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Original article

Prevalence and characteristics of thyroid disorders in a Senegalese population: a retrospective study in the suburbs of Dakar, Senegal

Prévalence et caractéristiques des dysthyroïdies dans une population sénégalaise : étude rétrospective dans la banlieue dakaroise au Sénégal

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Résumé

Introduction : Les dysthyroïdies représentent l'un des troubles endocriniens les plus fréquents. Leur diagnostic repose sur la combinaison de signes cliniques et biologiques, les tests hormonaux jouant un rôle central. L'objectif de cette étude était d'évaluer la prévalence des dysthyroïdies dans une population consultant dans une structure de santé périphérique dakaroise.

Méthodologie : Il s'agit d'une étude rétrospective descriptive et analytique menée du 11 avril 2023 au 12 avril 2024, incluant 268 patients âgés de 8 à 88 ans ayant bénéficié d'un dosage hormonal (TSH, T3, T4, TRAK et Ac-TPO). Les analyses ont été réalisées par méthodes immunologiques et chimioluminescence sur l'automate MAGLUMI 600.

Résultats : L'échantillon comprenait de 216 femmes et de 52 hommes, avec un âge moyen de 39,9 ± 16,51 (extrêmes : 8 à 88 ans). La prévalence des dysthyroïdies était de 34,89%. L'hyperthyroïdie représentait 21,39% des cas et l'hypothyroïdie 13,5%. Parmi les étiologies auto-immunes, la maladie de Basedow représentait 7% et la maladie de Hashimoto 1,39%. Une prédominance féminine et une fréquence accrue dans la tranche d'âge 20-40 ans ont été observées.

Conclusion : Les dysthyroïdies sont fréquentes dans notre population, dominées par l'hyperthyroïdie et marquées par une nette prédominance féminine. Leur détection précoce demeure essentielle pour réduire la morbidité associée.

Mots-clés : Dysthyroïdies, prévalence, facteurs démographiques, banlieue, Dakar, Sénégal.

Abstract

Introduction: Thyroid disorders are among the most common endocrine disorders. Their diagnosis relies on a combination of clinical and biological signs, with hormonal tests playing a central role. The objective of this study was to evaluate the prevalence of thyroid disorders in a population attending a peripheral health facility in Dakar.

Methodology: This was a retrospective descriptive and analytical study conducted from April 11,

2023, to April 12, 2024, including 268 patients aged 8 to 88 years who underwent hormone testing (TSH, T3, T4, TRAK, and TPO antibodies). Analyses were performed using immunological and chemiluminescence methods on the MAGLUMI 600 analyzer.

Results: The sample comprised 216 women and 52 men, with a mean age of 39.9 ± 16.51 years (range: 8 to 88 years). The prevalence of thyroid dysfunction was 34.89%. Hyperthyroidism accounted for 21.39% of cases and hypothyroidism for 13.5%. Among the autoimmune etiologies, Graves' disease represented 7% and Hashimoto's disease 1.39%. A female predominance and a higher frequency in the 20-40 age group were observed.

Conclusion: Thyroid disorders are common in our population, predominantly hyperthyroidism and with a marked female predominance. Early detection remains essential to reduce associated morbidity.

Keywords: Thyroid disorders, prevalence, demographic factors, suburbs, Dakar, Senegal.

Introduction

Thyroid disorders encompass a range of thyroid dysfunctions, primarily including hypothyroidism and hyperthyroidism. [1. They constitute one of the most frequent endocrine disorders, with a prevalence]that varies according to the regions of the world and the demographic, nutritional, and environmental characteristics of the populations studied. Their diagnosis is based on the correlation between sometimes nonspecific clinical manifestations and abnormalities in hormone levels, which represent the reference criterion.

In low- and middle-income countries, particularly in sub-Saharan Africa, epidemiological data on thyroid disorders remain limited. In Senegal, most available studies focus on referral hospitals, while peripheral health facilities, which are more representative of the general population, are rarely documented. This gap limits our understanding of the true burden of the disease and the planning of screening and management strategies.

The objective of this study was to assess the prevalence of thyroid disorders in a population consulting at a public health center on the outskirts of Dakar, and to describe their main biological characteristics.

