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Clinical, Laboratory and Ultrasound Profile of Patients with Thyroid Nodules in Kinshasa

Jacques Mbizi Kumbu[1], Aliocha Natuhoyila Nkodila[2*], Jules Nakafwako Kuzeye[2], Serge Fueza Bisuta[3], Dédé Tshitemb Matanda[3], Jacquie Bonsuani Lessenge[4], Jacques Aimé Bangudi Bazeboso[5], Erick Matondo Matondo[5], Raoul Vindu Makelele[5], Oscar Eputa Mokambo[5], Honoré Yambula Kiabaka[6], E. Sangwa Muyumba[7], Augustin Mutsunga Kasereka[8], Christophe Mulondwa Kimona[8], Franck Ngoange Kasereka[9], Florent Zola Kiazayawoko[10], Cynthia Bokumba Minouche[1], Michel Tshikwela Lelo[1], Antoine Molua[1], Jean Tshibola Mukaya[1]

[1]Department of Radiology and Medical Imaging, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[2]Department of Family Medicine and Primary Health Care, Protestant University of Congo, Kinshasa, Democratic Republic of the Congo
[3]Department of Internal Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[4]Department of Surgery, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[5]Department of Radiology, Okapia Medical Diagnostic Center, Kinshasa, Democratic Republic of the Congo
[6]Department of Radiology, International Center for Advanced Medicine in Goma, North Kivu, Democratic Republic of the Congo
[7]Department of Radiology, Sino-Congolese Friendship Hospital, Kinshasa, Democratic Republic of the Congo
[8]EYANO Hospital Center in Goma, North Kivu, Democratic Republic of the Congo
[9]RTNC Hospital Center, Kinshasa, Democratic Republic of the Congo
[10]Department of Internal Medicine, HPGRK, Kinshasa, Democratic Republic of the Congo
Email: *nkodilaaliocha@gmail.com

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Abstract

Background: Thyroid nodule is a common disorder normally detected by ultrasound. However, little is known about the prevalence of thyroid nodules in the population of Kinshasa. The objective of this study is to determine the ultrasound profile of thyroid nodules and its characteristics in patients followed in Kinshasa hospitals. **Methods:** This is a descriptive and cross-sectional study, based on the medical records of patients who have been operated on in hospitals in Kinshasa. All participants underwent thyroid ultrasound. The clinical and sonographic characteristics were studied. **Results:** In total, 61 patients (mean age: 47.38 ± 8.8 years, 96.7% women) were included in this study. The mean clinical score of the patients was 3.4 ± 0.84. The majority of patients were classified as having an intermediate risk (85.2%). The majority of ultrasounds performed were indicated for anterior cervical swelling (78.7%). The majority of patients had more than three nodules (34.4%), the outline of the nodules was more regular (85.2%), they had a rounded shape in 11.5%, mostly isoechogenic echogenicity (62.3%) and a solid echostructure in

54.1%. A total of 57.4% of nodules had central vascularization and 23% calcifications. After stratification according to the EU-TIRADS score, a majority of patients were classified at stages 3 and 4 (47.5% and 34.4% respectively). **Conclusion:** This study showed a proportion of thyroid nodules at malignant risk. Therefore, screening for thyroid nodules should be added to routine workups especially in women to improve early detection of thyroid nodules, targeting those with a high risk profile.

Subject Areas

Radiology & Medical Imaging

Keywords

Thyroid Nodule, Ultrasound, Profile, Kinshasa

1. Introduction

The thyroid nodule (TN), which is defined by any localized hypertrophy of the thyroid gland [1], has become increasingly frequent in medical practice, thanks to the development of medical imaging techniques [2] [3] and the recourse to the expertise of pathologists [1]. The prevalence of nodules depends on the detection technique used, sex and age [1] [4]. The prevalence of clinically palpable nodules is around 5% for women and around 1% for men in countries with sufficient iodine intake such as the United States of America and England [1] [2]. This prevalence is multiplied by 10 on ultrasound examination and by 15 on autoptic examinations, thus making nodules a major public health problem [1] [2]. The occurrence of nodules and their malignant degeneration are influenced by advanced age, female sex, multiparity, external irradiation and high TSH levels [5].

