International Journal of Biomedical and Advance Research
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: https://doi.org/10.7439/ijbar
CODEN: IJBABN

Original Research Article

Evaluation of the prescription of the thyroid function tests delivered in Paraclinical Training and Biochemistry Research Unit of the Joseph Ravoahangy Andrianavalona University Hospital Center

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Abstract

Objectives: The purpose of this work is to determine the pertinence of the prescriptions of thyroid tests sent to the Paraclinical Training and Biochemistry Research Unit of The Joseph Ravoahangy Andrianavalona University Hospital Center in order to bring out dysthyroidism.

Results: During the study period 94 prescriptions of thyroid test were received. The average age being 43, 8 ± 17.7 years old and there was rather a female predominance in our population study (sex – ratio 0.22). Ninety – one files (it means 96.8%) included a request of TSH dosage. 38.4% (36 files) included only a TSH dosage, and 58.4% included a request of simultaneous TSH dosage with one or two thyroid hormones. 23.4% were including TSH with FT4, 2.1% with FT3 and 33.0% of simultaneous dosage of the three hormones. Three prescriptions (3.2%) asked for a thyroid hormones dosage only without preliminary TSH dosage. Among the 55 prescriptions (58.4%) requesting a simultaneous TSH dosage of one or two thyroid hormones, we found 9 cases (16.4%) of TSH pathological values. So, there were only 16.4% of cases where thyroid hormone dosage was essential to highlight a thyroid dysfunction. The presence of goiter was the reason for the most frequent prescription.

Discussion and conclusion: There was too much dosage of thyroid hormone as a first- line treatment. Its prescription should be adapted to the actual recommendation in order to avoid the generated extra cost for the patients.

Keywords: Thyroid function tests, FT3, FT4, TSH, prescription.

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***Article History:**
Received: 20/02/2019
Revised: 10/03/2019
Accepted: 10/03/2019
DOI: https://doi.org/10.7439/ijbar.v10i4.5103

QR Code

How to cite: Rakotonindrina, F., Ranaivosoa, M. K., Razanadrakoto, I., Razanakolona, L. R. S., Rakoto Alson, A. O., & Rasamindrakotroka, A. Evaluation of the prescription of the thyroid function tests delivered in Paraclinical Training and Biochemistry Research Unit of the Joseph Ravoahangy Andrianavalona University Hospital Center. *International Journal of Biomedical and Advance Research* 2019; 10(4): e5103. Doi: 10.7439/ijbar.v10i3.5103
Available from: https://ssjournals.com/index.php/ijbar/article/view/5103

1. Introduction

The biological exploration of the thyroid function test is carried to complement the clinical examination. It allows not only to confirm and to quantify the eu-, hypo- and hyperthyroidism situations but also to help the etiological investigation in order to clarify the auto immune, iatrogenic and genetic origin of the affection; and finally, to conduct the dysfunction or the tumor pathology surveillance [1]. It essentially consists of TSH dosage which can be completed by the dose of the thyroid hormones free fractions such as free thyroxine (FT4) and / or free triiodothyronine (FT3). These analyses of hormone level are frequently prescribed at the Paraclinical Training and Biochemistry Research Unit of the Joseph Ravoahangy

Andrianavalona University Hospital Center (UPTR- JRA UHC) inspite of the upper cost of the analysis that patients must pay. The purpose of this work is to determine the pertinence of the prescriptions of thyroid tests sent to the UPTR-JRA UHC in order to bring out dysthyroidism for rationalizing the prescription of thyroid hormones dosage.

2. Materials and methods

It is a descriptive retrospective and analytic study within a period of 12 months, from January 1st 2017 to December 31st 2017, at the UPTR-JRA UHC. All the files including a request of TSH dosage and / or the thyroid hormone (FT4 and / or FT3) have been performed. No file was excluded. The studied variables were the age, the gender, the prescribing service, the clinical information and the results of the dosage of TSH, of FT4 and of FT3. We used the request files of the analysis, VIDAS® and the results records of TSH, FT4 and FT3. The data were recorded on Epi Info 7 and the statistical analysis was done on R 3.0. Non-parametric tests, Spearman correlation for the study of the relation between two quantitative variables, Wilcoxon test range to study the relation between a qualitative variable and a quantitative one has been used.

