



Physicians' Practices toward Thyroid Nodules: Experience of the City of Casablanca, Morocco

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Abstract

Thyroid nodules (TN) are very frequent, with up to 8% of adults having palpable nodules and by using ultrasound we can detect up to 10 times more nodules (Yeung & Serpell, 2008) [1]. In the absence of any guidelines for thyroid nodule management in Morocco, our study aims to describe physicians' practices in the Greater Casablanca Region regarding thyroid nodules. We conducted a descriptive cross-sectional study using a questionnaire issued to doctors who practice in the Greater Casablanca Region in both sectors public and private. Results show that half of the participants do a general exam for all patients and 72% of them include a routine palpation of thyroid. When they found a thyroid nodule, 97% and 99% demanded ultrasonography and TSH measure respectively. Furthermore, thirty percent refer patients for management regardless of the EU-TIRADS score. In brief, the management of thyroid nodules in Morocco needs a guideline based on the latest research advances and international guidelines, to improve diagnosis and management of thyroid nodules and avoid overdiagnosis and overtreatment.

Subject Areas

Oncology, Endocrinology

Keywords

Physician's Practice, Thyroid Nodule Management, Survey, Questionnaire

1. Background

Thyroid nodules (TN) represent the most frequent type of thyroid diseases, either as a solitary nodule or in multinodular goiter. Their incidence has been

continuously increasing on an international scale for the last thirty years. This frequency is in part due to the development of medical imagery and their widespread use especially the ultrasound which provide a TN's detection in 19% - 67% of randomly selected population with higher frequencies in females and the elderly (Cooper *et al.*, 2006) [2].

Indeed, TN can be identified as discrete lesions within the thyroid that are radiographically distinct from the surrounding thyroid parenchyma. Some palpable lesions may correspond to non-apparent radiographic abnormalities (Durante *et al.*, 2018) [3]. This abnormality does not meet the strict definition of a thyroid nodule. Incidental nodules or "incidentalomas" refer to impalpable nodules detected in the US or other radiology studies. They carry the same malignancy risk as palpable nodules confirmed by ultrasound (Haugen *et al.*, 2016) [4].

Their prevalence increase with age, iodine deficiency, in the female gender, and after radiation exposure (Dean & Gharib, 2008) [5]. TNs are commonly known to be benign and asymptomatic. Moreover, in North America autopsy data shows that approximately 60% of adults are found to harbor nodules and they had lived without ever knowing (Brito *et al.*, 2014) [6].

Thyroid nodules are very frequent in the daily practice of every clinician. This has motivated several international associations to develop guidelines for the management of thyroid nodules such as the American Thyroid Association and the European Thyroid Association. Unfortunately, in Morocco, we do not yet have a guide on the management of TN.

The challenge in the management of thyroid nodules is not to miss a disease that risks a patient's life, but also not to overtreat indolent nodules that will not cause any risk of morbidity or mortality during the patient's life.

As with any mass screened elsewhere in the body, the initial evaluation for any newly discovered TN must begin with a complete history, clinical examination, and neck ultrasonography. A strong family antecedent of thyroid cancer or previous radiation exposure to the head and neck should suspect thyroid cancer. After, the measurement of the serum thyroid-stimulating hormone (TSH), we can identify whether the nodule is hyper-functional or nonfunctional. This is an important feature since a solitary toxic nodule is rarely malignant and fine needle aspiration (FNA) biopsy or further cancer workup, in this case, is seldom required. According to the American Thyroid Association guidelines, a routine preoperative thyroglobulin (Tg) measurement for patients with differentiated thyroid cancer (DTC) is not recommended besides it allows the monitoring of treated thyroid cancers. Indeed, the persistence of Tg in the blood indicates recurrence or the presence of metastases since after a total thyroidectomy, the Tg level must be zero. Other examinations (TDM, MRI, thyroid scintigraphy) may be necessary to assess the extent of the disease. They are not systematic for all patients. (Haugen *et al.*, 2016 [4]; maladie, 2019 [7]; Schneider & Chen, 2013 [8])

In non-autonomous nodules, FNA biopsy remains the test of choice for evaluating TN based on ultrasound characteristics. In the goals of standardizing ultrasound and FNA cytology reports, an appreciable effort has been made. This is

marked by the development of different ultrasounds and cytological reporting systems (EU-TIRADS for ultrasound and Bethesda criteria for cytology). FNA biopsy is recommended for nodules greater than 1 cm and their sonographic appearance is suspicious. In the case of a multinodular gland, the nodule with suspicious sonographic characteristics must be biopsied (Schneider & Chen, 2013 [8]; Nguyen *et al.*, 2015 [9]; Paajanen *et al.*, 2018 [10]).

