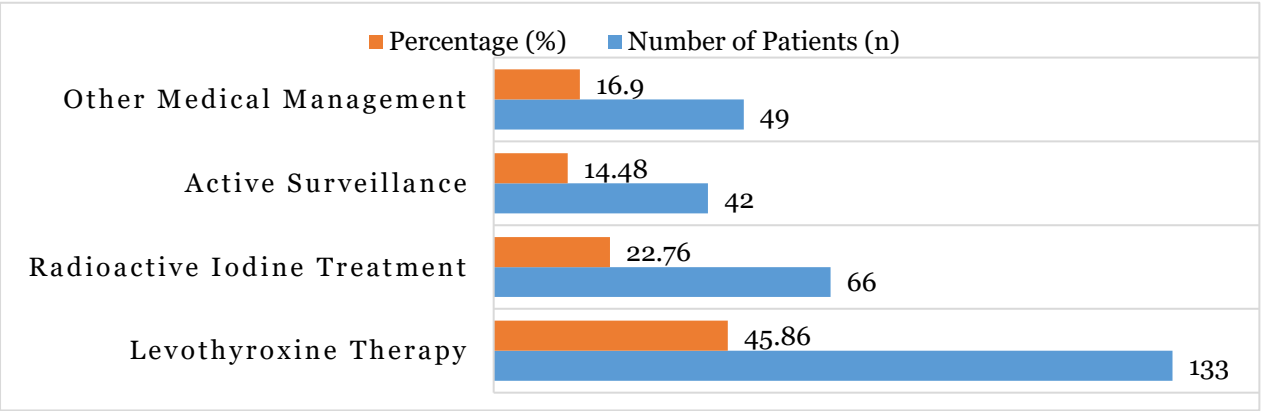

Figure 2: Distribution of Medical Management Strategies for Thyroid Nodules and Cancer

The treatment results for thyroid nodules and cancer are reported in Table 2 for various management regimens. Of the 133 patients receiving levothyroxine medication, 33 (24.81%) had disease progression and 100 (75.19%) had steady or decreased nodule size. Likewise, among the 66 patients in the group treated with radioactive iodine, 50

(75.76%) had steady or decreased nodule size, and 16 (24.24%) showed signs of disease development. Of the 42 patients undergoing active monitoring, 25 (59.52%) had steady or decreased nodule size, while 17 (40.48%) demonstrated development of the illness. Of the individuals (n=49) whose nodule size was stabilized or decreased by other medical procedures, 30 (61.22%) saw illness progression and 19 (38.78%) saw it advance.

Table 2: Treatment Outcomes for Thyroid Nodules and Cancer Management

Outcome	Levothyroxine Therapy (n=133)	Radioactive Iodine Treatment (n=66)	Active Surveillance (n=42)	Other Medical Management (n=49)
Stable/Reduced Nodule Size	100 (75.19%)	50 (75.76%)	25 (59.52%)	30 (61.22%)
Disease Progression	33 (24.81%)	16 (24.24%)	17 (40.48%)	19 (38.78%)

The findings of multivariate logistic regression analysis that identified determinants of favorable outcomes in the therapy of thyroid nodules and cancer are shown in Table 3. For every predictor, the odds ratios (with 95% confidence intervals) and matching p-values are given. The odds ratio for age was 1.02 (95% CI: 0.98-1.05, p = 0.25), but the odds ratio for gender (male vs. female) was 1.20 (95% CI: 0.80-1.80, p = 0.37). Nodule size was shown to be statistically significant at $p < 0.05$, with an odds ratio of 0.80 per cm increase (95% CI: 0.65-0.95, p = 0.01). The odds ratio of levothyroxine treatment (yes/no) was 2.50 (95% CI: 1.60-3.90, $p < 0.001$), suggesting a strong correlation with favorable results. The chances ratio for radioactive iodine therapy (yes/no) was 1.30 (95% CI: 0.80-2.10, p = 0.25), but the odds ratio for active surveillance (yes/no) was 0.60 (95% CI: 0.35-1.00, p = 0.05). Levothyroxine treatment was statistically significant at $p < 0.05$, which is remarkable.