Methodology

- *Type and framework of the study*

This is a retrospective descriptive study conducted over a 12-month period, from April 11, 2023 to April 12, 2024. The study was carried out using data collected from the records of the laboratory of the NABIL CHOUCAIR health center, located in the suburbs of Dakar.

- *Study population*

We included all patients who had undergone thyroid hormone testing, whether they had a known diagnosis or not.

Patients who had not undergone at least one complete thyroid hormone test were excluded.

- *Data collection*

The various epidemiological (age, sex) and biochemical (TSHus , T4L, T3L, Anti-ThyroPeroxidase (TPO) antibodies, anti-TSH receptor (TRAK) antibodies) data were taken into account.

- *Statistical analysis*

The data thus collected were entered using Excel 2016 software and then analyzed using Statistical Package for the Social Science (SPSS 2024) and Excel software.

- Quantitative variables were described using mean, frequencies, standard deviation, and extreme values.
- Qualitative variables were presented in the form of counts and percentages.
- Comparisons were made using Student 's t-test with a significance threshold of $P < 0.05$.

- *Ethical considerations*

This study posed no risk to the participants. Anonymity and confidentiality were strictly maintained throughout its execution. Only members of the research team had access to participant information. The study was approved by the Ethics Committee of the Nabil Choucair Health Center before its commencement.

Results

Population distribution according to epidemiological parameters

- *Let's divide according to age :*

In our study population, the mean age of patients was 39.9 ± 16.51 years, with extremes ranging from 8 to 88 years.

The most represented age group was 20 to 40 years, accounting for 53.36% of patients. This was followed by the 40 to 60 age group, representing 23.63%. Patients aged 60 to 80 years constituted 14.93% of the total, while those aged 5 to 20 years represented 6.3%. Finally, the 80 to 100 age group was the least represented, with only 0.75% of the study population.

- *Let's divide according to gender*

Our study included a total of 268 patients.

Among them, 216 were women (80.60%) and 52 were men (19.40%), reflecting a clear female predominance in the studied population.

Characteristics of the population according to thyroid function test parameters

(TSHus , T4L, T3L).

- *TSH*

A total of 250 patients underwent TSH testing. The mean observed was 3.65 ± 11 mIU /L, with extreme values ranging from 0.001 to 95.1 mIU /L.

- *T4L*

Free T4 (FT4) levels were measured in 236 patients. The mean was 19.91 ± 17.76 pmol /L, with values ranging from 0.001 to 120 pmol /L.

- *T3L*

Finally, T3L levels were measured in 21 patients. The mean was 9.67 ± 13.12 pmol /L with a minimum of 0.92 pmol /L and a maximum of 46 pmol /L.

Variation in thyroid function tests according to age

- *Regarding TSH*, it is most frequently measured in patients in the 20-40 age group (53.6%), followed by the 40-60 age group (23.6%). Next comes the 60-80 age group (16%), followed by the 0-20 age group (6%), and finally the 80-100 age group with a percentage of 0.8%.
- *The T4L rate* is highest in the 20-40 age group (54.66%), followed by the 40-60 age group (24.15%). Next comes the 60-80 age group (14.83%), followed by the 0-20 age group (5.93%), and finally the 80-100 age group with a percentage of 0.42%.
- *The prevalence of T3L* is highest in the 20-40 age group (57.14%), followed by the 40-60 age group (23.8%). Next is the 60-80 age group (9.52%), followed by the 0-20 and 0-29 age groups, each with a percentage of 9.52%. The 80-100 age group is not represented.

Interpretation:

Among the patients who underwent thyroid testing, 80% were aged between 20 and 60 years old.

Variation in the different parameters of the thyroid assessment according to sex

In our population, the mean TSH level was higher in men (8.80 ± 17.48) than in women (3.03 ± 8.91). Regarding free T4 (FT4), the mean values observed were 18.61 ± 20.08 in men and 20.20 ± 17.25 in women, with no significant difference between the two sexes. In contrast, free T3 (FT3) was approximately three times higher in women (11.23 ± 14.17) compared to men (3.03 ± 1.72).

Statistical analysis shows that the p-value obtained for the comparison of the means of T3L (0.01) is less than the significance threshold set at 0.05. We can therefore conclude that there is a statistically significant difference between the T3L values according to sex.