The FNA results are classified as per the Bethesda System for Reporting Thyroid Cytopathology (BSRTC) which was created in 2007 to standardize the reporting of thyroid cytopathology and to improve the clinical management of thyroid findings. The diagnostic categories of the BSRTC include different risks of malignancy, which influence the recommended management after the FNA. These categories are not diagnostic, malignant, suspicious for malignancy (50% - 75% risk), indeterminate or suspicious for neoplasms (20% - 30% risk), follicular lesions of undetermined significance (5% - 10% risk), and benign. Indeed, therapeutic management becomes clear when FNA results are definitively benign or malignant. As well, FNA biopsy has a false-negative rate of 1% to 3%, and one of the limitations of cytologic evaluation of thyroid nodules is its inability to distinguish adenomas from carcinomas in follicular lesions. Therefore, lobectomy with permanent histology may be the best way to make a definitive diagnosis in patients with follicular or unspecified disease. Many centers have turned to molecular analysis of FNA samples to help differentiate follicular lesions, especially the analysis of BRAF, RAS, RET/PTC, and PAX8 rearrangements (Nguyen *et al.*, 2015 [9]; Paajanen *et al.*, 2018 [10]; Campenni *et al.*, 2020 [11]).

The aim of this study is to describe the attitude of the doctors in the city of Casablanca regarding TN.

2. Materials and Method

2.1. Type of Study

To achieve our main research objectives, we conducted a cross-sectional study in June 2022 in the greater Casablanca region.

2.2. Study Population

By stratifying the doctors on the prefecture of exercise, we selected five prefectures at random, and all doctors working were invited to participate in this study. Of these, 154 doctors agreed to participate in the study. The data for this study were collected by means of a self-administered anonymous questionnaire. These data are grouped into three categories. The first category includes information about the respondent such as sectors of work, a domain of exercise, and years of working. The second category concerns the daily practice of the doctors, and the third category concerns the attitude of the doctors toward thyroid nodules. The ethics committee for biomedical research Casablanca permitted this study (Order no. 02/2022). Written informed consent has been included in the questionnaire with respect to the anonymity of the doctors involved in the study.

The characteristics of our sample are resumed in **Table 1**.

Data entry and statistical analysis were carried out using JAMOVI 2.3.17. A descriptive analysis of the results was carried out by studying the frequency, the percentage, and the confidence intervals.

3. Results

Table 2 shows that 51% CI [43.5 - 59.1] of physicians do a general examination for all patients. Almost three-quarters of physicians (72%) CI [61.4 - 80.8] includes the thyroid palpation in this general examination. In addition, 61% of doctors CI [53.2 - 68.4] do thyroid palpation only when the patient requests or complains of thyroid symptomatology.

Table 1. Characteristics of the sample.

	Number (N = 154)	Percentage %
Sector		
Public	114	74
Private	40	26
Domain of exercise		
General practitioner	106	69
Specialist physician	48	31
Working years		
0 to 10 years	90	58
11 to 20 years	46	29
More than 20 years	18	12

Table 2. Responses of physicians.

	Number	Percentage	IC 95%
General examination of all patients			
Yes	79	51	[43.5 - 59.1]
Non	75	49	[40.9 - 56.5]
Thyroid palpation			
Yes	57	72	[61.4 - 80.8]
No	22	28	[19.2 - 38.6]
Thyroid palpation in symptomatic patient or in case of patient's demand			
Yes	94	61	[53.2 - 68.4]
No	60	39	[31 - 46.2]

Table 3 presents the attitude of doctors in front of thyroid nodules. In fact, almost the totality (97%) CI [93.5 - 98.9] of the participants prescribes the cervical ultrasound in case of thyroid nodules. However, only 80 percent know the EU-TIRADS score.

