*Original Research Article*

# DISEASE OF THE THYROID GLAND: A HISTOPATHOLOGICAL PERSPECTIVE


## ABSTRACT

The thyroid is affected primarily by disease conditions which are variously classified and are not uncommon worldwide. They could lead to enlargement of the thyroid gland thereby earning the designation "goiter". Globally, iodine deficiency has been identified as a major cause of goiter. This was a descriptive retrospective study of consecutive cases of thyroid specimen analyzed at the Histopathology Department of the Jos University Teaching Hospital, Jos, Nigeria,between January 2008 and December 2017. The aim of this work is to study thyroid disorders histologically, relating these findings to age and sex, and comparing same with previous reports.

The Hospital's Medical records and the Histopathology Departments served as sources for extraction of patient's data which included age, sex, and histological diagnosis. Archival slides were reviewed to confirm the diagnosis of the thyroid lesion.

Three hundred and eleven (311) cases of thyroid disease were diagnosed histologically at the Jos University Teaching Hospital during the study period. These lesions were broadly classified into developmental anomalies, hyperplasias, immune/inflammatory diseases, and neoplasm. They accounted for 1.9% (6 cases), 81.4% (253 cases), 3.9% (12 cases), and 12.9% (40 cases) of all cases respectively. The age range of the study population was 1 year to 70 years, with a mean age of 41.2±12.0 SD, and peak incidence at 30 years to 39 years. There were 25 males and 286 females making a male female (M/F) ratio of 1:10.2.

Thyroid disorders are essentially a female disease in our environment occurring commonly in the third and fourth decade of life.



**KEY WORDS:** GOITER, IODINE, JOS.




## INTRODUCTION

The thyroid is an important endocrine gland. It sits with its butterfly shape on the anterior neck region, lying on the larynx and trachea midway between the thyroid cartilage and the suprasternal notch, at the level of C5-T1 vertebrae [1,2].

It is affected primarily by disease conditions which are variously classified [1,3,4]. These pathologies can be resolved into four groups: developmental anomalies; inflammatory/immune disorders; hyperplasias; and neoplasias. Thyroid disorders are not uncommon worldwide [6].They could lead to enlargement of the thyroid gland,thereby earning the designation "goiter"[7,8].

Globally, iodine deficiency has been identified as a major cause of goiter [9]. This has made the deficiency of this substance a major public health problem [9,10]. In 1998, it was reported that over 1/3$^{rd}$ of the world's population are resident in iodine deficient areas[12]. In 2004, it was reported that at least 350million Africans are exposed to the risk of iodine deficiency [13].

Clinical manifestations of thyroid disorders are protean, but are similar in both benign and malignant cases[8]. Treatment could be medical, surgical, radioiodine, or combination therapy.

The aim of this work is to study thyroid disorders histologically, describing their spectrum, relating these findings to age and sex, and comparing same with previous reports.

**METHODOLOGY**

This was a descriptive retrospective study of consecutive cases of thyroid specimen analyzed at the Histopathology Department of the Jos University Teaching Hospital, Jos, Nigeria,between January 2008 and December 2017. The Hospital's Medical records and the Histopathology Departments served as sources of patient's data which included age, sex, and histological diagnosis. Archival slides were reviewed to confirm the diagnosis of the thyroid lesion. In cases of missing, broken or faded slides, archival tissue blocks were selected, sectioned into 5µm slides, stained with haematoxylin and eosin, and reviewed microscopically to confirm the diagnosis of the disease. All histologically confirmed cases were included in the study, while those with inadequate records were excluded. We used SPSS statistical software to analyze the data and presented them in tables as simple frequencies and percentages.



**RESULTS**

Three hundred and eleven (311) cases of thyroid disease were diagnosed histologically at the Jos University Teaching Hospital during the study period. These lesions were broadly classified into developmental anomalies, hyperplasias, immune/inflammatory diseases, and neoplasms.

They accounted for 1.9% (6 cases), 81.4% (253 cases), 3.9% (12 cases), and 12.9% (40 cases) of all cases respectively (Table 1 and 2).

The age range of the study population was 1 year to 70 years, with a mean age of 41.2±12.0 SD, and peak incidence at 30 years to 39 years. There were 25 males and 286 females making a male female (M/F) ratio of 1:10.2 (Table 1 and 2).

Thyroglossal cyst was the only developmental anomaly with an age range of 2 years to 45 years, mean age of 22.0±15.7 and peak incidence at 10 years to 19 years. There were 3 cases each of thyroglossal cyst in males and females (Table 1 and 2).