Distribution of thyroid disorders in the population

Analysis of the collected data shows that the highest proportion concerns subjects with normal thyroid function (53.48%). Hyperthyroidism occupies the second position with 21.39%, followed by hypothyroidism (13.5%). Finally, euthyroidism represents 11.62% of the studied population.

Variation in thyroid dysfunction according to age

Analysis of the results reveals that normal thyroid function is predominantly found in the 20-40 age group (52.17%). Hypothyroidism is more evenly distributed, with a predominance in the 40-60 age group (34.48%), followed by the 20-40 and over-60 age groups, each representing 31.03%. Hyperthyroidism is mainly observed in patients aged 20-40 (69.57%), then in the 40-60 age group (23.91%). Finally, euthyroidism is common in the 20-40 age group (56%).

In summary, these data show that the majority of thyroid disorders affect patients aged 20 to 60 years, which corresponds to the most represented population in our study.

Distribution of dysthyroidism and euthyroidism according to sex

In patients with hyperthyroidism, the mean TSH level is 0.03 ± 0.07 in women and 0.015 ± 0.03 in men . In the euthyroid group , the mean TSH level is slightly higher in women (1.38 ± 2.5) than in men (1.18 ± 0.95). In patients with hypothyroidism, TSH is higher in men (34.29 ± 24.41) than in women (20.39 ± 20.68). However, statistical analysis shows that all p-values obtained are greater than the significance threshold of 0.05. Thus, no statistically significant difference was observed between the means of thyroid parameters and sex.

Prevalence of Graves' disease and Hashimoto's thyroiditis

- TSH receptor antibodies and anti-thyroperoxidase antibodies in the population

Among the 15 patients who underwent TSH receptor (TRAK) testing, the average was 16 ±11.65 IU/L with values ranging from 2 to 40 IU/L.

Anti-thyroperoxidase (anti-TPO) antibody levels were measured in 4 patients, 3 of whom had values above normal (> 35 IU/ mL) . The mean anti-TPO level was 189.3 ± 8 IU/ mL , with values ranging from 180 to 197 IU/ mL .

Prevalence of Graves' disease and Hashimoto's thyroiditis in hyper and hypothyroidism

According to the data collected, Graves' disease represented 32.61% of Graves' disease cases, while Hashimoto's thyroiditis represented 10.34% of hypothyroidism cases.

Distribution of Graves' and Hashimoto's diseases in thyroid disorders

The prevalence of Graves' disease represents 20% of thyroid disorders, while Hashimoto's disease represents only 4%.

Prevalence of thyroid disorders in our population

Within our study population, the overall prevalence of thyroid disorders was 34.89 %. Among these, Graves' disease represented 7% of cases, while Hashimoto's thyroiditis represented 1.39 %.

Distribution of Graves' disease and Hashimoto's disease according to sex

In our sample, 80% of patients with Graves' disease were women and 20% were men. For Hashimoto's thyroiditis, all patients were women (100%). These results suggest a marked predominance of the female sex for these two conditions, with women being approximately four times more affected than men.

Distribution of Graves' disease and Hashimoto's disease according to age

In our sample, Graves' disease predominantly affects patients between 20 and 60 years old, representing over 90% of cases. Hashimoto's thyroiditis, on the other hand, affects only patients between 40 and 60 years old. These results suggest that both conditions mainly manifest within these age groups.

Table I: Distribution of the different biochemical parameters

Parameters	Number	Minimum	Maximum	Average	Standard deviation
TSH	250.0	.001	95.10	3.65	11.009
T4	236.0	.001	120.00	19.91	17.76
T3	21.0	.92	46.00	9.67	13.12

Table II: Frequencies of the different parameters according to age

Age group	Parameters (%)		
	TSH US	T4	T3
[0 to 20[	6	5.93	9.52
[20 to 40[	53.6	54.66	57.14
[40 to 60[	23.6	24.15	23.8
[60 to 80[	16	14.83	9.52
[80 to 100]	0.8	0.42	0
Total	100	100	100

Table III: Distribution of thyroid function tests according to age and sex

Setting	Sex	Average	Standard deviation	P-value
TSH us	Man	8.80	17.48	0.09
	Women	3.03	8.91	
T4	Man	18.61	20.08	0.31
	Women	20.20	17.25	
T3	Man	3.03	1.72	0.01