In addition, ninety-nine percent and twenty-six percent of participants demand thyroid biological assessment and FNA Biopsy respectively. Further, 90% of doctors CI [85.3 - 94.5] refer patients with a thyroid nodule to a specialist.

Regarding the cases when they refer patients to specialists, 24% declare that they refer patients when they present a disturbed thyroid function test, and 30% in the case of thyroid nodules on ultrasound regardless of EU-TIRADS grade.

Table 3. Physicians' attitude toward thyroid nodules.

	Number	Percentage %	IC%
Ultrasonography			
Yes	150	97	[93.5 - 98.9]
No	4	3	[1.01 - 6.49]
If yes, Knowledge of the EU-TIRADS score			
Yes	121	80	[71.4 - 84.3]
No	29	20	[13.4 - 25.7]
Prescription of the biological assessment (TSH, T3, T4...)			
Yes	152	99	[95.3 - 99.6]
No	2	1	[0.35 - 4.61]
Prescription of a FNA biopsy			
Yes	40	26	[19.7 - 33.4]
No	114	74	[63.8 - 78]
Referral to a specialist consultation			
Yes	142	92	[85.3 - 94.5]
No	12	8	[4.03 - 12.3]
If yes, when			
Disturbed thyroid function test	34	24	[15.1 - 32.1]
Thyroid nodule on ultrasound regardless of EUTIRADS grade	42	30	[20.8 - 34.8]
Thyroid nodule EUTIRADS > 3	42	30	[20.8 - 34.8]
Thyroid function test disturbed/thyroid nodule EUTIRADS < 3	11	8	[3.1 - 10.7]
Disturbed thyroid function tests/thyroid nodule on ultrasound regardless of EUTIRADS grade.	9	7	[0.4 - 5.2]

4. Discussion

The incidence of thyroid cancer had reached in the greater region of Casablanca from 6.6 per 100,000 populations including both sexes between 2008 and 2012, to 8.9 per 100,000 between 2013 and 2017 (Registre des Cancers de la Region du Grand Casablanca 2013-2017) [12]. This higher incidence shows the extent of TN in Morocco since thyroid cancers, in most cases, present clinically as a nodule or as part of a multinodular goiter.

This incidence does not concern only Morocco, it has been registered in different countries around the world and it has been attributed to an overdiagnosis in many of them. As an example, South Korea had known an epidemic of thyroid cancer between 1999 and 2011 due to a screening program that led to overdiagnosis of a non-dolente type of thyroid cancer (papillary thyroid microcarcinoma: histological type known to be frequently present at the death, but never causing symptoms). (Ahn *et al.*, 2014 [13]; Davies *et al.*, 2015 [14])

Thyroid nodules are common in clinical practice. Their prevalence depends on the method used for detection. 3% - 7% are detected by clinical examination, and 20% - 76% by ultrasound in the general population (Gharib & Papini, 2007) [15]. Nevertheless, opinions regarding TN management and evaluation remain diverse, and a panel of guidelines was published in order to help medical decision-making. Our study had an objective to describe physicians' attitudes toward thyroid nodules in the Casablanca region.

Interestingly, our survey shows that half of the participants do a general exam for all patients and seventy-two percent include a routine palpation of thyroid. In fact, thyroid examination with the use of palpation is a simple and non-expensive method for TN diagnosis. Its sensitivity can reach 71%, according to Miki *et al.* in their study about the value of mass screening for thyroid cancer (Miki *et al.*, 1998) [16]. The value of thyroid palpation has been demonstrated by Wang and Crapo who evaluated the prevalence of TN screened by palpation in non-endemic goiter areas and from unselected populations. They reported that the prevalence of TN detected by thyroid palpation ranged from 4.7 to 51.0 per 1000 individuals (Dean & Gharib, 2008) [5].

