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An Analytical Survey for Prevalence of Thyroid Lesions in a Secondary Care Centre

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Abstract

Objective: To establish a significant predominance of thyroid lesions in outpatient department of a tertiary care centre in west of Maharashtra.

Materials and methods: This was a hospital based analytical prospective study, conducted in outpatient Department Of Otolaryngology, Rajiv Gandhi Medical College and Chhatrapati Shivaji Maharaj Hospital, Thane, Maharashtra, India; involving 240 patients. The study was carried over duration of 2 years from January 2010 to January 2012. Patients attending endocrinologic clinics and the newly detected cases of thyroid lesions, within set parameters of study, were the subjects of this study. The principal complaint of all patients was neck swelling.

Results: Out of 240 cases 36 cases (15%) were diagnosed as thyrotoxicosis. Others were multinodular goiter (20%), myxedema (18.3%), diffuse goiter (25%), thyroiditis (11.66%) and thyroid carcinoma (10%). From above observations it was obvious that among the thyroid swellings 90% cases were benign and 10% cases were malignant.

Conclusion: It is concluded that even though the number of malignant goiters are increased recently, still benign thyroid swellings are more common. It is also observed thyroid swellings more commonly seen in female population. Similar to previous studies, we have found that papillary carcinoma is the most common type of thyroid.

Keywords: Thyrotoxicosis, Myxedema, Goiter, Malignancy, Thyroid Swellings.

Introduction

Almost one-third of the world's population lives in areas of iodine deficiency and account for an estimated 200 million cases worldwide and 42 million cases in India itself.[1]

Thyroid gland is a highly vascular endocrine gland that is placed anteriorly in the neck, extending from the fifth cervical to the first thoracic vertebrae. Evered et al[2] have observed high serum TSH levels and normal T3 and T4 concentration in case of mild hypothyroidism while, Caldwell et al[3] have examined low serum TSH levels and high levels of T3 and T4 concentration in case of hyperthyroidism due to negative feedback mechanism. Goiter is the most commonly used term related to swelling in front of neck refers to enlargement of thyroid gland. These swellings are mostly nodular or show a smooth

enlargement of thyroid gland. All swellings move on swallowing unless it is fixed to underlying structures due to malignancy.

The prevalence of goiter in areas of severe iodine deficiency can be as high as 80%. Populations at particular risk tend to be remote and live in mountainous areas in South-East Asia, Latin America and Central Africa.[2] Iodine deficiency resulting in goiter occurs 187 million people globally as of 2010 (2.7% of the population) [3] certain areas of the world, due to natural deficiency and unavailability of iodine, are severely affected by iodine deficiency, which affects approximately two billion people worldwide. It is particularly common in the Western Pacific, South-East Asia and Africa. According to World Health Organization, in 2007, nearly 2 billion individuals had insufficient iodine intake, a third being of school age. Thus iodine deficiency, is the single greatest preventable cause of mental retardation, it is a significant cause of defective neurointellectual development in children and adults as well, posing as an important public-health problem.[4]

Goiter is classified as diffuse or nodular. In diffuse goiter the whole thyroid gland have diffuse swelling and with smooth consistency. In nodular goiter, solid or fluid-filled lumps called thyroid nodules develop in the thyroid gland. Nodular goiter is further classified into two types, Unilocular and Multinodular; the nodules may be inactive or toxic. Goiter may also be classified as endemic and sporadic. Endemic goiter occurs due to insufficient dietary iodine intake. More than 10% of the community is usually affected. In sporadic goiter, a lesser number of individuals from the community are affected.

The risk factors include a positive family history, dietary iodine deficiency, age (over 40 years) and female predominance.

Thyroid Lesions are influenced by a variety of epidemiological factors which include Age, Sex, Region, Diet, Iodine Intake, Radiations and Environmental Factors. This particular study specifically works with special emphasis on the aetiopathological and epidemiological aspects leading to endemicity of thyroid in particular geographical regions.

Iodine deficient diet due to inadequate intake of iodine-rich foods or high consumption of certain foods like cabbage, broccoli and cauliflower can cause thyroid dysfunction. Soy also induces goiter. Drugs such as lithium and phenylbutazone, thyroid cancer such as infiltrating papillary thyroid cancer, lymphoma, anaplastic thyroid cancer, thyroid nodules, hormonal conditions like hyperthyroidism or hypothyroidism due to several causes. Autoimmune disorders like autoimmune thyroiditis (Hashimoto thyroiditis) and painless (postpartum) thyroiditis.