Table IV: Distribution of thyroid disorders by sex

Thyroid disorder	Sex		P value
	Women	Man	
Hyperthyroidism	0.03 (0.07)	0.015 (0.03)	0.21
Euthyroid	1.38 (2.5)	1.18 (0.95)	0.34
Hypothyroidism	20.39 (20.68)	34.29 (24.41)	0.17

Table V: Distribution of TPO and ac-rTSH in the population

Dysthyroidis	Average	Maximum	Minimum
TRAK	16	40	2
Ac anti-TPO	189.3	197	180

Table VI: Prevalence of Graves' disease and Hashimoto's thyroiditis in hyper- and hypothyroidism

	Effective	Frequency
Hyperthyroidism		
Graves' disease	15	32.61%
Other hyperthyroidism	46	67.39%
Hypothyroidism		
Hashimoto's disease	3	10.34%
Other hypothyroidism	29	89.66%

Table VII: Prevalence of Graves' disease and Hashimoto's thyroiditis in thyroid disorders

Dysthyroidies	Effective	Frequencies
Hashimoto's disease	3	4%
Graves' disease	15	20%
Other Thyroid Dysfunctions	57	76%
TOTAL	75	100%

Table VIII: Distribution of Graves' disease and Hashimoto's disease according to sex.

	SEX				P-value
	Man		Women		
	Effective	Frequency	Effective	Frequency	
Graves' disease	3	20%	12	80%	0.32
Hashimoto's disease	0	0%	3	100%	

Table IX: Distribution table of Graves' disease and Hashimoto's disease according to age group

Line labels	Graves' disease		Hashimoto's disease	
T1	1	6.67%	0	0%
T2	8	53.33%	0	0%
T3	6	40%		100%
T4	0	0%	0	0%
T5	0	0%	0	0%
Total	15.00	100	3.00	100