Regarding the evaluation of thyroid nodules, close to the totality (97%) of physicians order the US and 80% know the EU-TIRADS score. This result was very similar to that found in the literature, Bonnema *et al.* and D. Fuhrer *et al.* found that 84.2% and 98% respectively use the US in diagnosis processes in the case of TN. In addition, in the 2015 Survey of Clinical Practice Patterns in the Management of Thyroid Nodules, 98% of respondents reported that they would obtain thyroid US as the baseline in the index patient. However, the present result contradicts Bennedbæk F and Laszlo H who found that only 33.8% of physicians use the US in the evaluation of TN. (Bennedbæk & Hegedüs, 2000 [17]; Bonnema *et al.*, 2000 [18]; Burch *et al.*, 2016 [19]; Fuhrer *et al.*, 2005 [20])

Indeed, the US is the most accurate and low-cost imaging method for evaluating and monitoring thyroid nodules and it provides characterization of no-

dules by sonographic features that suggest malignancy. All patients with thyroid nodules should have an ultrasound evaluation of the nodule, thyroid, and cervical lymph nodes if indicated. Current ultrasound machines are relatively inexpensive, sensitive and easy to use, whereas the high sensitivity of the US has resulted in the detection of TN, despite their small size and their uncertain clinical importance. As reported by Black and Welch, advances in diagnostic imaging have created confusion in two key parts of medical decision-making: determining the existence of disease and determining the effectiveness of treatments (Bomeli *et al.*, 2010 [21]; Dean & Gharib, 2008 [5]; Yeung & Serpell, 2008 [1]).

For the evaluation of the functional status of the thyroid, the results of the present study reveal that 99% investigate thyroid function by measuring the TSH level, and this result converges with those of a European survey about diagnosis and treatment of the solitary thyroid nodule, which has the same percentage (Benedbæk *et al.*, 1999) [22]. As a matter of fact, a sensitive thyroid-stimulating hormone (TSH) test should be drawn on every patient diagnosed with TN to determine those with thyrotoxicosis or hypothyroidism and be used for further management (Popoveniuc & Jonklaas, 2012 [23]; Welker & Orlov, 2003 [24]).

Concerning the FNA biopsy, only twenty-six percent prescribe it, which may be justified by the fact that our sample contains a high percentage of general practitioners who would leave the FNA biopsy to a more specialist one. FNA plays a central role in the diagnostic workup of patients with TN. FNA is a safe, useful and inexpensive procedure. To improve precision, FNA can (if necessary) be performed under ultrasound guidance. The results may be particularly helpful in determining indications for surgery. Thyroid nodule FNA cytology reports should be reported using the diagnostic panels described in the Bethesda Thyroid Cytopathology Reporting System (Haugen *et al.*, 2016 [4]; Sakorafas, 2010 [25]).

Besides, in the current study one-third of respondents refer patients to a specialist for management regardless of the EU-TIRAD grade of thyroid nodules. Unfortunately, the surgeon who receives the index patient is often the last person in a long chain of events. In this position, it's hard to stop the train to thyroid surgery. The patient is ready for it, and the referring physician may expect that the surgery will be performed (Davies *et al.*, 2010) [26].

5. Limitation

Our analysis has several limitations and the results communicated here must be interpreted considering the strengths and weaknesses of the study. First, our sample size cannot be representative of all physicians in the Greater region of Casablanca, because doctors refused to participate. Second, more generalist practitioners should be included in the study because they are implicated in the management of TN, and they represent the first contact of patients with the health system. In addition, our questionnaire cannot reflect the ultimate management of thyroid nodules because it differs according to several aspects, *i.e.*,

patient's age, family history, concomitant illness, and patients' preferences.

6. Conclusions

In conclusion, our study was designed to provide an overview of the management process of TN in Casablanca. In view of our results, the management of TN in Casablanca follows in part the international recommendations. However, the management of thyroid cancer in Morocco will be a health public problem in the absence of any guideline or program that can limit overdiagnosis and over-treatment of small indolent types of thyroid cancer (TC). According to several studies, the hypothesis of overdiagnosis is the main driver of the dramatic increase in TC incidence and is in part related to physicians' practices, and the extent of intentional inspection of the thyroid gland or incidental findings. This may be due to the longstanding belief that early detection and treatment are better (Ahn *et al.*, 2014 [13]; Vaccarella *et al.*, 2016 [27]).