For each patient, 4 to 5mL of venous blood was sampled on a lithium heparin tube, forwarded to the laboratory in less than 2 hours, and then centrifuged at 3500prm for 10 minutes. The analysis of the plasma was done on VIDAS® using the ELFA technique (Enzyme Linked Fluorescent Assay). For TSH dosage, a third generation VIDAS®TSH kit was used with a detection limit of 0.05µUI /mL. The dosing principle combined a sandwich enzyme immunoassay method in one step to final fluoride detection. The reference values used by the laboratory were 9.0 – 20.0pmol/L for FT4, and 4.0 – 8.3 pmol/L for FT3. All the values outside these limits were considered as pathological ones.

3. Results

3.1 Origin and characteristics of the study population

During the study period 94 prescriptions of thyroid test were received at the UPTR-JRA-UHC and among them 54 external requests (57.4%) and 40 internal patients (42.5%), mainly from the medicine departments such as neuropsychiatric (20%), endocrinology (10%), cardiology (10%) and oncology (10%) services. (Figure 1)

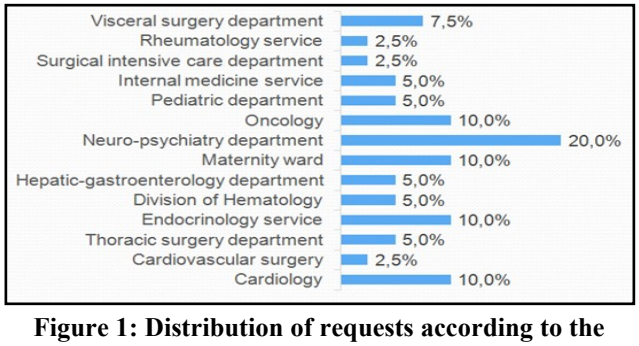

Figure 1: Distribution of requests according to the prescribing service for inpatient (n=40)

The age of the patients ranged from 1 to 78 years old, the average age being 43.8±17.7 years old and there be rather a female predominance in our population study; women: 82% and men: 18% (sex – ratio 0.22).

3.2 Prescription of the thyroid test

Ninety – one files (it means 96.8%) included a request of TSH dosage. 38.3% included only a TSH dosage, and 58.4% included a request of simultaneous TSH dosage with one or two thyroid hormones. 23.4% were including TSH with FT4, 2.1% with FT3 and 32.9% of simultaneous dosage of the three hormones. Three prescriptions (3.2%) asked for a thyroid hormones dosage only without preliminary TSH dosage (Table 1).

Table 1: Thyroid test prescribed at the Laboratory of Biochemistry of Ravoahangy Andrianavalona

Prescriptions	Numbers (n)	Percentage (%)
TSH	36	38,3
TSH + FT4	22	23,4
TSH + FT3	2	2,1
TSH + FT4 +FT3	31	33.0
FT4 + FT3	3	3.2
Total	94	100

3.3 The reasons for the prescriptions

The reasons for the prescriptions were much diversified. The presence of goitre was mentioned in 11.7%, and palpitation in 6.4% of the prescriptions. Eight requests (8.5%) were prescribed for non definite test, and 3 cases (3.2%) for control (Figure 2). For the 3 requests of thyroid hormone dosage without preliminary TSH, the reason of the prescription was the presence of the goitre in 2 cases and the other case was prescribed for a non definite test. We did not receive any information about eventual treatment of the patients.

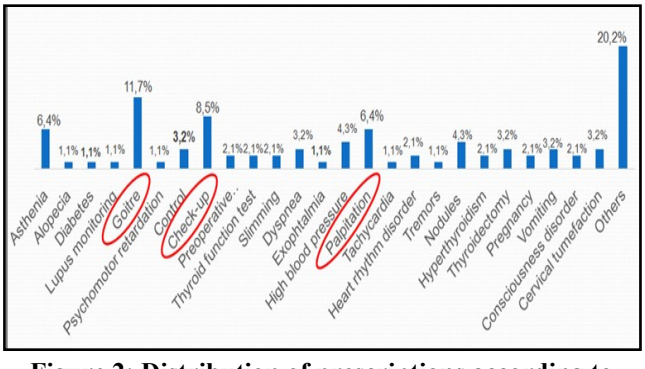

Figure 2: Distribution of prescriptions according to clinical information (n=94)