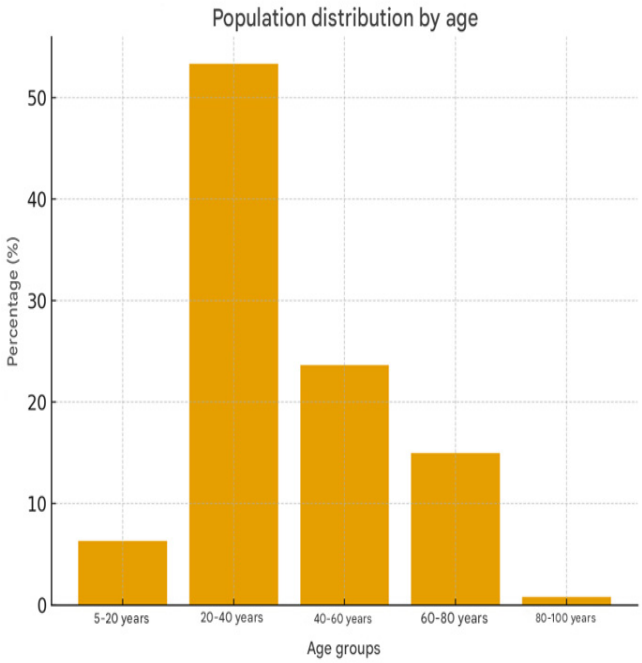

Figure 1: Diagram of population distribution according to age groups

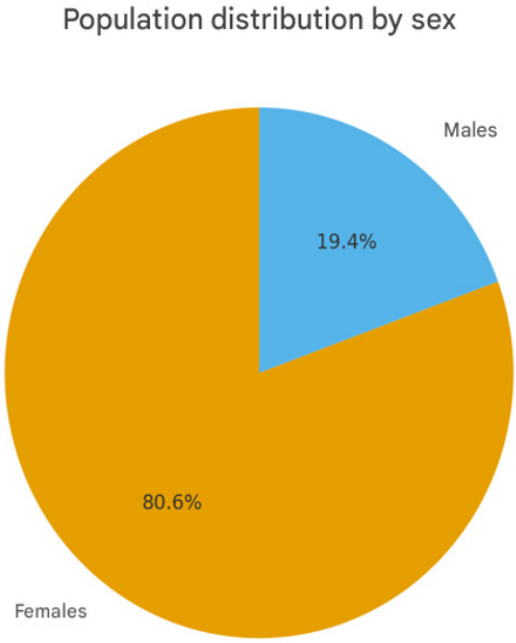

Figure 2: Population distribution by sex

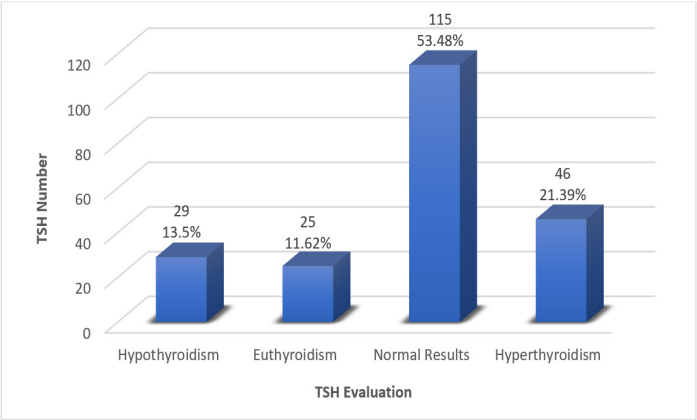

Figure 3: Prevalence of thyroid dysfunction and euthyroidism.