Furthermore, we recommend that future research should provide more details about clinical practices regarding thyroid nodules and investigate the factors that influence the diagnosis of TC in Morocco.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Yeung, M.J. and Serpell, J.W. (2008) Management of the Solitary Thyroid Nodule. *The Oncologist*, **13**, 105-112. <https://doi.org/10.1634/theoncologist.2007-0212>
- [2] Cooper, D.S., Doherty, G.M., Haugen, B.R., Kloos, R.T., Lee, S.L., Mandel, S.J., *et al.* (2006) Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Taskforce. *Thyroid*, **16**, 109-142. <https://doi.org/10.1089/thy.2006.16.109>
- [3] Durante, C., Grani, G., Lamartina, L., Filetti, S., Mandel, S.J. and Cooper, D.S. (2018) The Diagnosis and Management of Thyroid Nodules : A Review. *JAMA*, **319**, 914-924. <https://doi.org/10.1001/jama.2018.0898>
- [4] Haugen, B.R., Alexander, E.K., Bible, K.C., Doherty, G.M., Mandel, S.J., Nikiforov, Y.E., *et al.* (2015) 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*, **26**, 1-133. <https://doi.org/10.1089/thy.2015.0020>
- [5] Dean, D.S. and Gharib, H. (2008) Epidemiology of Thyroid Nodules. *Best Practice & Research Clinical Endocrinology & Metabolism*, **22**, 901-911. <https://doi.org/10.1016/j.beem.2008.09.019>
- [6] Brito, J.P., Gionfriddo, M.R., Al Nofal, A., Boehmer, K.R., Leppin, A.L., Reading, C., *et al.* (2014) The Accuracy of Thyroid Nodule Ultrasound to Predict Thyroid Cancer: Systematic Review and Meta-Analysis. *The Journal of Clinical Endocrinology & Metabolism*, **99**, 1253-1263. <https://doi.org/10.1210/jc.2013-2928>
- [7] Elsevier Health Sciences (2019) Maladie C des enseignants d'endocrinologie diabète et. *Endocrinologie, diabétologie et maladies métaboliques: Réussir les ECNi*. 577 p.