The problem of the management of these nodules lies in the determination of the cancerous nodules since 5% to 10% of the nodules are cancerous. The specification of the histological type guides the rest of the management, which involves surgery, supplemented as appropriate by radioactive iodine or chemotherapy or outright target therapies.

In the DRC, data on thyroid pathologies are relative and fragmentary [6]; thyroid cancer is relatively uncommon; it would be detected at advanced clinical stages [7]. As a result, several patients benefit from surgery for its resection, of which more than half of the thyroid nodules remain benign [8]. Hence the implementation of ultrasound classifications (TIRADS) [9] [10] to reduce the rate of unnecessary thyroid surgeries. This study has set the objective of studying the clinical, laboratory and ultrasound profile of TN operated in Kinshasa.

2. Patients and Methods

This is a cross-sectional and descriptive study that included 61 records of pa-

tients with thyroid nodules operated on at the Bibwa Initiative Plus Hospital Center (CHIP/BIBWA), at the NGALIEMA Clinic, at the Pigeon Medical-Surgical Center (CMCP) and at the Cliniques University of Kinshasa (CUK) over a period of 24 months, from June 01, 2020 to May 31, 2022. These patients had benefited from a thyroid ultrasound and an anatomopathology examination. All available records were reviewed. The sampling was exhaustive and convenient. The variables studied were those reported in the registers, namely: age, sex, biology, clinical diagnostic parameters, and ultrasound parameters.

Only cases containing all the information on the variables of interest described were retained for the final analyses. The period concerned was guided by the availability of registers in all the hospitals mentioned above.

Collection of ultrasound data

Ultrasound equipment

The ultrasound system must have: high frequency linear transducers (10 - 13 MHz) wide band, convex and sectoral (endocavity) reproducing high quality images. Doppler mode (color and pulsed) and/or elastography module. Patient in head position in hyperextension (without auricle), in dorsal decubitus.

2.1. Ultrasound Technique

Clinical information: Indication and old report, biology result (T3, T4 and TSH) Techniques themselves: basic ultrasound sections: transverse and longitudinal, study of the thyroid (3D biometry, echogenicity, echostructure, vascularization, calcification), nodular characterization (size, contours, shape; echostructure, echogenicity, calcification, perinodular halo EU-TIRADS), study of echopalpable glands & neighboring structures trachea, esophagus, jugulocarotidian vascular pedicle (compression, deviation) and study of cervical lymph nodes; search for possible cervical lymphadenopathy (short axis and pejorative ultrasound characters). The illustrations (**Figure 1** and **Figure 2**) related to the ultrasound data are those proposed by Dr. Gilles RUSS [11].