The commonest hyperplastic disease was simple multinodular goiter (SMG) amounting to 213 of cases, thereby accounting for 84.2% of hyperplasia, and 68.55% of all cases. It is therefore the commonest singular disease entity in this study. There were 12 males and 201 females with SMG with a M/F ratio of 1:16.8. Other hyperplastic diseases were Colloid goiter and Toxic goiter with 39 (12.5% of cases) and 1 (0.3% of all cases) case(s) respectively (Table 1 and 2).

Thyroiditis (Hashimoto) and Grave's disease accounted for 5(1.6%) and 6(1.9%) cases of all thyroid diseases. This translates to 41.7% and 50.05% of all immune/inflammatory diseases. The age range, peak incidence and mean of thyroiditis were 27-56 years, 50-59 years, and 40.6±12.5 SD respectively, while corresponding values for Grave's disease were 19-33 years, 30-39years, and 27.5±5.1 SD respectively. All 5 cases of thyroiditis were female, while 1 of the 6 cases of Grave's disease was male (M/F ratio 1:16.7). There was a case of Granulomatous thyroiditis (Table 1 and 2).

Follicular adenoma was the commonest neoplasm (18 cases) accounting for 45% of neoplasm, and 5.8% of all cases. It recorded an age range of 1-60 years, peak incidence at 30-39 years, and mean of 39.2±13.9 SD. There 5 males and 13 females (M/F ratio 1:2.4) with this neoplasm (Table 1 and 2).

Papillary carcinoma was slightly commoner than follicular carcinoma. They recorded 10 and 9 cases respectively accounting for 25.0% and 22.5% of neoplasms and 3.2% and 2.9% of cases respectively. They respectively had an age range of 32-65 years and 25-70 years; peak age of incidence of 30-39 years and 50-59 years; and mean age of 40.9±11.1SD, and 50.8±13.2. There were 2 male cases and 8 female cases of papillary carcinoma (M/F ratio 1:4). There was no male case of follicular carcinoma. There was 1 case each of medullary carcinoma, and poorly differentiated carcinoma (Table 1 and 2).

**TABLE 1**

| AGE DISTRIBUTION OF THYROID LESIONS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Diagnosis/disease** | AGE (Years) | | | | | | | | **TOTAL (%)** |
| | <10 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70 - 79 | |
| **Developmental** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **anormalies** | | | | | | | | | |
| Thyroglossal cyst | 1 | 2 | 1 | 1 | 1 | - | - | - | 6(1.9) |
| **Hyprplasias** | | | | | | | | | |
| Simple multinodular goiter | - | 2 | 20 | 66 | 68 | 38 | 14 | 5 | 213(68.5) |
| Colloid goiter | 0 | 1 | 8 | 11 | 11 | 6 | 1 | 1 | 39(12.5) |
| Toxic Goiter | - | - | 1 | - | - | - | - | - | 1(0.3) |
| **Inflammatory/Immune** | | | | | | | | | |
| Thyroiditis (Hashimoto) | - | - | 1 | 1 | 1 | 2 | - | - | 5(1.6) |
| Grave's disease | - | 1 | 2 | 3 | - | - | - | - | 6(1.9) |
| Granulomatous thyroiditis | | - | - | - | - | - | 1 | - | 1(0.3) |
| **Neoplasia** | | | | | | | | | |
| **Benign Neoplasm** | | | | | | | | | |
| Follicular adenoma | 1 | - | 1 | 6 | 5 | 4 | 1 | - | 18(5.8) |
| Hurtle cell adenoma | - | - | - | - | - | 1 | - | - | 1(0.3) |
| **Malignant Neoplasm** | | | | | | | | | |
| Pappillarycancinoma | - | - | 1 | 6 | 1 | 1 | 1 | - | 10(3.2) |
| Follicular carcinoma | - | - | 1 | - | - | 7 | - | 1 | 9(2.9) |
| Medullary carcinoma | - | - | 1 | - | - | - | - | - | 1(0.3) |
| Poorly differentiated carcinoma | - | - | - | 1 | - | - | - | - | 1(0.3) |
| **TOTAL** | 2 | 6 | 37 | 95 | 87 | 59 | 18 | 7 | 311(100.0) |