Symptoms and Signs of goiter include-

- Enlargement of the thyroid gland in the throat. It may appear as a smooth diffuse swelling or with an irregular surface due to the presence of nodules. It moves vertically during swallowing.
- Difficulty in swallowing due to a large goiter that presses the esophagus or food pipe
- Difficulty in breathing due to a large goiter that presses the windpipe (trachea)
- Hoarseness of voice
- Symptoms of hyperthyroidism or hypothyroidism may be present

Goiter is diagnosed based on the following-

- Physical examination for signs related to thyroid enlargement, such as the size of the gland or nodule, its firmness, mobility and tenderness.
- Blood tests to check for thyroid hormone levels and specific antibodies. The patient is identified to have an

underactive thyroid if the TSH is elevated. Some patients with goiter may have normal thyroid hormone levels.

- If the thyroid nodule is larger than 1.0-1.5 cm in diameter and with TSH level of normal or high, then the patient is advised a fine needle aspiration biopsy. The biopsy may reveal a benign nodule, thyroid cancer, or an uncertain diagnosis. In some cases, an inadequate specimen may be obtained.
- Ultrasound scan or a radioactive iodine scan is performed. A thyroid sonogram or ultrasound sends inaudible sound waves into the neck in such a way that the returning echoes determine the structure of the thyroid and surrounding tissues. A radioactive scan determines if the nodule is a hot nodule (a hyperactive nodule that takes up more radioactive iodine) or a cold nodule (a hypoactive nodule that takes up less radioactive iodine). Cancerous nodules appear as cold nodules on a radioactive thyroid scan, though some benign nodules may also appear cold.
- Symptoms of hyperthyroidism or hypothyroidism may be present
- Physical examination is performed by a doctor who examines for signs related to thyroid enlargement, such as the size of the gland or nodule, its firmness, mobility and tenderness.
- Blood tests are performed to check for thyroid hormone levels and specific antibodies. The patient is identified to have an underactive thyroid if the TSH is elevated. Some patients with goiter may have normal thyroid hormone levels.
- If the thyroid nodule is larger than 1.0-1.5 cm in diameter and with TSH level of normal or high, then the patient is advised a fine needle aspiration biopsy. The biopsy may reveal a benign nodule, thyroid cancer, or an uncertain diagnosis. In some cases, an inadequate specimen may be obtained.
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The thyroid pathology and their lesions clinically have been categorized as hypothyroid state, euthyroid state and hyperthyroid states. Thyroid pathology includes a whole spectrum within them–ranging from hormonal imbalances, manifesting as obvious Goitrogenic enlargements in the neck (surgical causes)– encompassing Endemic, Autoimmune Etiology to Neoplastic lesions at the other end of the spectrum.

The term subclinical hypothyroidism is used to describe the finding of a raised serum thyrotropin (TSH) but a normal free thyroxine (T4). In the community, the most common etiology is chronic autoimmune thyroiditis. The mean annual incidence of spontaneous hypothyroidism during the 20-year follow-up period was 3.5 per 1000 and 0.6 per 1000 in surviving women and men, respectively.[5]

The aim of this study was to find out the prevalence of thyroid lesions in the adult population of Maharashtra state and to study and analyze the aetiopathological factors for causation of those thyroid lesions.

Materials and Methods

This was a hospital based cross sectional analytical study conducted in the outpatient Department of Otolaryngology, Rajiv Gandhi Medical College and

Chhatrapati Shivaji Maharaj Hospital, Thane, Maharashtra, India; involving 240 patients over the duration of 2 years from January 2010 to January 2012.

The individuals having a history and or clinical signs and symptoms of thyroid swelling and disorder during the study period and all cases of thyroid lesions presenting as lump or nodule in neck with or without lymphadenopathy attending the OPD were included in the study.

All genetic/ congenitally affected thyroid patients, antenatal cases with thyroid abnormalities, thyroid disorders caused due to drug intake/ side effects, patients having thyroid complications due to surgery and patients undergoing treatment for thyroid disorders were excluded from the study.

Descriptive statistics like mean and percentages were used to interpret the results. Microsoft office 2007 was used for making tables and graphs.

Results

Figure-1 distribution of lesions based on thyroid function in which diffuse goiter has highest hypothyroid levels, and thyrotoxicosis have least tsh levels.

Figure- 2 indicated the gender wise distribution of the thyroid cases. Of the 240 cases during a period of 2 years, all lesions showed female predominance in the study.

Table- 1 showed age based distribution of thyroid lesions in which most of the thyroid swellings were diagnosed in the age group of 30-49 yrs i.e 136 cases (48.4%) and least occurrence diagnosed in the age group of above 60 years i.e.18 (7.5%).

