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RESEARCH ARTICLE

THYROID DISORDERS AMONG OLDER PEOPLE IN BURKINA FASO

[1]Christelle NADEMBEGA, [1]Abdoul Karim OUATTARA, [1]Birama DIARRA, [3]Dorcas OBIRI-YEBOAH, [2]Théodora ZOHONCON, [2]Virginio PIETRA and [1,2]Jacques SIMPORE

[1]Laboratoire de Biologie Moléculaire et de Génétique (CERBA/LABIOGENE), Université Ouaga I Pr. Joseph Ki-Zerbo, 03 BP 7021 Ouagadougou, Burkina Faso
[2]Hôpital Saint Camille de Ouagadougou (HOSCO), 01 BP 444 Ouagadougou 01, Burkina Faso
[3]University of Cape Coast, School of Medical Sciences, Microbiology Department, University Post Office, Ghana

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ABSTRACT

Introduction: Thyroid disorders are common in adults with significant clinical consequences. The objective of this study was to estimate the prevalence of biochemical hyperthyroidism and hypothyroidism in older people in Ouagadougou, Burkina Faso.
Material and Methods: This was a retrospective analysis of thyroid function tests results of people who presented at the biomedical laboratory of the "Hôpital Saint Camille de Ouagadougou (HOSCO)" from January 2016 to September 2017. Serum thyrotropin (TSH) and free tyroxine (FT4) concentrations were measured by chimiluminescence immunoassay (Roche Diagnostics, Switzerland). The normal ranges for TSH and FT4 were 0.25-5 µUI/ml and 9-20 ρmol/L respectively.
Results: Older people aged 50 years and over represented 9.7% (251/2589) and 28.9% (747/2589) for men and women respectively. Among them, 85.7% (855/998) had a normal concentration of TSH (0.25 µUI/ml ≤TSH > 5 µUI/ml). Hyperthyroidism (TSH≤0.25 µUI/ml) was twice more frequent than hypothyroidism (TSH>5 µUI/ml): 9.8% *vs*. 4.5% (p value < 0.05). People aged 70 to 79 years presented the most abnormal concentrations of TSH: 15.2% of women had a concentration of TSH lower than 0.25 µUI/ml against 0% for males (*p* value 0.010) and 16.7% of men a concentration greater than 5 µUI/ml TSH against 5% in women (*p* value 0.043).
Conclusion: These results confirm that the elderly are proned to thyroid disorders and women are more affected than men. The diagnostic of thyroid disorders must take into account the physiological changes of aging. The implementation of a health system adapted to older people is very necessary to ensure regular monitoring of their health.

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INTRODUCTION

Thyroid disorders and diabetes constitute the most common pathologies in endocrinology. An abnormal serum concentration of Thyroid Stimulating Hormone (TSH) or thyrotropin is the main biochemical manifestation of thyroid disorders (Sheehan, 2016). TSH is a 28-kDa glycoprotein, composed of two subunits α and β. It is secreted by the anterior pituitary to stimulate the thyroid gland to produce thyroid hormones, triiodothyronine (T3) and tetraiodothyronine or thyroxine (T4). Thyroid hormones play an important role in cell differentiation, growth and metabolism (Yen, 2001). They are essential for the normal function of nearly all tissues and are primarily involved in oxygen transport and basal metabolism (Yen, 2001). The thyroid gland produces more thyroxine (T4) than triiodothyronine (T3) and the two hormones are interdependent: T3 is obtained by a 5'-deiodination of the outer ring of T4 by deiodinases. About 0.03% and 0.3% of the total serum T4 and T3 are "free" (unbound) and this form allows them to inter target cells and generate a biological response. The remaining proportions are bound to carriers proteins such as thyroxine binding protein (TBP) and albumin (Yen, 2001). T4 predominantly circulate throughout the body when T3 is predominantly within the cells (Yen, 2001 and Hoermann, 2016). Thyroid hormones exert a negative feedback on TSH and there is an inverse log-linear relationship between TSH and free T4 concentrations. The serum TSH measurement is considered to be the primary screening test to diagnose the dysfunctions of the thyroid gland (Ladenson, 2000) Thus, hyperthyroidism is characterized by a low concentration of TSH below normal values and