**TABLE 2**

| GENDER AND AGE DISTRIBUTION OF THYROID DISEASE | | | |
|---|---|---|---|
| **Diagnosis/disease** | **Number of cases** | **Gender** | **Age (Years)** |

| | (%) | M | F | Age range | Peak age | Mean |
|---|---|---|---|---|---|---|
| **Developmental anormalies** | | | | | | |
| Thyroglossal cyst | 6(1.9) | 3 | 3 | 2-45 | 10-19 | 22.0±15.7 |
| **Hyprplasias** | | | | | | |
| Simple multinodular goiter | 213(68.5) | 12 | 201 | 13-70 | 40-49 | 42.5±11.3 |
| Colloid goiter | 39(12.5) | 2 | 37 | 18-49 | 30-39/40-49 | 40.8±8.3 |
| Toxic Goiter | 1(0.3) | - | 1 | - | - | 24.0 |
| **Inflammatory/immune** | | | | | | |
| Thyroiditis (Hashimoto) | 5(1.6) | - | 5 | 27-56 | 50-59 | 40.6±12.5 |
| Grave's disease | 6(1.9) | 1 | 5 | 19-33 | 30-39 | 27.5±5.1 |
| Granulomatous thyroiditis | 1(0.3) | - | 1 | - | - | 61 |
| **Neoplasia** | | | | | | |
| **Benign Neoplasm** | | | | | | |
| Follicular adenoma | 18(5.8) | 5 | 13 | 1-60 | 30-39 | 39.2±13.9 |
| Hurtle cell adenoma | 1(0.3) | - | 1 | - | - | 50.0 |
| **Malignant Neoplasm** | | | | | | |
| Pappillary carcinoma | 10(3.2) | 2 | 8 | 32-65 | 30-39 | 40.9±11.1 |
| Follicular carcinoma | 9(2.9) | - | 9 | 25-70 | 50-59 | 50.8±13.2 |
| Medullary carcinoma | 1(0.3) | - | 1 | - | - | 22.0 |
| Poorly differentiated carcinoma | 1(0.3) | - | 1 | - | - | 37.0 |
| **TOTAL** | 311(100.0) | 25 | 286 | 1-70 | 30-39 | 41.2±12.0 |



**DISCUSSION**

Hyperplastic lesions (goiter) are the commonest disorders of the thyroid gland in this study. This finding has been consistently reported by researchers [14-27]. We found simple multinodular goiter as the singular lesion with highest frequency of all hyperplastic lesions, and

of the entire population, accounting for 68.5% of all thyroid lesions. Similar findings were recorded by Salami et al (73.0%),[15] Chalya et al (67.2%),[16] Der et al (77.9%), [18] Solomon et al (53.6%),[19] and Eke et al (75.2%), [20].

Simple goiter results from an interplay of genetic susceptibility and environmental factors [28,29,30]. Iodine deficiency has been identified as the most important acquired trigger in this regard [9,28,31]. A study by Patel et al, demonstrated an increase in thyroid gland volume in Fischer rats fed low dose iodine diet [32]. Conversely, iodine supplementation has been shown to reduce thyroid/goiter volume [10,28,33]. One of the goals of the millennium development goals adopted by the United Nations was the elimination of iodine deficiency [34]. This led to the USI (Universal Salt Iodization) program, an intervention that gained the attribute of being an exceptional cost effective community health strategy [35]. This program was executed with reports of successacross the globe in reducing goiter incidence [36,37,38]. Despite this, iodine deficiency still subsist [28,38].

Iodine deficiency is commonly associated with hilly or mountainous areas [39,40,41,42].This is the attribute of the location of our center, as the designation “Plateau” was used to Christine this state that is located at the north-central part of Nigeria. Furthermore, some food substances (cabbage, broccoli, soya, and cauliflower) have been shown to interfere with uptake of iodine by neutralizing it [43]. These food substances are in abundance in our locality.

Goitrogenesis involves the hyperplasia and hypertrophy of thyroid parenchymal cells and connective tissue [32]. This is triggered by iodine deficiency. Other causative factors includes some drugs (e.g lithium and phenyl betazone), pitituary/thyroid hormone resistance, increased TSH receptor stimulation from pituitary tumors secretions, inborn errors of metabolism, exposure to radiations, smoking, increased BMI (body mass index), thyroid nodule, and female gender [43,44,45]. Ironically, iodine excess has also been reported to be goitrogenic [37,44,46,47,48,49,50,51,52].