Discussion

The worldwide prevalence of goiter in the general population is estimated at 4%–7% and the incidence of malignancy in tortious thyroid is about 10%[3].

Among thyroid malignancies, papillary thyroid carcinoma (PTC) is the most common malignant tumor of the thyroid gland, accounting for 85% of all thyroid cancers.[4]

An increased incidence of thyroid carcinoma has been noted in endemic goiter regions such as Columbia and Austria as well as in non-endemic goiter regions such as Iceland and Germany. It was also noted that follicular thyroid carcinoma (FCA) and anaplastic thyroid carcinoma (ANA) occurred more frequently in endemic goiter regions than in goiter-free areas. This implies that highly aggressive thyroid cancer prevails in countries with endemic goitre.[5, 6]

The Universal Salt Iodization programme was meant to be a major slogan to solve this problem. While focusing on this issue, it is the duty and responsibility of healthcare professionals to be aware of the consequences of increased iodine intake which could probably result in either iodine-induced thyrotoxicosis or thyroid cancers.[7]

Thyrotoxicosis is transient and of less significance, while thyroid cancer requires early detection and treatment. From observation in 2 years, out of 60 cases of goiters only 9 cases (15%) were malignant.

A higher incidence of cancer at 26.4% was also observed in a three-year study done in Myanmar. From the Myanmese study, it was observed that there was a high incidence of thyroid cancer in the age range between 21 and 60 years, in both follicular and papillary patterns.[8]

The possibility of a significantly higher chance of malignancy in males should be considered in this situation as there is a disparity between male and female patients with thyroid cancers, according to Machens et al in 2006.[9]

They emphasized that an early diagnosis and treatment of thyroid cancer in male patients are needed because the cancer may behave more aggressively in men than in women, as there is a marked variation in the risk of hormone-dependent cancers found between males and females.[9]

Riccabona in 1980 and Bikiri et al in 1998, those highly-aggressive thyroid cancers like FCA and ANA were more prevalent in countries with endemic goiter.[5, 6]

From our study, we did not observe any case of medullary carcinoma, although existing literature reports its presence in less than 5% of the total thyroid malignancy.[10]

Primary operations for benign goiter were associated with a 5.3% and 0.3% incidence (3.4% and 0.2% nerves at risk) of transient and permanent nerve palsy.[11]

An estimated 200 million people around the world suffer from some or the other kind of thyroid dysfunction, India itself accounting for almost 42 million, which is a major proportion. And that is why the epidemiology of thyroid dysfunction is very significant in the present scenario. A range of factors affect the thyroid gland and decide its abnormalities. These mainly include- age, sex, genetic/hereditary factors, diet, salt (Iodine Intake), Environmental factors (geographical), Radiations (Industrial/Occupational). The epidemiological parameters like sex, age and diet were considered in our study and correlated with each individual thyroid lesion.[32, 33]

Lesion based distribution: Out of 240 cases of thyroid lesions, cases of goiter were maximum (45%), amongst which diffuse goiter (25%) were slightly more than nodular goiters (20%). Cases of myxedema were 19% and those of thyrotoxicosis were 15%. The other two categories of thyroid lesions were thyroiditis which was 11% and the least in frequency of presentation was thyroid cancers (10%).

The cases had the following distribution of thyroid lesions- thyrotoxicosis 36, myxedema 44, thyroiditis 28, diffuse goiter 60, nodular goiter- 48, and carcinoma thyroid- 24; total cases in the present study were 240.

Figure-1 shows the age wise distribution of the thyroid cases. Of the 240 cases during a period of 2 years, most of the thyroid swellings were diagnosed in the age group of 20-39 yrs i.e. 54 cases (50.4%) and least occurrence diagnosed in the age group of above 50 (7%). Figure-2 shows the different surgical pathologies and procedures of thyroid obtained during the study. Out of 240 cases 60 cases (25%) were diagnosed as colloid goiter. Others were multinodular goiter 48 (20%), thyroid cyst (10.2%), Follicular adenoma (9.3%), and papillary carcinoma (2.8%), undifferentiated carcinoma (0.9%). From above observations it was obvious that among the thyroid swellings 87% cases were benign, and 13% cases were malignant. Lobectomies were performed in 4 (3%), Hemi thyroidectomies 75 (70%), Near Total thyroidectomies were performed in 22 (20.5%). In 6 cases performed total thyroidectomy. Table 1 shows the variation of structures during surgery as identification of superior parathyroid and identification of inferior parathyroid, etc.