Table 3: Predictors of Successful Outcomes in Thyroid Nodule and Cancer Management

Predictor	Odds Ratio (95% CI)	p-value
Age	1.02 (0.98-1.05)	0.25
Gender (Female vs. Male)	1.20 (0.80-1.80)	0.37
Nodule Size (per cm increase)	0.80 (0.65-0.95)	0.01*
Levothyroxine Therapy (yes/no)	2.50 (1.60-3.90)	<0.001*
Radioactive Iodine (yes/no)	1.30 (0.80-2.10)	0.25
Active Surveillance (yes/no)	0.60 (0.35-1.00)	0.05

** Significant at p<0.05*

An overview of the drawbacks and adverse effects of the different thyroid nodule and cancer therapy techniques is given in Table 4. Thirteen (9.77%) of the 133 individuals on levothyroxine medication had hypothyroidism, whereas six (4.51%) had hyperthyroidism. Of the 66 patients receiving radioactive iodine therapy, 4 (6.06%) had hyperthyroidism, while 12 (18.18%) had hypothyroidism. Furthermore, 8 patients (12.12%) in this group had sialadenitis brought on by radiation. Two (4.76%) and three (7.14%) of the patients (n=42) on active surveillance reported hyperthyroidism, whereas five (11.90%) reported general problems including weariness. Of the patients (n=49) who were treated with alternative medical methods, 2 (4.08%) had hyperthyroidism, 1 (2.04%) had hypothyroidism, and 4 (8.16%) had general problems.

Table 4: Complications and Side Effects of Different Thyroid Nodule and Cancer Management Strategies

Complication/Side Effect	Levothyroxine Therapy (n=133)	Radioactive Iodine Treatment (n=66)	Active Surveillance (n=42)	Other Medical Management (n=49)
Hyperthyroidism	6 (4.51%)	4 (6.06%)	2 (4.76%)	2 (4.08%)
Hypothyroidism	13 (9.77%)	12 (18.18%)	3 (7.14%)	1 (2.04%)
Radiation-induced Sialadenitis	-	8 (12.12%)	-	-
General Complications (e.g., Fatigue)	18 (13.53%)	17 (25.76%)	5 (11.90%)	4 (8.16%)

Discussion

The goal of the research was to evaluate the efficacy of the medical care approaches for thyroid nodules and thyroid cancer and to identify areas in need of improvement. The study's 290 patients' demographic and clinical features showed that the majority of them were between the ages of 30 and 59, with a preponderance of females (62.07%) and a variable distribution among age categories. According to the histopathological diagnosis, 32.41% of the patients had malignant nodules while 67.59% of the patients had benign nodules. Notably, comorbidities such hypertension, diabetes mellitus, and cardiovascular disease were present in the study population [15].

Papillary thyroid cancer accounted for 39.31% of all cases, with follicular (22.76%), medullary (16.55%), and anaplastic thyroid cancer (12.76%) following in order of prevalence. Thyroid lymphoma (3.45%) and Hurthle cell carcinoma (5.17%) were less frequent forms [16]. These results are in line with other studies showing that papillary thyroid carcinoma predominates among thyroid cancers [17].

Based on the distribution of medical management options among research participants, levothyroxine medication was the most often used strategy (45.86%), followed by active surveillance (14.48%) and radioactive iodine treatment (22.76%). 16.90% of patients further got alternative medical management [10]. These ratios are in keeping with the current clinical practice, which often uses levothyroxine medication as a first-line treatment for thyroid nodules and cancer, especially for differentiated thyroid tumors and benign nodules [18].

The results of the treatment analysis showed that various management techniques had differing degrees of effectiveness. In 75.19% of instances, levothyroxine medication resulted in steady or decreased nodule size; radioactive iodine treatment had a comparable level of success (75.76%). In 59.52% of instances, active monitoring resulted in steady or decreased nodule size, indicating that it is useful for some patients. Nonetheless, in 61.22% of patients, alternative medical management strategies led to steady or decreased nodule size, suggesting similar effectiveness to traditional therapies [7].