Excess iodine intake has been associated with thyroid autoimmunity [53].This is an underlying pathologic mechanism of autoimmune thyroiditis (Hashimoto). Hashimoto thyroiditis has a low frequency of occurrencein this study accounting for 1.6% of all thyroid lesions. This low figure might not be unconnected with insufficiency of iodine in our locality (Plateau state, Nigeria) [30]. The rare occurrence of autoimmune thyroiditis was reported in most African studies [11,14,15,17,18,19,20,26,27,54,55]. Across Nigeria, Raheem et al (Zaria), [14] Solomon et al (Kano), [19] Salami et al (Sagamu), [15] and Dodiyi-Manuel et al (Port-Harcourt), [27] reported a frequency of 1.3%, 0.4%, 0.6%, and 1,3% respectively. Genetic factors have been suggested to be contributory to thyroid auto-antibodies in Africa [56]. Lower levels of these auto-antibodies were established in black Africans than Africans of European and Asian descent [57].

Thyroglossal cyst is a developmental anomaly occurring in the thyroid gland. It is the only developmental anomaly seen in this study. It is also the lone congenital anomaly of the gland reported by other researchers [14,19,20,25,26].Although thyroglossal duct cyst is reported as having a low frequency, our study recorded a figure as lower as 1.9% of all thyroid pathologies. Raheem et al (Kano), Salami et al (Sagamu), Solomon et al (Kano), Eke et al (Abuja), Ijomone et al (Port Harcourt) reported a frequency of 5.7%, 2.2%, 6.9%, 9.2%, and 5.3% respectively for thyroglossal cyst in this regard[14,15,19,20,25].

Malignant thyroid neoplasms (21.0%) were commoner than benign (19.0%) neoplastic proliferations. This finding was corroborated byChalya et al, and Bhaita et al [16,17]. However many other researchers reported a preponderance of benign neoplasm [14,15,18,19,20,25,26]. Dodiyi-Manuel et al reported an equal frequency of occurrence ofthese two broad classesof neoplasia [27].

Malignant neoplasms are by far the most important histopathologic diagnostic entity, and the commonest reported in the thyroid are carcinomas. Thyroid cancer is the commonest endocrine malignancy [58,59]. Worldwide, it's incidence has been increasing [44,60]. Papillary carcinoma and follicular carcinoma are the commonest cancers in this study accounting for 3.2% and 2.9% of all thyroid lesions. The predominance of these cancers over other subtypes was corroborated by many researchers across Africa [11,14,15,18,26,27,54,55,61-67]. The frequent occurrence of papillary thyroid cancer in our study over follicular carcinoma was similar to reports by some researchers [14,18, 26,27,11,63,67]. Other researchers reported the reverse [16,54,55,61,64,65,66]. The reason for this discrepancy within the same continent has not yet been fully elucidated. However, iodine deficiency has been associated with follicular carcinoma,[61] while iodine supplementation (sufficiency) has been linked to papillary thyroid carcinoma [68]. The rising incidence of thyroid carcinoma has been attributed to increase in papillary thyroid carcinoma [69]. This might not be unconnected with the drive towards iodine sufficiency through the USI program lunched across the globe. More studies are needed to trail a possible change in pattern of thyroid carcinoma from follicular to papillary subtype in our environment.

To the best of our knowledge, reported studies across the globe showed a preponderance of female over males in the incidence of thyroid diseases. Our study is no exceptions as there were 25 males and 286 females making a male female ratio of 1:10.2. A similar wide gap has been reported by researchers [14-21,25-27,63,69,70]. Future prospects of studying the possible stimulatory effects of estrogen or estrogen like hormone, or the inhibitory influence of male sex hormones on the thyroid towards the development of disease in the gland is worthwhile.

We found 58.5% (182) cases of thyroid lesions occurring within the third and fourth decade (30 to 49 years). Salami et al (Sagamu), Solomon et al (Kano), and Eke et al (Abuja), documented

similar findings for this age range, as it accounted for 57.2%, 54.8%, and 54.0% respectively for all thyroid lesions [15,19,20]. Raheem et al (Zaria) and Dodiyi-Manuel et al (Port Harcourt), similarly found the age group 30-50 years accounting for 56.2% and 52.5% respectively [14,27]. Ijeomone et al (Port Harcourt), however differ from these, reporting the class 21-40 years as the age group with the highest frequency (63.9%) [25].

Thyroid disorders are essentially a female disease in our environment occurring commonly in the third and fourth decade of life. It is linked to iodine deficiency which is associated with some factors like high altitude and goitrogenic diets, which are attributes of our environment. Multinodular goiter is by far the commonest pathology of the gland in our locality and papillary carcinoma is the most frequent malignancy.

**Disclaimer regarding Consent and Ethical Approval:**

As per university standard guideline participant consent and ethical approval has been collected and preserved by the authors.



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