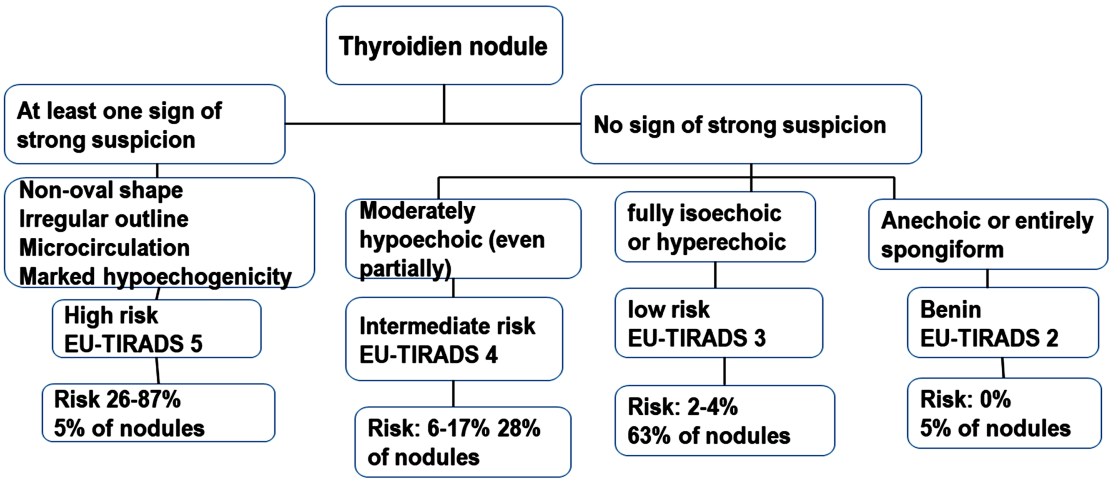

Figure 1. EU-TIRADS ultrasound score parameters.

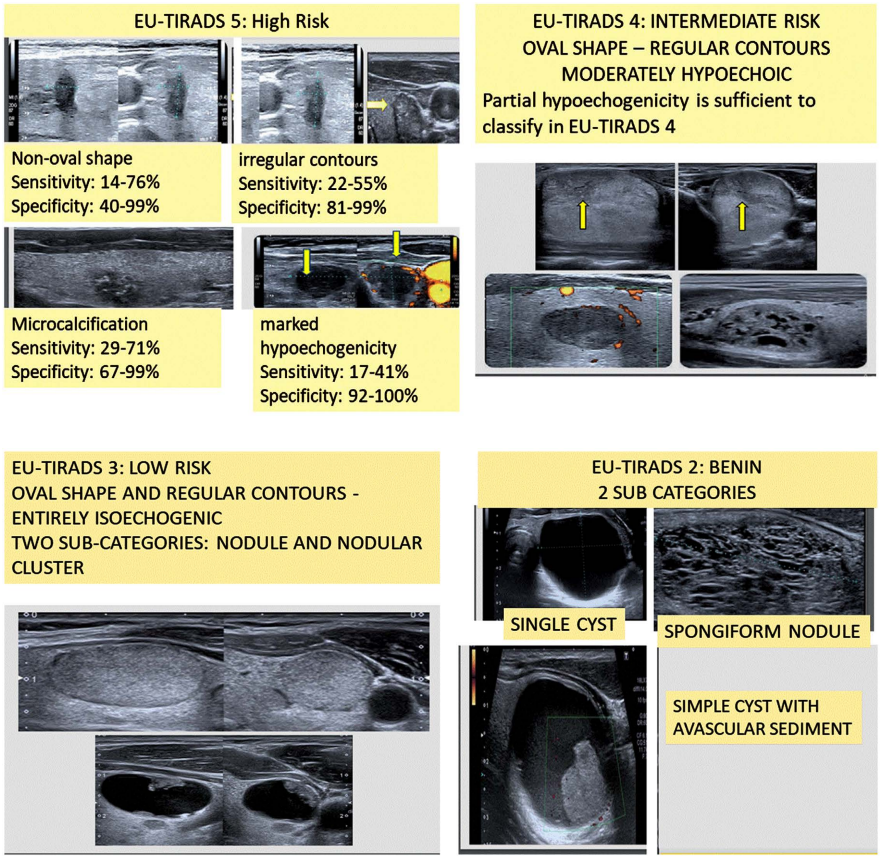

Figure 2. Ultrasound score, EU-TIRADS 2 to 5 nodule.

2.2. Collection of Histopathological Data

After excision, the surgical specimens were brought to the anatomopathology laboratory of the University Clinics of Kinshasa, the Ngaliema Clinic, CHIP (BIBWA) and the LEBOMA Anatomopathology Center of Kalamu. The reading of the slides was carried out by specialists in the field. The anatomopathological diagnosis collected was recorded in the anatomopathology registers of each laboratory mentioned above.