3.4 The results of hormone dosages

TSH ranged from<0.05 to 53.22 µUI/mL. It was normal in 75.8%, reduced in 14.3% and increased in 9.9% of the dosages (Figure 3,4). Among the 31 prescriptions requesting a simultaneous dosage of the three hormones (TSH, FT4 and FT3), there were 2 high pathologic values of TSH associated to low pathologic values of FT4 corresponding to a proved hypothyroidism. Two cases of high TSH have been associated to a low value of FT3 but

the FT4 of which has been in normal limits, it may correspond to a mild hypothyroidism. There was only one case where the 3 values fit with the proved hyperthyroidism (7µUI / TSH <mL, FT4< 9pmol /L and FT3< 4.0pmol / L). Among the prescriptions requesting a simultaneous dosage of TSH with FT4 there were 7 cases (7.4%) of hyperthyroidism: 5 were proved and 2 were mild, and 1 case of proved hypothyroidism. Among the 3 prescriptions requesting TSH dosage with FT3, there was 1 case where the TSH value was too much low (0.07 µUI / mL) leading to a suspicious thyroidism, but the FT3 value of which was also too low (2.2 pmol / L) (Table 2).

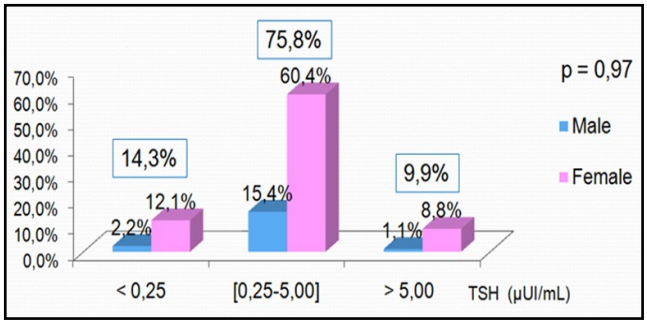

Figure 3: Distribution of the patients according to the TSH value and the ender (n=94)

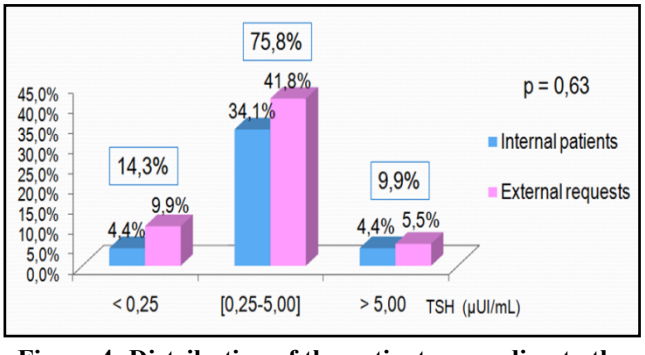

Figure 4: Distribution of the patients according to the TSH value and where the prescription comes from (n=94)

Table 2: Pathological values of TSH among simultaneous dosages of TSH ± FT4 ± FT3 (n=55)

	TSH<0,25 µUI/mL	TSH>5,00 µUI/mL
FT4<9,0 pmol/L	0	**2**
9,0≤FT4≤20,0 pmol/L	2	4
FT4>20,0 pmol/L	**5**	0
FT3<4,0 pmol/L	1	**3**
4,0≤FT3≤8,3 pmol/L	0	1
FT3>8,3 pmol/L	0	0
FT4<9,0 & FT3<4,0 pmol/L	0	**1**
FT4>20 & FT3>8,3 pmol/L	0	0

On the whole, there were 23.4% (22 cases) of thyroid dysfunction revealed by the TSH dosage: 14.9% (14 cases) among the prescriptions requesting a simultaneous dosage of TSH with one or both thyroid hormones. For the 3 prescriptions without TSH dosage, the thyroid hormones were becoming normal (3.2%).

3.5 Factors associated to TSH variations

The TSH pathologic values were mainly observed on patients over 40 (Figure 5), but the difference was not significant (p=0.69, Spearman correlation). A feminine predominance for TSH pathologic values was also observed but it was not significant (p=0.97) (Figure 3). The TSH did not change according to whether outpatients or inpatients were concerned (p= 0.63) (Figure 4). We have found only one low pathologic TSH value (TSH=0.22 µUI / mL) among the goitre sufferers and only one value over 5.00 µUI / mL) among the patients having palpitation.