Corresponding author: **Christelle NADEMBEGA**
Laboratoire de Biologie Moléculaire et de Génétique (CERBA/LABIOGENE), Université Ouaga I Pr. Joseph Ki-Zerbo, 03 BP 7021 Ouagadougou, Burkina Faso

hypothyroidism by a high concentration of TSH. Complementary measurements of total T3 and T4 or free (FT3 and FT4) may confirm the initial diagnosis (Ladenson, 2000 and Baskin, 2002). Epidemiological studies have shown that the frequency of thyroid diseases is variable among populations: 1.3-4.6% (Hollowell, 2002) 1%-15% (Hollowell, 1988), 0.4 to 18% (Bensenor, 2012), 0.24%-11.3% (Carlé, 2017). Data from the US National Health and Nutrition Survey (NHANES III) revealed that TSH concentrations are higher in women and increase with age (Hollowell, 2008). Symptoms of thyroid disease in the elderly are similar to those caused by the process of aging and the interpretation of thyroid function test results may be difficult, hence the need for adequate screening, diagnostic and treatment protocols (Peeters, 2008 and Gesing, 2012). The need for screening for thyroid disease after a certain age is not adopted but some organizations are in favor of screening.

Indeed, the American Thyroid Association, ATA, recommends screening for thyroid function at 35 years of age and every 5 years thereafter, the American College of Pathologist, recommends an evaluation for older women at 50 years of age presenting one or more general symptoms caused by a deficiency of the thyroid gland, and the American Association of Clinical Endocrinologist, recommends a systematic screening of older people especially women (Baskin, 2002 and Gharib, 2005). These different recommendations show the problem of the management of thyroid diseases in elderly in view of the risks, complications or sequelae they cause. Atrial fibrillation, cognitive dysfunction, osteoporosis, increased cardiovascular risk, myxeodematous coma are handicapping troubles for the elderly (Papaleontiou, 2012).

In Burkina Faso, the increase in life expectancy (48.5 years in 1985 to 56.7 years in 2006) has led to an increase in the number of older people. In urban areas, life expectancy increased from 55 years in 1985 to 64.3 years in 2006 (Institut National de la Statistique et de la démographie, 2011). According to the general census of the population in 2006, the proportion of adults over 50 years increased from 5.4% in 1985 to 9.8% in 2006 (Ouédraogo, 2009). In this context, few epidemiological studies have been conducted to evaluate the prevalence of thyroid disorders in the elderly in the country and their impact on other diseases related to aging.

Yaméogo et al. in 2012 in their study on cardiothyrosis in Bobo Dioulasso (Burkina Faso), identified 42/6940 patients (0.6%) whose mean age was 53.57 years, with a clinical hyperthyroidism biochemically confirmed associated with cardiac damage (Yaméogo, 2012). National statistics of the Ministry of Health in 2016 showed that for all endocrine diseases diagnosed in adults in outpatient consultation, about 6% were related to thyroid disorders and 92.3% to diabetic diseases (Direction générale des études et des statistiques sectorielles, 2017). This study was initiated with the aim of providing additional information on the endocrine system in the elderly in Burkina Faso. Although these results are not representative of the general population, they try to assess trends in abnormal concentrations of TSH and thyroid hormones and to determine the characteristics of thyroid disorders encountered in the elderly. The objective of this study was therefore to estimate, through TSH and thyroid hormone test results, the frequency of people over 50 years of age with thyroid disorders.

MATERIAL AND METHODS

Study area

This retrospective and descriptive study was conducted at the "Hôpital Saint Camille Hospital de Ouagadougou, HOSCO" in Burkina Faso. This hospital was founded in 1967 by Camillian Religious congregation in Burkina Faso. Initially focused on maternal and child health, HOSCO is today a teaching hospital with several different services including the biomedical analysis laboratory and endocrinology service.

Type of study

This was a descriptive and retrospective study from January 2016 to September 2017 that analyzed the records of TSH and thyroid hormones measurements in patients (hospitalized or outpatients) attending the biomedical analysis laboratory of HOSCO. Only the results of TSH and/or FT4 in people aged 50 and over were selected for statistical analyzes.

TSH and FT4 measurements

Serum TSH and FT4 concentrations were performed with COBAS e 411 (Roche, Hitachi) using the electro-chemiluminescence immunoassay (ECLIA) of Roche Diagnostic (Switzerland) with a functionnal sensitity of 0.014 µUI/ml for TSH and 0.6 ρmol/L for FT4. The normal ranges for TSH and FT4 were 0.25-5 µUI/ml and 9-20 ρmol/L respectively according to the manufacturer.