2.3. Statistical Analyzes

The statistical analyses of the data were carried out using Statistical Package for Social Sciences (SPSS) for Windows version 24 software. The descriptive analyses carried out are the mean and standard deviation for the quantitative data with Gaussian distribution and the absolute (n) and relative (%) frequencies for categorical data. Pearson's Chi-square or Fisher's exact test, as the case may be, was performed to compare the proportions (%). The Student's t was performed to compare the means. Logistic regression was used to search for factors associated with cancerous thyroid nodules in univariate and multivariate analysis with the calculation of OR and their 95% confidence interval to estimate the degree of association. For all the tests used, the value of $p < 0.05$ was considered as the threshold of statistical significance.

Before carrying out this study, the protocol was submitted and approved by the Ethics Committee of the School of Public Health of the University of Kinshasa Approval number: ESP/CE/078/2023. The notion of confidentiality was essential for the study, the data were collected anonymously, were only for use in writing this work.

3. Results

3.1. General Characteristics of the Study Population

The study population included 61 patients whose general characteristics are summarized in Table 1.

Table 1 reports that there was a clear female predominance (96.7%) for a sex ratio of 29.5/1. The age of the patients follows a normal distribution with the extremes ranging from 21 to 80 years. The average age of these patients was 47.4 ± 9.9 years, the age groups of 40 - 49 years and 50 - 59 years were the most found with respective frequencies of 39.3% and 27.7%. Most of the patients had a euthyroid hormonal biological status (89.3%). The average clinical score of patients was 3.4 ± 0.84 with extremes ranging from 1 to 5. The majority of patients were classified as having an intermediate risk, *i.e.* 85.2% of cases. The high risk was found in 6.6% of patients. The risk of malignancy low clinically (85.2%), sonographically (59.0%) and histopathologically (91.2%) (Table 1).

3.2. Ultrasound Characteristics of Patients

In view of this table, we note that the left thyroid lobe had a median volume of 19.5 ml, that of right thyroid lobe was 11 ml and the isthmus had a thickness of 6.5 mm. The majority of the thyroid gland had a regular outline at the left thyroid lobe (83.6%), LTD (75.4%) and isthmus (80.3%). The echostructure of the gland was mostly heterogeneous. This heterogeneity was 67.2% at the LTG level, 70.5% at the LTD level and less at the isthmic level. There is a predominance of homogeneous echostructure (50.8%). The echogenicity was mostly isoechogenic, *i.e.* 72.1% at the LTG level, 73.8% at the LTD level and 68.9% at the isthmus level (Table 2).

Most of the nodules were located at the level of the isthmus, *i.e.* 37.7% of cases. The majority of patients had more than three nodules (34.4%), the outline of the nodules was more regular (85.2%), they had a rounded shape in 11.5%, mostly isoechogenic echogenicity (62.3%) and a solid echostructure in 54.1%. A total of 57.4% of the nodules had a central vascularization and 23% presented calcifications (Table 3).

In this figure, the majority of ultrasounds performed were indicated for anterior cervical swelling (78.7%), 8.2% of ultrasounds for recurrence of cervical swelling (Figure 3).

3.3. Diagnoses Made

The majority diagnosis on thyroid ultrasound was GMHTN represented at a

Table 1. General characteristics of the study population.

Variable	n = 61	%
Mean age (year)	47.38 ± 8.8	
<40	13	21.3
40 - 49	24	39.3
50 - 59	17	27.9
≥60	7	11.5
Gender		
Female	59	96.7
Male	2	3.3
F/M ratio	29.5	
Biological profile		
Euthyroidism	53	83.9
Hyperthyroidism	7	11.5
Hypothyroidism	1	1.6
Elements constituting the clinical score		
Extreme ages < 21 and >65 years old	3	4.9
Presence of lymphadenopathy	8	13.1
Fixed nodule	22	36.1
Painless nodule	56	91.8
Male gender	2	3.3
Signs of local compression	57	93.4
Exophthalmos	2	3.3
Cervical swelling	61	100.0
Interpretation of the clinical score		
Weak	52	85.2
Intermediate	5	8.2
Pupil	4	6.6
Ultrasound score		
Weak	36	59.0
Intermediate	21	34.4
Pupil	4	6.6

Table 2. Ultrasound characteristics of the thyroid gland.