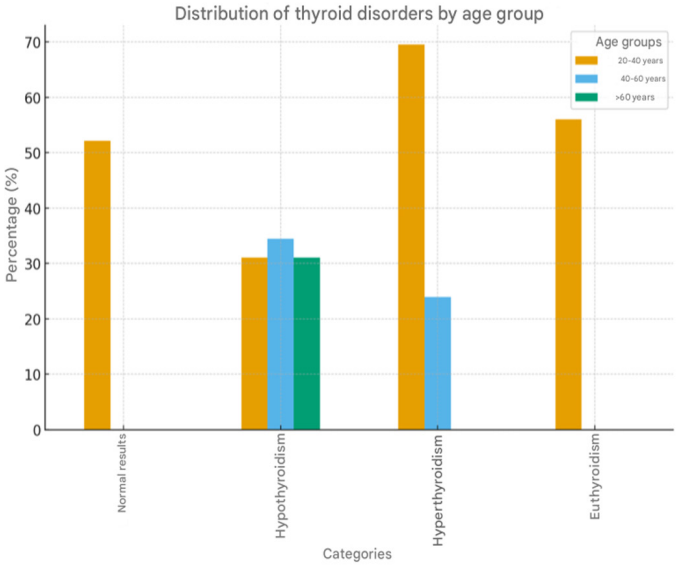

Figure 4: Distribution of thyroid disorders according to age

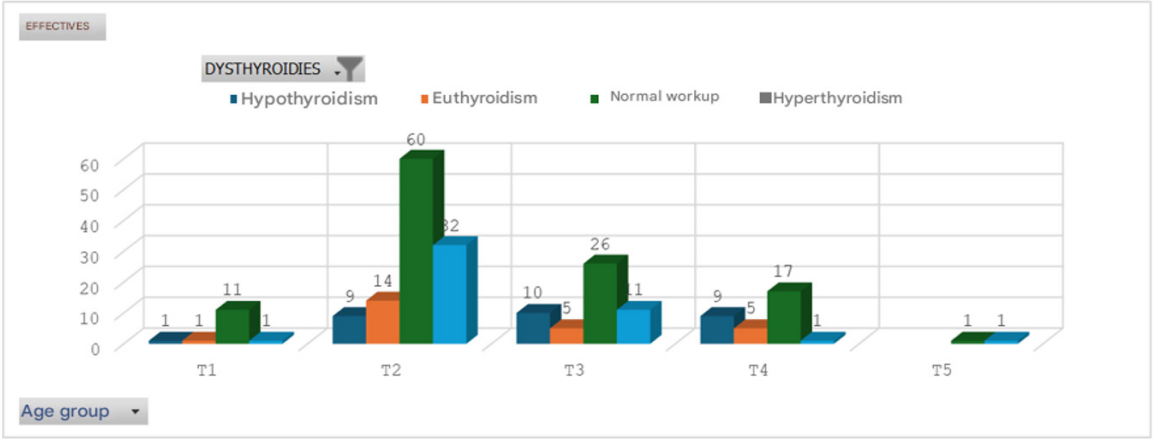

Figure 5: Distribution of thyroid dysfunction according to age

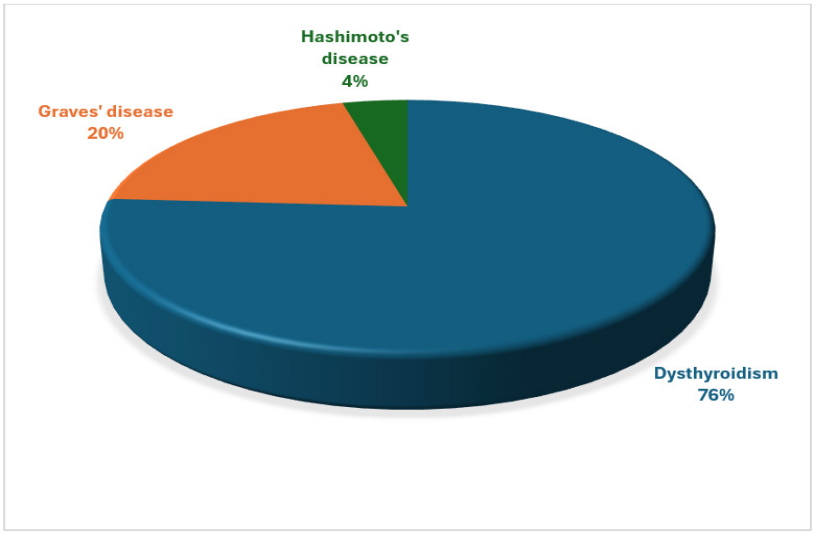

Figure 6: Distribution of thyroid dysfunctions

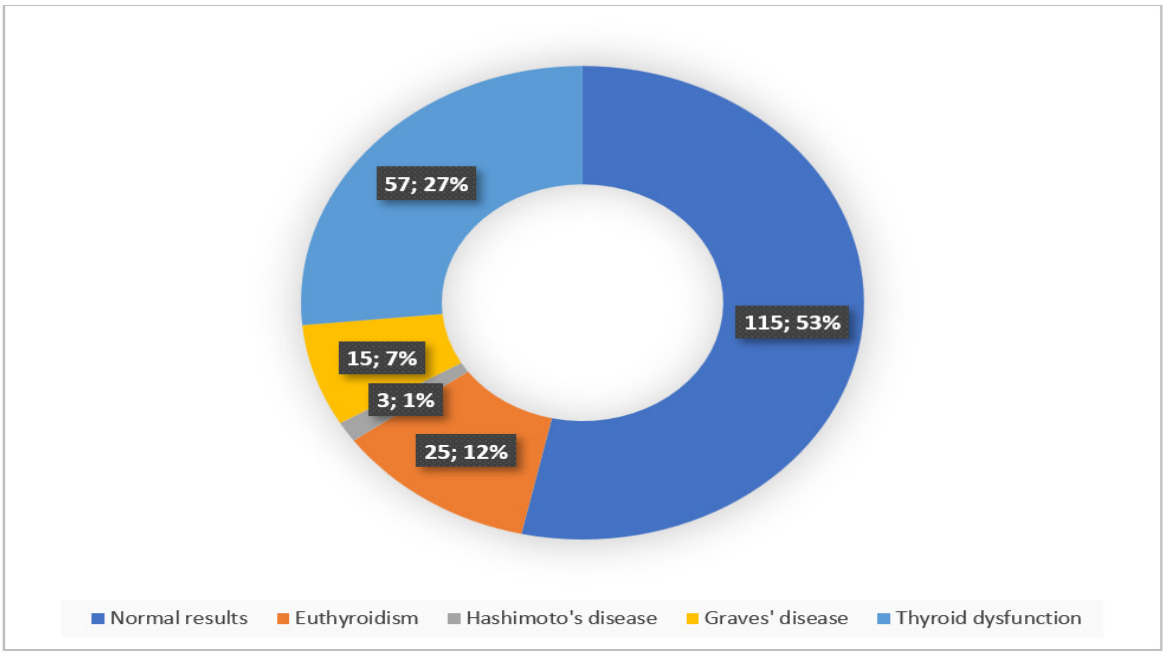

Figure 7: Prevalence of thyroid dysfunction in our population

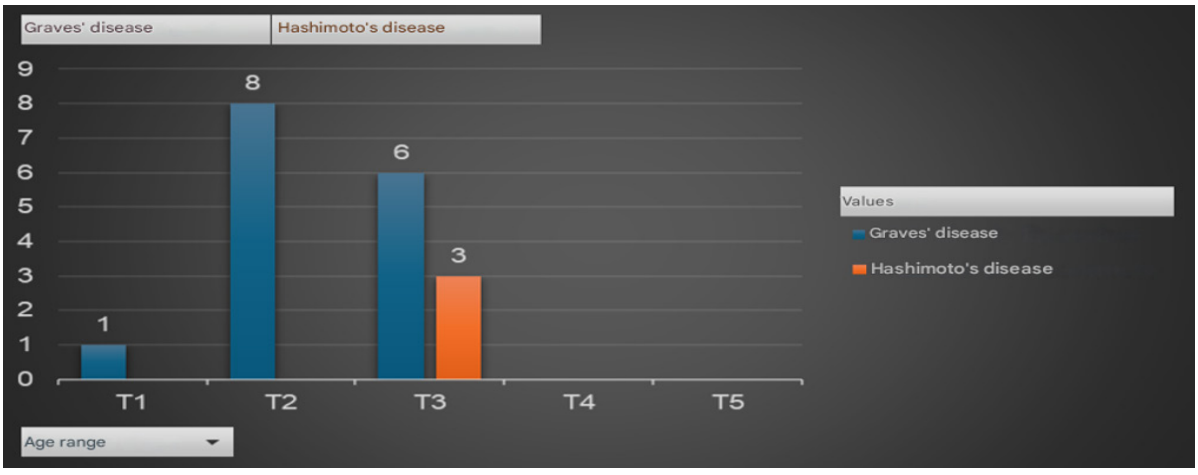

Figure 8: Distribution of basic water disease and Hashimoto's according to age group.

Discussion

Analysis of our population reveals a clear female predominance (80.6%) and a majority of cases affecting young adults, particularly those aged 20 to 40. This distribution is consistent with data from national and regional literature, Dr. Aloui soulimani at the Fann University Hospital (November 29, 2022) a female predominance 79%, an average age of 42 years with extremes ranging from 15 to 75 years, the most represented age group being between 30 and 39 years, suggesting that women of childbearing age constitute the population most exposed to thyroid disorders [2].

Clinically, this observation highlights the need for increased vigilance among Senegalese women, particularly during pregnancy or postpartum, where hormonal imbalances can exacerbate thyroid disorders and compromise maternal and fetal health.

The overall prevalence of thyroid disorders observed (34.9%), dominated by hyperthyroidism (21.39%), reinforces the idea that these conditions constitute a significant public health problem in Senegal. In Senegal, Dr. Assane Drame reported a similar prevalence of 22.2% in a series of 174 patients .^[3] Lower prevalence rates are observed in some regions of the world, such as France, where the SU.VI.MAX study (1995) revealed a prevalence of 5.7%.