Classification by thyroid dysfunction

Serum TSH and FT4 concentrations were used to classify elder people in the following groups:

- Clinical hyperthyroidism is defined by a concentration of TSH ≤ 0.25 µIU/ml and a FT4 value > 20 ρmol/L.
- Subclinical hyperthyroidism is defined by a concentration of TSH ≤ 0.25 µIU/ml and a normal value of FT4 (9 ρmol/L ≤ FT4 > 20 ρmol/L).
- Clinical hypothyroidism is defined by a concentration of TSH > 5 µIU/ml and a FT4 value ≤ 9 ρmol/L.
- Subclinical hypothyroidism is defined by a concentration of TSH concentration > 5 µIU/ml and a normal value of FT4 (9 ρmol/L ≤ FT4 > 20 ρmol/L).

Statistical analyzes

Thyroid function tests results and patient information were extracted from the HOSCO database and analyzed with EpiInfo Version 7. Participants characteristics were compared using chi square or *t* test.

Ethical considerations

This study was approved by the HOSCO Institutional Ethics Committee.

RESULTS

Characteristic of the population

From January 2016 to September 2017, 2589 people performed the serum TSH test, 76% (1961/2589) were women and 28.9% (747/1961) of them were 50 years old or older.

Table 1. Distribution of people by gender with a serum TSH quantification en 2016 and 2017

	TSH	TSH		TSH in people ≥ 50 years old		TSH/FT4 in people ≥ 50 years old	
Year	All	Men	Women	Men	Women	Men	Women
	N	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
2016	1436	346	1090	141	414	33	146
		24.1%	75.9%	9.8%	28.8%	2.3%	10.2%
2017	1153	282	871	110	333	17	86
		24.5%	75.5%	9.5%	28.9%	1.5%	7.6%
Total	2589	628	1961	251	747	50	232
		24.3%	75.7%	9.7%	28.9%	1.9%	9%

Table 2. Distribution of serum concentration of TSH in people ≥ 50 years old by gender and age strata

	TSH ≤ 0.25 µUI/ml		*P* value	0.25 µUI/ml ≤TSH> 5 µUI/ml		*P* value	TSH > 5 µUI/ml		*P* value
	Men N (%)	Women N (%)		Men N (%)	Women N (%)		Men N (%)	Women N (%)	
All	15/251 (6%)	83/747 (11.1%)	0.018	221/251 (88%)	634/747 (84.9%)	0.214	15/251 (6%)	30/747 (4%)	0.195
Mean TSH	0.08 ± 0.09	0.058 ± 0.07	0.287	1.67 ± 0.98	1.46 ± 0.92	0.004	17.15 ± 28.75	16.93 ± 22.10	0.977
Age strata									
50-59	7/93 (7.5%)	42/406 (10.3%)	0.410	83/93 (89.2%)	354/406 (87.2%)	0.587	3/93 (3.2%)	10/406 (2.5%)	0.955
60-69	8/101 (7.9%)	25/224 (11.2%)	0.370	89/101 (88.1%)	184/224 (82.1%)	0.173	4/101 (4%)	15/224 (6.7%)	0.330
70-79	0/48 (0%)	15/99 (15.2%)	0.010	40/48 (83.3%)	79/99 (79.8%)	0.608	8/48 (16.7%)	5/99 (5%)	0.043
80 et +	0/9 (0%)	1/18 (5.6%)		9/9 (100%)	17/18 (94.4%)		0/9 (0%)	0/18 (0%)	

Table 3. Prevalence of thyroid diseases by gender

		All N: 282	Men N: 50	Women N: 251	*P* value
Hyperthyroidism	All (N, %)	54 (19.1%)	7 (14%)	47 (20.3%)	0.300
	Clinical hyperthyroidism (N, %)	28 (9.9%)	3 (6%)	25 (10.8%)	0.443
	Subclinical hyperthyroidism (N, %)	24 (8.5%)	3 (6%)	21 (9.1%)	0.651
Hypothyroidism	All (N, %)	12 (4.3%)	0	12 (5.17%)	
	Clinical hypothyroidism (N, %)	6 (2.1%)	0	6 (2.6%)	
	Subclinical hypothyroidism (N, %)	(2.6%)	0	6 (2.6%)	

The serum TSH quantification is the initial test in thyroid diagnostic and the quantification of FT4 is required in addition to that of TSH. Patients who simultaneously measured TSH and FT4 accounted for 10.9% of the total population, 1.9% and 9% for men and women, respectively (Table 1).