Variables	Left thyroid lobe n = 61 (%)	Rigth thyroid lobe n = 61 (%)	Isthmus n = 61 (%)
Outline			
Irregular	8 (13.1)	14 (23.0)	5 (8.2)

Continued

Regular	51 (83.6)	46 (75.4)	49 (80.3)
Unspecified	2 (3.3)	1 (1.6)	7 (11.5)
Echostructure			
Homogeneous	16 (26.2)	16 (26.2)	31 (50.8)
Heterogeneous	41 (67.2)	43 (70.5)	19 (31.1)
Unspecified	4 (6.6)	2 (3.3)	11 (18.0)
echogenicity			
Hypoechoic	6 (9.8)	6 (9.8)	5 (8.2)
Isoechogenic	44 (72.1)	45 (73.8)	42 (68.9)
Hyperechoic	5 (8.2)	4 (6.6)	4 (6.6)
Unspecified	6 (9.8)	6 (9.8)	10 (16.4)
Volume	19.5 (6.0 - 47.0)	11.0 (6.0 - 31.5)	6.5 (4.0 - 8.0)

Table 3. Ultrasound characteristics of thyroid nodules.

Variables	Effectif (n = 61)	Percentage
Topography		
Right unilobal	11	18.0
Left unilobar	13	21.3
Isthmus	23	37.7
Bilobar	14	23.0
Nodule number		
1	21	34.4
2	19	31.1
≥3	21	34.4
Outlines		
Irregular	9	14.8
Regular	52	85.2
Form		
Oval	54	88.5
Rounded	7	11.5
Echogenicity		
Hypoechoic	12	19.7
Isoechogenic	38	62.3
Hyperechoic	11	18.0

Continued

Echostructure		
Solid	33	54.1
Liquid	3	4.9
Mixed	25	41.0
Vascularization		
Central	35	57.4
Others	26	42.6
Calcifications		
No	47	77.0
Yes	14	23.0

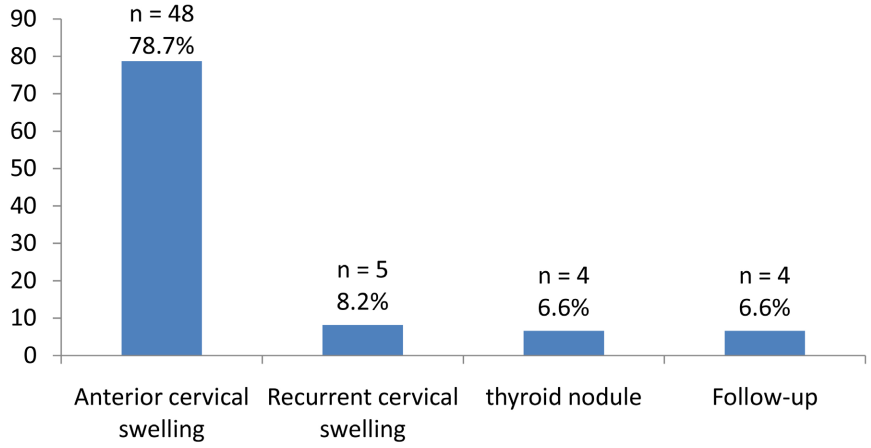

Figure 3. Distribution of patients according to ultrasound indications.

frequency of 55.7%, followed by thyroid nodules at 21.3% nodular 19.7% (**Table 4**)

3.4. EU-TIRADS Score (Risk of NT Ultrasound Malignancy)

After stratification of the nodules according to the EU-TIRADS score, the majority of the patients were classified at stage 3 and 4 respectively with a frequency of 47.5% and 34.4% (**Figure 4**).