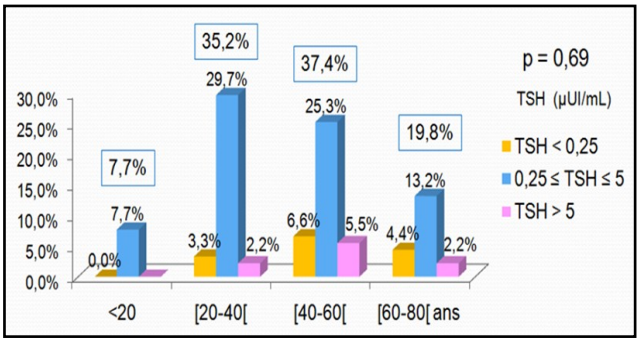

Figure 5: Distribution of the patients according to age and the TSH value (n=94)

4. Discussion

4.1 According to the age

The average age was 43.8 years old so our patients seemed younger than those of other authors [4-7]. The pathologic TSH values frequency on patients over 40 that we have found fit to the data mentioned in the literature. It would seem that the incidence of thyroid dysfunction increased with the age, it explained why many population studies on thyroid pathology lead on people over 40 were interesting [6-9]. Perturbations of thyroid biology were frequent on elder people. They were generally secondary to inter current diseases and drug interactions mainly on elder inpatients. There were anatomical and physiological changes of the thyroid gland. With aging the relative fibrosis thyroid tissue associated to cellular lymphomonocyticin filtrate and follicle atrophy. The presence of micro- and macronodules are usual and the microscopic cancers (occult) were more frequent [10]. We did not find any significant link between TSH and the age in our study.

4.2 According to the gender

For the prescription of thyroid test, feminine predominance was observed in our study and so was in Fabris' (women: 74% and men: 23%) [4]. This predominance of the thyroid test prescription on women could be explained by the frequency of thyroid dysfunction among feminine gender, which was also considered as a risk factor [4,8,11]. But in our study we did not find any significant link. From literature, thyroid pathologies are frequent in women of procreative age, mainly in pregnant women because thyroid balance is modified by the

metabolic and hormonal changes which are inherent to pregnancy. These changes concern iodine metabolism, the proteins of thyroid hormone transport, and the effect of chorionic gonadotropin (hCG) on the thyroid stimulating axis. In fact, the structural homology between the sub-units β of TSH and hCG, as well as between their receptors confer on the homology a low thyroid stimulating action [12].

4.3 According to the prescription

- Among the 55 prescriptions (58.4%) requesting a simultaneous TSH dosage of one or two thyroid hormones, we found 9 cases (16.4%) of TSH pathological values. So, there were only 16.4% of cases where thyroid hormone dosage was essential to highlight a thyroid dysfunction. In most of the cases thyroid hormones dosage was not necessary.

Thyroid hormones were worse than TSH for monitoring thyroid dysfunction. You must know that the relationship between the TSH plasma concentration and free thyroid hormones (FT4 and FT3) concentration is not linear but algorithmic. Otherwise, a low level of variability of TF4 will be accompanied by a significant change of TSH levels. Therefore TSH is the most sensitive parameter to detect a thyroid dysfunction [11].

4.4 According to HAS recommendation in 2014 [13,14] :

- The isolated dosage of TSH, in first-line, is a sufficient supply for the diagnosis and monitoring of thyroid dysfunction in almost all cases.

FT4 dosage is limited:

- to the 2 to 3 first months of hyperthyroidism treatment then to the monitoring of hyperthyroidism by exclusively anti-thyroid of synthesis drugs (ATS)
- to the initial monitoring of patients on replacement therapy by thyroxin as the TSH is increased
- to unusual situations where pituitary or hypothalamic level is suspected

FT3 dosage prescription must be exceptional.

In our study, there were 58.4% of excessive prescriptions of thyroid hormone dosage in first-line and 3.2% of non recommended prescriptions, and only 38.3% of the prescriptions followed the recommendations. The upper cost of thyroid hormone dosage would have been avoided if the prescriptions fit to the actual recommendations. In France, Kasonga *et al*. found 12.5% of prescriptions which did not follow the recommendations of the HAS at Rouen UHC in 2017. Most of the prescriptions (75, 5%) were received from consultation department or day hospital. The main cause of these non recommended prescriptions was the realization of complete thyroid test for commodity reasons [15]. But in our case it might have been an ignorance of prescriptions recommendations by the clinicians.

5. Conclusion

The number of thyroid hormone dosage in first-line in our country is still important. The adaptation of the prescriptions to the actual recommendations could avoid the extra cost of unnecessary dosages for patients, most of them did not have a life insurance. The elaboration of good practices for the medical tests prescriptions would help the clinicians to update their knowledge. A clinical-biological consultation is always as a rule for a better medical care of the patients.

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