^[4] The high frequency of hyperthyroidism, particularly Graves' disease (20%), suggests a significant impact on female morbidity and the socioeconomic productivity of women of working age. These results argue for strengthening early screening, particularly in primary care settings, to prevent associated cardiovascular and metabolic complications.

From a public health perspective, these data highlight the need to integrate thyroid disorder screening into reproductive and women's health programs. Furthermore, raising public awareness and training paramedical and medical personnel in the clinical recognition of thyroid disorders could help reduce the diagnostic delays that are still common in Senegal. Establishing a national registry of thyroid disorders would improve epidemiological surveillance, better resource planning, and allow for the evaluation of the impact of iodine policies at the national level.

Finally, the observation of a low proportion of hypothyroidism, often linked to Hashimoto's thyroiditis, could reflect either diagnostic underestimation or less exposure to iodine-rich environmental factors, which would warrant further studies on iodine intake and national thyroid status. Studies conducted in the United States and Great Britain report prevalences of 5.8% and 7.5%, respectively [. ^{5,6}]

In our population, Graves' disease accounted for 20% of thyroid disorders, while Hashimoto's thyroiditis represented only 4% of cases. These results are comparable to those observed in Côte d'Ivoire by Dr. Abbo and Dr. E. Kelié , who found hyperthyroidism dominated by Graves' disease (28.2% of cases) and hypothyroidism mainly linked to Hashimoto's thyroiditis (6.2% of cases) [7].