4. Discussion

In our series, the majority of patients were women with a sex ratio of 1H/30F. The female sex is always very represented in thyroid pathology. The hormonal hypothesis [12], the drop in immunity during pregnancy, beta HCG during pregnancy acting on the same receptor with TSH and the stress suffered by women during pregnancy and in all events of genital life can justify a preponderance of the female sex in the thyroid pathology. This trend was observed in our study with 96.7%, these results are similar to those found in several African series [13] [14] and also in Western series [15] [16].

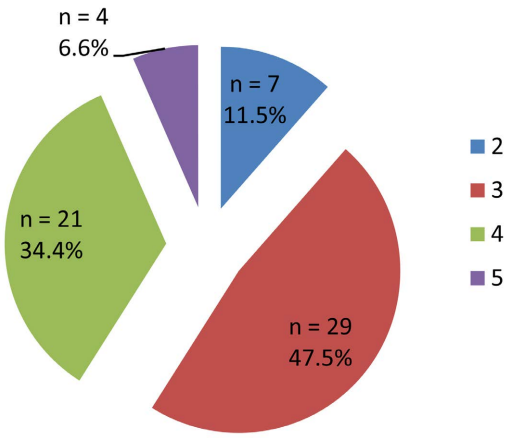

Figure 4. Distribution of thyroid nodules according to the EU-TIRADS score.

Table 4. Distribution of patients according to ultrasound diagnoses.

Ultrasound diagnosis	Effectif	Percentage
GMHTN	34	55.7
Cystic goiter	2	3.3
Nodular goiter	12	19.7
Thyroid nodule	13	21.3
Total	61	100.0

Age influences the occurrence of thyroid nodules and even malignant degeneration [15] [16]. In our study, the average age of patients with nodules is 47.4 ± 9.9 years. Our average age is within the limits of those found by several African authors who found an average age around 44 ± 3 years [13] [14]. With regard to age groups, a peak was observed, that of 40 - 49 years. In the literature and especially in Africa, nodular thyroid pathology and even thyroid cancer are pathologies that are frequent around the age of 40 [13] [14].

This series found: 4.9% Graves' exophthalmos, 50% dyspnoea; 47.5% dysphagia, 8.2% dysphonia and 8.2% NT with intrathoracic plunging character. Other authors may have shown these signs in their series. But the presence of these three compressive signs, namely dysphonia, dysphagia and dyspnea, would only be related to malignancy when there is not only compression but also infiltration of neighboring organs [17]. The plunging character would explain the seriousness of these NT whose endothoracic extensions dangerously compressed the esophagus, the trachea with corollary an asphyxia syndrome requiring emergency tracheal intubation. NTs rarely disturb thyroid function apart from toxic and hyperfunctional nodules; this was confirmed by our study. The clear predominance of patients with euthyroidism could be explained by the normal hormonal balance sought by surgeons by administering a synthetic antithyroid drug (carbimazol) before planning the operation. Normal thyroid function; a state of euthyroidism concomitant with the development of NT was also found

in proportions of 89% - 93.3% in the studies by Bukasa *et al.* [7] and Mighri *et al.* [18].

EU-TI.RADS score and risk criteria for thyroid nodule malignancy

In our series, the practitioner used more the terminology regular contours, well circumscribed or limited against or irregular, badly limited or badly circumscribed. The fuzzy contours were not mentioned by the practitioners. Gilles Russ *et al.* [19] believe that the irregular nodular contour is a criterion of malignancy. In our series, the EU-TIRADS score retained 25 NT at risk of malignancy, including 9 with irregular contours and 16 with regular contours. But after histological analysis confirmed only five malignant NT. Nodular delimitation can be difficult when the NT is isoechogenic to the glandular segment where it sits. Thus, color Doppler vascularization will help to make the demarcation by the peripheral vascular corbelling of the NT [20].