Classification according to TSH concentration

In all people aged 50 years and over (998 people), 85.7% (855/998) of them had a normal concentration of TSH (0.25 µIU/ml ≤ TSH > 5 µIU/ml). Among people with an abnormal concentration of TSH (14.3% (143/998)), 9.8% (98/998) had a concentration of TSH ≤ 0.25 µIU/ml, and 4.5% (45/998) a concentration of TSH ≥ 5 µIU/ml. People aged 70 to 79 years presented the most abnormal concentrations of TSH: 15.2% of women had a concentration of TSH ≥ 5 µIU/ml against 0% for men (p value 0.010) and 16.7% of men a concentration of TSH ≥ 5 µIU/ml against 5% in women (p value 0.043). Minimum and maximum serum concentration of TSH were 0.005 µIU/ml and 96.88 µIU/ml in elder women; 8.3% (62/747) of them had a concentration of TSH ≤ 0.1 µIU/ml and 1.7% (13/747) a concentration of TSH ≥ 10 µIU/ml. In elder men, minimum and maximum serum concentration of TSH were 0.005 µIU/ml and 100 µIU/ml. Four percent (10/251) had a concentration of TSH ≤ 0.1 µIU/ml and 3/251 (1.2%) a concentration of TSH ≥ 10 µIU/ml. The distribution of concentration of serum TSH by gender and age of people are shown in Table 2.

Hyperthyroidism and hypothyroidism

The classification of thyroid diseases is generally done by the biochemical results of blood concentration of TSH and thyroid hormones, T3 and T4, total and/or free. Taking into account the measurements of TSH and FT4, 19.1% (54/282) are elder people with hyperthyroidism and 4.3% (12/282) with hypothyroidism. Table 3 presents the classification of dysfunction of the thyroid gland according to the people gender.

DISCUSSION

Burkina Faso, like other developing countries, faces many challenges in public health (WHO, 2015). The needs in this area are enormous and the priorities are mainly for the diseases causing the most deaths that are among others, malaria, infections of the newborn, pneumonia, anemia, severe acute malnutrition (Direction générale des études et des statistiques sectorielles, 2017). Improvements in living conditions and scientific progress have led to an increase in the life expectancy of the Burkinabe population, with the consequent increase in the number of elderly people (Direction de la santé de la famille, 2008). These latter live mainly in rural areas and are generally faced with precariousness and a lack of medical care adapted to their old age (Direction de la santé de la famille, 2008 and Berthe, 2013). The health needs for this group of population are enormous not only those related to the aging but also those that can arise in case of illness. Hence the importance of having a health system that incorporates the specific needs of the elderly whose role in society is invaluable (Berthe, 2013). Thyroid disorders in adults aged 50 years and over in Burkina Faso are poorly documented. Despite the lack of clinical data (previous assessments of thyroid function and thyroid treatments) on the people, the analysis of the results shows that 76% of people performing thyroid function tests are women and 29% were women aged 50 years and over. At that age, the hormonal fluctuation due to the menopause process affecting the general health of women lead them to assess their hormonal status. In women aged 50 and over, 15% had an abnormal concentration of TSH, 11% a concentration of TSH ≤ 0.25 µIU/ml and 4% a concentration of TSH ≥ 5 µIU/ml. The proportion of men aged 50 years and with a concentration of TSH ≤ 0.25 µIU/ml or ≥ 5 µIU/ml was identical, at 6% for each case.

Hyperthyroidism

Hyperthyroidism is defined by excessive production of thyroid hormones T3 and T4. It can be caused by Graves-Basedow autoimmune disease or Graves' disease, multinodular goiters, thyroiditis or excess iodine intake (Baskin, 2002; Ross, 2016 and De Leo, 2016). The consequences, risks or sequelae of hyperthyroidism include atrial fibrillation, cardiovascular diseases, osteoporosis and ophthalmological disorders (Baskin, 2002; Papaleontiou, 2012; Ross, 2016; De Leo, 2016; Cooper, 2012). In our study population, considering the patients who measured only TSH concentration, hyperthyroidism was most often seen in women (11%) than in men (6%). In patients with TSH and FT4 values, 20% of women and 14% of men had confirmed biochemical hyperthyroidism. This difference in the prevalence of hyperthyroidism by gender was found in the NHANES III survey in the United States with a statistically significant difference between these two groups (TSH <0.4 µIU/ml). Bjoro et al. in 2000 also found the same trend in the results of their study conducted in Norway in unselected adults over 20 years old: the frequency of hyperthyroidism (TSH <0.2 µIU/ml) was 0.08% and 0 45% in men and women aged 50 to 59 years respectively (Bjoro, 2000). More recently in 2011, Bensenor et al. found in a Brazilian population aged 65 years and over, a prevalence of hyperthyroidism (TSH <4.5 µIU/ml) of 2.3% in men and 3.6% in women (Benseñor, 2011). Considering a TSH concentration ≤ 0.1 µIU/ml in the analyzes of our results, 8.3% of women and 4% of men could develop clinical hyperthyroidism. In these people, the quantification of FT4 would confirm the diagnosis and identify the cause of hyperthyroidism which is most often Grave's disease (De Leo, 2012). In Africa, some epidemiological studies revealed the same trend: 80.8% (63/78) in Nigeria (Ogbera, 2007), and 72% (108/150) in Senegal (Diagne, 2016). Ogbera et al. 2012 in their review on thyroid diseases in Africa found a prevalence of 34% to 80.8% of Grave's disease among people with thyroid disorders (Ogbera, 2011).

