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Thyroid Hormone Assessment in Patients with Anterior Neck Swelling: A Five-Year Retrospective Study at the National Ear Care Centre, Kaduna

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Abstract:

Introduction: Anterior neck swellings are usually benign lesions however special concerns are given due to the possibility of malignancy. This study was designed to assess the thyroid function hormones in patients attending the National Ear Care Centre, Kaduna, Nigeria that presented with anterior neck swelling.

Method: A total of 52 patients were recruited for this study. Thyroid Function Tests; T_3, T_4, and TSH were assayed using dry chemistry point of care machine.

Result: The study showed that T_3 was significantly elevated in age groups 10-19, 30-39 and >80 years while T_4 and TSH were within the normal range. However, TSH was significantly decreased in age group 70-79.

Conclusion: Findings from this study and suggests elevated levels of T_3 in some age groups and could be as a result of increased metabolic activities or an underlying disease, while decreased levels of TSH in age group 70-79 suggests subclinical hypothyroidism.

Keywords: Anterior neck swelling, Thyroid Hormone (TSH), Thyroid gland,

INTRODUCTION

The occurrence of neck masses during childhood creates anxiety to both parents and family physicians because of fear for possibility of malignancy even though majority of Paediatric neck masses are benign lesions. Despite this fact, special concern should be given for the possibility of malignancy. Under three main aetiology, neck masses can be classified into these: inflammatory or infectious, congenital and neoplastic Carvalho *et al*. (2012); Lucymay *et al*. (2014). Some number of lesion found at the anterior neck masses includes thyroglossal cyst, abscesses, cervical lymphadenopathy and goiter (thyroid enlargement).

The Thyroid gland is a key endocrine organ located in the neck region. Thyroid nodular lesions are common clinical problem. In the United States, 4% to 7% of adult population has a palpable thyroid nodule. The incidence of thyroid cancer in a clinically solitary thyroid nodule or in a multinodular goiter is equal and is about 5% in non-endemic areas Clark, (2008) and this has been on the rise in recent decades, mainly due to the wider use of neck imaging and therefore, the incidental finding of a thyroid nodule in an asymptomatic patient is not rare Polyzos *et al*. (2007). Iodine deficiency is the most common cause of goiter (thyroid gland enlargement) world-wide. Franklin,(2008). WHO reported 5% of world's population suffers from goiter and that 75% of these people live in iodine deficient areas.

The thyroid glandsecretes the thyroid hormones that acts on nearly every cell in the body and have several function amongst which are start formation of foetal life, growth and development in children, puberty and sexual maturation, aid in pregnancy and lactation. They also stimulate vitamin metabolism, regulate protein, fat and carbohydrate. It acts to increase the basal metabolic rate, affect protein synthesis, neural maturation, and increase the body's sensitivity to catecholamines (Walter *et al*. 2012). Thyroid hormones are essential to proper development and differentiation of all cells of the human body. Abnormality seen in these hormones are basically found amongst people with thyroid gland enlargement (goitre). Thyroid hormones (T_4 and T_3) are produced by the follicular cells of the thyroid gland and are regulated by TSH produced by the Thyrotropes of the anterior gland. The effects of T_4 in vivo are mediated via T_3 (T_4 is converted to T_3 in target tissues). T_3 is three to five times as active than T_4. Thyroxine (3,5,3′,5′-tetraiodothyronine) is produced by follicular cells of the thyroid gland. It is produced as the precursor thyroglobulin (this is *not* the same as thyroxine-binding globulin (TBG)), which is cleaved by enzymes to produce active T_4Merck, (2006). Increase or decrease in the serum levels of (T_4 and T_3) with a corresponding increase or decrease in TSH serum levels result in to hyper and hypothyroidism respectively. This study is aimed at assessing thyroid function hormones among patients with anterior neck swelling attending the National Ear Care Centre, Kaduna.

MATERIALS AND METHODS

Study Area

This study was conducted at the National Ear Care Centre; Kaduna State, Nigeria. Kaduna State is located at Northwestern region of Nigeria; it covers a total area of 46,053 km2 (17,781 sq. mi) and an area rank of 4th of the 36 states of Nigeria. It has a population of 6,066,562 people going by 2006 census leaving it the 3rd of the 36 states of Nigeria in rank and a density of 130 km2 (340/sq. mi). Its coordinates are 10º201N and 7º451E; these coordinates clearly indicate that the location is centralized and connects the major routes reaching most of the states of the Nation. Kaduna State consists of twenty-three (23) Local Government Areas.

Study Population

The population included all patients, 52 participants, presented with anterior neck swellings attending the National Ear Care Centre and are investigation for Thyroid function test in the hospital from January; 2018 to December; 2022.

Ethical Clearance and Informed Consent

A concise copy of the research proposal was submitted to the Health Research Ethics Committee of the National Ear Care Centre, Kaduna as part of the requirements for application for ethical clearance to carry out the research work. This research does not in any way constitute harm, invade privacy, involve deception or need any informed consent from any participant as no personal details of patients were used. All data will only be handled, stored and shared within the scope of this research and will not be improperly divulged. Information will only be shared for this research purpose and will remain protected from unauthorized persons.