- [8] Schneider, D.F. and Chen, H. (2013) New Developments in the Diagnosis and Treatment of Thyroid Cancer: New Developments in Thyroid Cancer. *CA: A Cancer Journal for Clinicians*, **63**, 373-394. <https://doi.org/10.3322/caac.21195>
- [9] Nguyen, Q.T., Lee, E.J., Huang, M.G., Park, Y.I., Khullar, A. and Plodkowski, R.A. (2015) Diagnosis and Treatment of Patients with Thyroid Cancer. *American Health & Drug Benefits*, **8**, 30-40.
- [10] Paajanen, I., Metso, S., Jaatinen, P. and Kholová, I. (2018) Thyroid FNA Diagnostics in a Real-Life Setting: Experiences of the Implementation of the Bethesda System in Finland. *Cytopathology*, **29**, 189-195. <https://doi.org/10.1111/cyt.12513>
- [11] Campenni, A., Barbaro, D., Guzzo, M., Capocchetti, F. and Giovannella, L. (2020) Personalized Management of Differentiated Thyroid Cancer in Real Life—Practical Guidance from a Multidisciplinary Panel of Experts. *Endocrine*, **70**, 280-291. <https://doi.org/10.1007/s12020-020-02418-x>
- [12] Registre des Cancers de la Region du Grand Casablanca 2013-2017. https://www.contrelecancer.ma/site_media/uploaded_files/Registre_des_Cancers_de_la_Region_du_Grand_Casablanca_2013-2017.pdf
- [13] Ahn, H.S., Kim, H.J. and Welch, H.G. (2014) Korea's Thyroid-Cancer "Epidemic"—Screening and Overdiagnosis. *The New England Journal of Medicine*, **371**, 1765-1767. <https://doi.org/10.1056/NEJMp1409841>
- [14] Davies, L., Morris, L.G.T., Haymart, M., Chen, A.Y., Goldenberg, D., Morris, J., et al. (2015) American Association of Clinical Endocrinologists and American College of Endocrinology Disease State Clinical Review: The Increasing Incidence of Thyroid Cancer. *Endocrine Practice. Official Journal of the American College of Endocrinology and the American Association of Clinical Endocrinologists*, **21**, 686-696. <https://doi.org/10.4158/EP14466.DSCR>
- [15] Gharib, H. and Papini, E. (2007) Thyroid Nodules: Clinical Importance, Assessment, and Treatment. *Endocrinology and Metabolism Clinics of North America*, **36**, 707-735. <https://doi.org/10.1016/j.ecl.2007.04.009>
- [16] Miki, H., Inoue, H., Komaki, K., Uyama, T., Morimoto, T. and Monden, Y. (1998) Value of Mass Screening for Thyroid Cancer. *World Journal of Surgery*, **22**, 99-102. <https://doi.org/10.1007/s002689900356>
- [17] Bennedbæk, F.N. and Hegedüs, L. (2000) Management of the Solitary Thyroid Nodule: Results of a North American Survey. *The Journal of Clinical Endocrinology & Metabolism*, **85**, 2493-2498. <https://doi.org/10.1210/jcem.85.7.6672>
- [18] Bonnema, S.J., Bennedbæk, F.N., Wiersinga, W.M. and Hegedüs, L. (2000) Management of the Nontoxic Multinodular Goitre: A European Questionnaire Study. *Clinical Endocrinology (Oxford)*, **53**, 5-12. <https://doi.org/10.1046/j.1365-2265.2000.01060.x>
- [19] Burch, H.B., Burman, K.D., Cooper, D.S., Hennessey, J.V. and Vietor, N.O. (2016) A 2015 Survey of Clinical Practice Patterns in the Management of Thyroid Nodules. *The Journal of Clinical Endocrinology & Metabolism*, **101**, 2853-2862. <https://doi.org/10.1210/jc.2016-1155>
- [20] Führer, D., Mügge, C. and Paschke, R. (2005) Questionnaire on Management of Nodular Thyroid Disease (Annual Meeting of the Thyroid Section of the German Society of Endocrinology 2003). *Experimental and Clinical Endocrinology & Diabetes*, **113**, 152-159. <https://doi.org/10.1055/s-2005-837523>
- [21] Bomeli, S.R., LeBeau, S.O. and Ferris, R.L. (2010) Evaluation of a Thyroid Nodule. *Otolaryngologic Clinics of North America*, **43**, 229-238. <https://doi.org/10.1016/j.otc.2010.01.002>

-
- [22] Bennedbæk, F.N., Perrild, H. and Hegedüs, L. (1999) Diagnosis and Treatment of the Solitary Thyroid Nodule. Results of a European Survey. *Clinical Endocrinology*, **50**, 357-363. <https://doi.org/10.1046/j.1365-2265.1999.00663.x>
- [23] Popoveniuc, G. and Jonklaas, J. (2012) Thyroid Nodules. *Medical Clinics of North America*, **96**, 329-349. <https://doi.org/10.1016/j.mcna.2012.02.002>
- [24] Welker, M.J. and Orlov, D. (2003) Thyroid Nodules. *American Family Physician*, **67**, 559-566.
- [25] Sakorafas, G.H. (2010) Thyroid Nodules; Interpretation and Importance of Fine-Needle Aspiration (FNA) for the Clinician—Practical Considerations. *Surgical Oncology*, **19**, e130-e139. <https://doi.org/10.1016/j.suronc.2010.06.003>
- [26] Davies, L., Ouellette, M., Hunter, M. and Welch, H.G. (2010) The Increasing Incidence of Small Thyroid Cancers: Where Are the Cases Coming from? *The Laryngoscope*, **120**, 2446-2451. <https://doi.org/10.1002/lary.21076>
- [27] Vaccarella, S., Franceschi, S., Bray, F., Wild, C.P., Plummer, M. and Maso, L.D. (2016) Worldwide Thyroid-Cancer Epidemic? The Increasing Impact of Overdiagnosis. *The New England Journal of Medicine*, **375**, 614-617. <https://doi.org/10.1056/NEJMp1604412>