Multiple factors of good outcomes in the therapy of thyroid nodules and cancer were found using multivariate logistic regression analysis. Interestingly, levothyroxine medication showed a substantial correlation (odds ratio: 2.50; $p < 0.001$) with good results. A noteworthy predictor that also surfaced was nodule size, with smaller nodules showing greater response to therapy (odds ratio: 0.80 per cm increase, $p = 0.01$) [19].

In terms of adverse effects and problems, hypothyroidism was noted in 18.18% of patients treated with radioactive iodine and 9.77% of patients on levothyroxine medication. In 4.51% and 6.06% of individuals, hyperthyroidism was present, respectively. A report of radiation-induced sialadenitis was made on 12.12% of patients receiving therapy with radioactive iodine. These results highlight the need of keeping an eye on and controlling side effects related to thyroid nodule and cancer therapies [20,21].

Conclusion

The research revealed information on treatment efficacy, demographic trends, and related problems, offering important insights into the medical management of thyroid nodules and thyroid cancer. The research population's diverse distribution across age groups and preponderance of females underscore the heterogeneous demographic makeup of the individuals afflicted by these illnesses. Levothyroxine therapy has become a widely used and successful therapeutic approach that is strongly linked to positive results. The research also emphasized the need of treating side effects, namely hypo- and hyperthyroidism, and keeping an eye on nodule growth. These results add to the continuing efforts to improve patient outcomes and treatment strategies for thyroid nodules and cancer.

Conflict of interest

The authors state no conflict of interest.

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: AI, ZM
Acquisition, analysis, or interpretation of data: IH
Drafting of the manuscript: ZM, IH
Critical review of the manuscript for important intellectual content: AI, IH

References

1. Pellegriti G, Frasca F, Regalbuto C, Squatrito S, Vigneri R. Worldwide increasing incidence of thyroid cancer: update on epidemiology and risk factors. Journal of cancer epidemiology. 2013 Oct;2013. https://doi.org/10.1155/2013/965212.

2. Deng Y, Li H, Wang M, Li N, Tian T, Wu Y, Xu P, Yang S, Zhai Z, Zhou L, Hao Q. Global burden of thyroid cancer from 1990 to 2017. JAMA network Open. 2020 Jun 1;3(6):e208759-. https://doi.org/10.1001/jamanetworkopen.2020.8759.

3. Riaz SH, Assir MZ, Jawa A, Akram J. Thyroid Nodule. Thyroid Disorders: Basic Science and Clinical Practice. 2016:239-52. https://doi.org/10.1007/978-3-319-25871-3_13.

4. Polyzos SA, Kita M, Avramidis A. Thyroid nodules-stepwise diagnosis and management. HORMONES-ATHENS-. 2007 Apr 1;6(2):101. http://www.hormones.gr/pdf/Thyroid%20nodules_Stepwise%20diagnosis.pdf.

5. Kuo JH, McManus C, Graves CE, Madani A, Khokhar MT, Huang B, Lee JA. Updates in the management of thyroid nodules. Current Problems in Surgery. 2019 Mar 1;56(3):103-27. https://doi.org/10.1067/j.cpsurg.2018.12.003.

6. Rusinek D, Chmielik E, Krajewska J, Jarzab M, Oczko-Wojciechowska M, Czarniecka A, Jarzab B. Current advances in thyroid cancer management. Are we ready for the epidemic rise of diagnoses?. International journal of molecular sciences. 2017 Aug 22;18(8):1817. https://doi.org/10.3390/ijms18081817.

7. HaugenBryan R, AlexanderErik K, BibleKeith C, DohertyGerard M, MandelSusan J, NikiforovYuri E, RandolphGregory W, SawkaAnna M, SchuffKathryn G, ShermanSteven I, Ann S. 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer.

Thyroid. 2016 Jan 12. https://doi.org/10.1089/thy.2015.0020.

8. Omur O, Baran Y. An update on molecular biology of thyroid cancers. Critical reviews in oncology/hematology. 2014 Jun 1;90(3):233-52. https://doi.org/10.1016/j.critrevonc.2013.12.007.