RESULTS AND DISCUSSION

Age and Sex Distribution of Cases

The distribution of age and sex from the overall cases reported had a high frequency found between the age group 30-39, males are 19 (36.5%) while females are 33 (63.5%) out of the 52 study participants study obtained as shown in the **Table 1**.

Age and Sex Distribution in Relation to TFT

Table 2 shows elevated T3 at ages 10-19, 30-39, and > 80. T4 is only elevated at age 40-49, while TSH is elevated at ages 60-69 while it decreases at 70-79.

Table 3: Sex distribution with TFT levels

The female study participants have elevated T3 of 2.36 while T4 and TSH are normal

Table 4; Distribution of TFT with years.

The highest frequency of participants' attendance to the hospital was in 2020 with the frequency of 17 and representing 32.2%.

Table 1 Age and sex distribution of cases

Age	Male	Female	Frequency	Percent
0-9	0	1	1	1.9
10-19	2	5	7	13.5
20-29	4	5	9	17.5
30-39	3	7	10	19.5
40-49	3	6	9	17.6
50-59	0	5	5	9.6
60-69	3	3	6	11.5
70-79	1	2	3	5.8
>80	0	2	2	3.0
TOTAL	19	33	52	100

Table 2: Age distribution and TFT

AGE	T3 Mean±SEM	T4 Mean±SEM	TSH Mean±SEM
0-9	-	-	-
10-19	3.05±1.06*	8.75±1.50	0.50±.042
20-29	1.75±0.67	8.51±.0.78	1.94±1.29
30-39	3.65±2.16*	9.17±2.19	0.66±0.36
40-49	1.51±0.23	24.21±15.7*	4.77±3.69
50-59	0.77±0.23	8.48±1.62	2.09±1.80
60-69	1.48±0.25	6.46±1.27	10.30±9.30
70-79	1.1±0.04	7.25±1.37	0.34±0.14*
>80	4.45±3.38*	11.36±2.58	0.68±0.19

Data presented as mean±SEM; Statistical tool: one-way ANOVA and * = $p \leq 0.05$ (Dunnett post hoc test)

Table 3: Sex distribution and TFT

SEX	T3 Mean±SEM	T4 Mean±SEM	TSH Mean±SEM
Male	1.28±0.20	7.20±1.22	9.37±6.89
Female	2.36±0.52	12.98±4.24	1.82±1.12

Data presented as mean±SEM; Statistical tool: one-way ANOVA

Table 4: Distribution of TFT with year

Years	Frequency	Percent
2017	4	7.7
2018	9	17.3
2019	8	15.4
2020	17	32.7
2021	14	26.7
Total	52	100

Discussion

The thyroid gland is a key endocrine organ located in the neck region which secretes the thyroid hormone and thyroid enlargement constitutes about a large percentage of anterior neck swellings Lucymay *et al*. (2014). Thyroid hormone is metabolic hormone involved in all levels of metabolism and maintaining hormones.Thyroid nodular lesions are common clinical problem in the otorhinolaryngology specialty.

The distribution of age and sex distribution from the overall cases reported, the highest frequency was found between the age group 30-39, with the frequency of 10 participants representing 19.5%, with male representing 19 (36.5%) and female are 33 (63.5%)as out of the 52 patient study obtained as shown in Table 3.1. This may be associated with the fact that this age group is the most active adult age involved in child birth and parenting, gainful employment, and shoulder

most of the family responsibilities. Therefore, they always get themselves engaged in struggling and striving to carter for family responsibilities thereby not remembering to consider and take care of their health state.

There is a significant elevated T3 in age groups (10-19, 30-39, and> 80) based on the reference range of (0.80-1.70) ng/mL and a corresponding normal levels of T4 and TSH. This may be associated with the biological activity and puberty found in participants (10-19) years due to increase basal metabolic activity to support the energy demand of this age group. For participants age (30-39) years, it may be due to the adopted life activity of work and other family or other ailment such as early onset of hypertension with increase adrenergic impulse often as a response to thyroid hormones. Age > 80 are often associated with older diseases, such as diabetes, hypertension as well as other disease associated with immune weakness.

There was a significant decrease in the concentration of TSH at age 70-79, which is similar to the finding of Chen *et al*. (2019 who found a significant decline in the TSH of geriatrics. This may probably due to aging and pituitary gland atrophy.

Our study showed significant increase in T3 amongst female more than male, this may be due the female hormones oestrogen and progesterone effect on thyroid hormones, similar finding was reported by Chen *et al*. (2019. Davies *et al*. (201) reported that estradiol promoted FRTL-5 thyroid cells growth in a time and concentration dependent manner, a process that occurs in either the absence or presence of TSH. The remaining age groups showed normal thyroid hormones which is suggestive of euthyroid sick syndrome.

In conclusion, thyroid hormones T3 is elevated in (10-19, 30-39 and> 80) while age group 70-79 lowered TSH suggests subclinical hypothyroidism.

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Conflict of Interest declaration
The authors declare no conflict of interest with regarding this research and it publication.

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