The hypoechoic nature is strongly pejorative suggestive of all criteria of malignancy [19]. Contradictory results exist in the literature. This difference in the figures, which is sometimes too significant, would be due; to the fact that the thyroid ultrasounds were performed by several people with different sampling criteria for the population studied.

Nodular calcifications constitute a criterion of nodular malignancy. There is both a plurality of sonographers and descriptions; we found a multiplicity of terminology (micro or macro calcifications, dusty calcifications, central, mixed, diffuse, popcorn, peripheral, linear, hyper echogenic punctuations) whose exploitation was difficult. Thus we simply reported the presence or absence of nodular calcification in this study. We found only 14 calcifications associated with the risk of EU-TIRADS malignancy. Confusion would exist between micro calcifications with comet-tail artifact, microcysts which are sometimes a source of false positives; misinterpreted as papillary microcancers.

The rounded, non-oval shape (*i.e.* higher than wide, higher than long) is retained as a criterion for malignancy [21]. In our series, we found 7 rounded NT representing a risk of malignancy assessed at 28%. Our results are not in line with Roussanka D *et al.* [22] found a much higher rate of malignancy, 51.5% of malignant NT (non-oval shape) out of a total of 103 rounded NT after histological confirmation.

Nodular echostructure: in our series, we found 54.1% nothy solids, 41% mixed and 4.9% liquid. 14 (56%) mixed NT versus 11 (44%) solid NT were associated with elevated risk of EU-TIRADS malignancy for a statistically significant p of 0.061. On the other hand, no liquid NT was. These results are similar to those of Roussanka D *et al.* [22] who found no risk of malignancy among cystic NT; 30.6% for NT EU-TIRADS 5. These authors affirm that it would then be useless to recommend a diagnostic cytopuncture for this category of cystic NT without other ultrasound malignancy characteristics, Coulibaly Ali [23] in Ivory Coast found the same proportion for solid NTs (54.4%) but very different compared to mixed NTs (28.8%) and 16.8% for liquids. However, evacuating cytopuncture could well be considered in the event of rapid growth with the risk of compres-

sion phenomena.

Distribution of NT according to the EU-TIRADS score

In our series, it was noted a high number of patients classified at stage 3 and 4 of EU-TIRADS. The figures related to EU-TIRADS mapping found in this study and others [7] [23] are very different and sometimes contradictory; this could be explained by the sampling techniques used recognized population already sick at the start or a population referred for a cervical ultrasound for a pathology other than thyroid in which the NT was discovered by chance, the equipment used (type of probes) as well as the level of training of the sonographer, unfortunately in our developing countries there is not yet a diploma training course in thyroidology required to do thyroid diploma in thyroidology, each one making prevail his own acquired experience and the type of population (white, black, North African) with totally different genetic conditions [19].

Despite the cross-sectional nature of the study constituting a limit in this study due to the lack of certain variables to assess the characters of thyroid nodules, this study, which is a first in the DRC, reports a better appreciation of the clinical characteristics of the nodules, the progress of the he paraclinical exploration and above all the generalization of anatomopathological analysis will make it possible to better detect cancers in order to reduce their morbidity and avoid useless interventions sometimes with heavy consequences.

5. Conclusion

Thyroid nodules are frequent in our series. The proportion of cancerous nodules is significant compared to the other series. It is important to do an ultrasound to already predict the malignancy of the nodule before doing the pathology examination.

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Conflicts of Interest

The authors declare no conflict of interest.

Author's Contributions

JMK and ANN designed and analyzed the statistical data for the study. JNK, SFB, DTM, JBL, JABB, EMM, RVM, OEM, HYK, ESM, AMK, CMK, FNK, FZK, CBM, MTL and JTM supervised the study. All authors have read and approved the final and revised version of the manuscript.

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