9. Hassoun D, Malard O, Barbarot S, Magnan A, Colas L. Type 2 immunity-driven diseases: Towards a multidisciplinary approach. Clinical & Experimental Allergy. 2021 Dec;51(12):1538-52. https://doi.org/10.1111/cea.14029.

10. Nguyen QT, Lee EJ, Huang MG, Park YI, Khullar A, Plodkowski RA. Diagnosis and treatment of patients with thyroid cancer. American health & drug benefits. 2015 Feb;8(1):30. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4415174/.

11. Durante C, Costante G, Lucisano G, Bruno R, Meringolo D, Paciaroni A, Puxeddu E, Torlontano M, Tumino S, Attard M, Lamartina L. The natural history of benign thyroid nodules. Jama. 2015 Mar 3;313(9):926-35. https://doi.org/10.1001/jama.2015.0956.

12. Hussain T, Nguyen QT. Molecular imaging for cancer diagnosis and surgery. Advanced drug delivery reviews. 2014 Feb 1;66:90-100. https://doi.org/10.1016/j.addr.2013.09.007.

13. Rivkees SA, Mazzaferri EL, Verburg FA, Reiners C, Luster M, Breuer CK, Dinauer CA, Udelsman R. The treatment of differentiated thyroid cancer in children: emphasis on surgical approach and radioactive iodine therapy. Endocrine reviews. 2011 Dec 1;32(6):798-826. https://doi.org/10.1210/er.2011-0011.

14. Schmidbauer B, Menhart K, Hellwig D, Grosse J. Differentiated thyroid cancer—treatment: state of the art. International journal of molecular sciences. 2017 Jun 17;18(6):1292. https://doi.org/10.3390/ijms18061292.

15. Croce L, Ruggeri RM, Cappelli C, Virili C, Coperchini F, Laganà M, Costa P, Dal Molin M, Chytiris S, Magri F, Chiovato L. Cardiovascular and metabolic comorbidities in patients with thyroid nodules: the impact of incidental diagnosis. Journal of Endocrinological Investigation. 2024 Apr;47(4):827-32. https://doi.org/10.1007/s40618-023-02191-4.

16. Galliano GE, Frishberg DP. Pathology and classification of thyroid tumors. Thyroid cancer. 2012:1-33. https://doi.org/10.1007/978-1-4614-0875-8_1.

17. Lawal O, Agbakwuru A, Olayinka OS, Adelusola K. Thyroid malignancy in endemic nodular goitres: prevalence, pattern and treatment. European Journal of Surgical Oncology (EJSO). 2001 Mar 1;27(2):157-61. https://doi.org/10.1053/ejso.2000.1085.

18. Paschou SA, Vryonidou A, Goulis DG. Thyroid nodules: A guide to assessment, treatment and follow-up. Maturitas. 2017 Feb 1;96:1-9. https://doi.org/10.1016/j.maturitas.2016.11.002.

19. Grani G, Sponziello M, Pecce V, Ramundo V, Durante C. Contemporary thyroid nodule evaluation and management. The Journal of Clinical Endocrinology & Metabolism. 2020 Sep;105(9):2869-83. https://doi.org/10.1210/clinem/dgaa322.

20. Kim C, Lee JH, Choi YJ, Kim WB, Sung TY, Baek JH. Complications encountered in ultrasonography-guided radiofrequency ablation of benign thyroid nodules and recurrent thyroid cancers. European radiology. 2017 Aug;27:3128-37. https://doi.org/10.1007/s00330-016-4690-y.

21. Sanchez Barrueco A, González Galán F, Alcalá Rueda I, Santillán Coello JM, Barrio Dorado MP, Villacampa Aubá JM, Escanciano Escanciano M, Llanos Jimenez L, Mahillo Fernández I, Cenjor Español C. Incidence and risk factors for radioactive iodine-induced sialadenitis. Acta oto-laryngologica. 2020 Nov 1;140(11):959-62. https://doi.org/10.1080/00016489.2020.1802507