Hypothyroidism

Hypothyroidism is the result of insufficient production of thyroid hormones by the thyroid gland. Hypothyroidism may be congenital, or caused by iodine deficiency, autoimmune disease (Hashimoto's disease), drug or post-surgery of thyroid gland (Baskin, 2002; González-Rodríguez, 2013 and La'ulu, 2007). The consequences, risks or sequelae of hypothyroidism include cognitive dysfunction, cardiovascular disease, myxedema. The results of this study showed that 4.5% of people aged 50 years and over had a concentration of TSH > 5 µIU/ml, 4% in women and 6% in men. For a serum concentration of TSH > 10 µIU/ml this frequency was 1.7% and 1.2% for women and men respectively. In people with TSH and FT4 measurements, 12/232 (5.17%) women had confirmed biochemical hypothyroidism. Hypothyroidism is common with varied prevalence among older men and women in Europe, US, Latin America, and Australia (Bensenor, 2012).

Bensenor et al. in Brazil, found a prevalence of hypothyroidism (TSH≥5 µIU/ml) of 12.6% and 11.5% for women and men aged 65 years and over respectively (Benseñor, 2011). In an unselected adult population older than 20 years, a prevalence of hypothyroidism (TSH≥4 µIU/ml) was 0.37% for men and 0.9% for women in Norway (Bjoro, 2000). In Africa, the retrospective study of Sarfo-Kantaka et al. conducted in a hospital in central Ghana showed a progressive decrease in the prevalence of hypothyroidism (TSH≥5 µIU/ml) from 20.4% in 1982 to 2.1% in 2014 (Sarfo-Kantanka, 2000). The decrease in the prevalence of hypothyroidism was attributed to the 1996 iodization policy in the country. Despite the iodization policy in most African country (Andersson, 2012 and Pearce, 2012), the iodine deficiency remain with a significant prevalence of goiter in population (Ogbera, 2011).

Hyperthyroidism *vs* hypothyroidism

In this study, hyperthyroidism was twice more frequent than hypothyroidism in people aged 50 years and over, 9.8% and 4.5%. Some studies in Nigeria found that the prevalence of hyperthyroidism is also higher than that of hypothyroidism among people with thyroid disorders: 81.1% *vs* 18.9% in the Northeastern Nigeria (Mshelia, 2016), 83.8% *vs* 6.4% in Southeastern Nigeria (Ogbera, 2007). In contrast to our findings, epidemiological studies in developed countries have shown that hypothyroidism is more common than hyperthyroidism (Hollowell, 2002; Cappola, 2006; Bjoro, 2000; Benseñor, 2011; González-Rodríguez, 2013). The NHANES III survey in the US had shown that the respective prevalence of hypothyroidism and hyperthyroidism were 4.6% and 1.3%. Among African-Americans, these prevalence were 1.7% and 1.1% respectively (Hollowell, 2002).

In addition, this survey found that the proportion of African-Americans with a concentration of TSH > 4.5 µIU/ml was significantly lower than that of white Americans and the proportion of African-Americans with a concentration of TSH ≤ 0.4 µIU/ml was significantly higher than that of white Americans. The higher frequency of hyperthyroidism in our population is explained by low concentrations of TSH observed in African populations (La'ulu, 2007). This study also highlights the issue of the reference values to be taken into account for the diagnosis of thyroid disorders in African populations in general and the elderly in particular. In Burkina Faso, these people are generally in situations of extreme poverty and self-medication and traditional medicine is often the initial choice for health care (Hien, 2015). In addition, food safety is often not ensured and prolonged undernutrition and malnutrition has consequences on the thyroid gland. It would therefore be necessaryto evaluate the concentrations of TSH and thyroid hormones in the populations of Burkina Faso in order to find reference values.

Conclusion

The retrospective study of people who performed a serum TSH and FT4 measurement in the HOSCO laboratory shows that women aged 50 years and over were the most represented. Hyperthyroidism was twice prevalent in the elderly with predominance in women. The vulnerability of this population recommends not only quality food security but also the establishment of health care systems adapted to their specific needs.

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