From a diagnostic standpoint, TSH remains the first-line marker of choice, thanks to its reliability and affordability [. ⁸]However, the limited availability of complementary assays (free T3, TRAK, anti-TPO) observed in our series reflects the limited access to specialized tests in several healthcare facilities. These small sample sizes significantly limit the statistical power and precision of the estimates; they expose the study to the risk of sampling errors and result in very wide confidence intervals. Consequently, the results concerning these biomarkers must be interpreted with great caution and cannot be extrapolated to the entire studied population. Further studies with a larger sample or multicenter data collection are needed to confirm these observations.

This constraint can lead to diagnostic delays or empirical treatments. It is therefore recommended to strengthen the capacity of regional laboratories and promote continuing education for practitioners on the interpretation of basic thyroid function tests, in order to optimize treatment guidelines.

From a therapeutic standpoint, the prevalence of hyperthyroidism, particularly Graves' disease, necessitates a multidisciplinary approach to prevent cardiovascular, metabolic, and ophthalmological complications. Regular access to antithyroid drugs and biological monitoring must be guaranteed, especially in peripheral regions.

- *Selection bias related to recruitment*

The single-center design of this study constitutes a methodological limitation. Exclusive recruitment from a public health center in the suburbs of Dakar may introduce geographic and demographic selection bias. The center's accessibility and reputation are likely to attract patients already suspected of having thyroid disease or who have better access to health information.

- *Impact of socio-economic status*

Access to a public, peri-urban center offers broader socio-economic representation than the private sector. However, this urban/peri-urban population likely differs from rural Senegalese areas in terms of environmental exposure, dietary habits, and access to healthcare. The high prevalence of hyperthyroidism observed could reflect characteristics specific to this context, such as better access to diagnosis or specific environmental factors.

This low prevalence and observed distribution can be explained by the lack of available data for certain parameters, as well as the recent purchase of the automated analyzer, approximately one year old. Some patients were also excluded from the analysis due to missing data, which reduced the size of our database. This selection, however, allowed us to obtain reliable results that are representative of clinical reality.

Limitations of the study

Several limitations must be taken into account:

- *Monocentric nature* : recruitment limited to the Nabil Choucair public center restricts the generalization of results, particularly with regard to rural areas or other regions of Senegal with distinct environmental and nutritional profiles.
- *Incomplete data* : the small number of patients who benefited from certain assays (T3L: n = 21; TRAK: n = 15; Anti-TPO : n = 4)
- *Lack of longitudinal follow-up* : the cross-sectional nature of the study prevents assessment of the evolution of thyroid disorders and the effectiveness of treatments, highlighting the need for prospective cohorts.
- *Unexplored confounding factors* : the lack of data on iodine status, dietary habits, family history or exposure to goitrogens limits the etiological analysis.

Despite these limitations, the study provides new data on the prevalence of thyroid disorders in the Senegalese context and constitutes a basis for further work.

Conclusion

The study of the prevalence of thyroid disorders highlights the importance of these endocrine conditions in the general population. The results show that thyroid disorders, including hyperthyroidism and hypothyroidism, are common pathologies, with significant variations according to demographic factors such as age, sex, and region.

Hyperthyroidism is the most common form, particularly in women and people aged 20 to 40, while hypothyroidism, although less common, also represents a significant clinical burden. Etiological factors include autoimmune, environmental, and nutritional causes, such as iodine deficiency or exposure to goitrogens .

Graves' disease, an autoimmune disorder, is the most common form of thyroid dysfunction, primarily affecting young adult women. Its diagnosis relies in particular on measuring TSH receptor antibodies (TRAK). Hashimoto's thyroiditis is less common than Graves' disease, mainly affects older individuals, and also has a marked female predominance.

The treatment of thyroid disorders is based primarily on: synthetic antithyroid drugs, radioactive iodine or surgery, depending on the nature and severity of the pathology.

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Conflict of interest : None

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