A. Brander et al[6] found solitary Nodular Goiter in 79% and Thyroiditis in 3.2% patients. Fabrizio Aghini-Lombardi et al[7] found that the prevalence of goiter was 59.8% in adults. Thyroid Nodularity was found in 0.5% children and progressively increased with age to 28.5%. The prevalence of hyperthyroidism was 2.9% that of hypothyroidism in the adults were 4%, of diffuse autoimmune Thyroiditis was 3.5% whereas only one case of Thyroid cancer was found. However in contrast Martin A Nzegwu et al[8] in their study found that the most common entity is Multinodular Goiter 72(44.2%). Simple Colloid Goiter is 31(19%), Diffuse Toxic Goiter 5(3.1%) and Thyroid Adenomas (majority; Follicular) are 17(10.4%).

The present study has a distribution very similar to the above mentioned studies. Goiters were uniformly of the highest frequency in all the mentioned studies followed by thyroiditis and least among the thyroid disorders are the neoplasms of thyroid.

Age base correlation of thyroid lesions: The present study highlights a significant link between thyroid lesions with age like thyrotoxicosis and diffuse goiters occur in younger age groups (<45yrs) in comparison to myxedema and nodular goiter which occur in elderly population (>40yrs of age). Thyroiditis is seen to occur more in the middle age 40-49 yrs. and thyroid cancers are evenly spread all across the age spectrum.

Except for Thyrotoxicosis and diffuse Goiter, all the other thyroid lesions were more prevalent above 40 yrs. of age as found by M Helmand et al[9] who also found that Thyroid Disorders are mainly found in women over 40 yrs. of age but hardly found in young males. Fabrizio Aghini-Lombardi et al[7] found that the prevalence of goiter was 16.0% in children and 59.8% in adults. They also found that Thyroid Nodularity was 0.5% in children and progressively increased with age to 28.5% in the 56- to 65-yr-old group, thereby a progressive increase with age of goiter prevalence, thyroid Nodularity, and functional autonomy was observed. Guth S. et al[23] in their study detected that in 68% patients (in 432 of 635 patients) thyroid nodules could be detected with an increasing incidence with age. R. W. V. Flynn et al[24] found that although the incidence of both hyperthyroidism and hypothyroidism was found to increase with age, the trend was more pronounced among the hypothyroid subjects, with the highest incidence found in the 80+ age category.

We found an increase in incidence of Thyroid disorders with age (except in Thyrotoxicosis and Solitary Nodular Goiter) which correlated with the studies of Fabrizio Aghini-Lombardi. et al[20], M Helmand et al[22], Guth S. et al[23] and R. W. V. Flynn et al[24]. However in contrast, Martin A Nzegwu et al[21] in their study found that Multinodular Goiter occurs at the mean age group of 39.5 yrs. Simple Colloid Goiter is seen at a mean age of 38.7 years whereas Thyroid Cancers are seen at a mean age range of 22-49 years.

Gender based differences: Thyroid lesions are 5-7 times more common in female population than in males and their Incidence increases with age. Very few systemic organs have so much gender bias as that found in endocrine gland, the thyroid gland. Thyroid disorders ranging from hormonal imbalances due thyrotoxicosis, myxedema, inflammatory conditions (autoimmune, infective) thyroiditis, goiters and thyroid cancers each one of these disorders are much more prevalent amongst women than in men.[12] Disparities between men and women have been based on several concepts some of them focus on differential screening, behavior differences amongst gender, biological differences, hormonal based cell responses, tumor cell biology, biological sex differences may account for the gender discrepancies resulting in thyroid lesions being predominant in females. Unlike men in females the TSH levels vary depending on phase of their menstrual cycle, pregnancy, intake of hormone replacement therapy (HRT) or oral contraceptives, and possibly during lactation. TSH tends to rise in such situations and is a known promoter of thyroid hyperplasia and may therefore be involved in goiter formation as well as tumorogenesis.

In the present study, the Thyroid Lesions were found predominantly in Females i.e. 70% (168 patients) but were found less in Males 30% i.e. (72 patients). The male: female ratio was 3:7, for over all thyroid related disorders combined.

M P Vanderpump et al[15] found in their study a mean incidence of 4.1/1000 survivors/year of spontaneous hypothyroidism in women for all causes of hypothyroidism as compared to a mean incidence of 0.6/1000 survivors/year in men. The mean incidence of hyperthyroidism in women was 0.8/1000 survivors/year

(0.5-1.4) and was negligible in men. Similarly M Helfand et al[9] also found a higher incidence of both Hypothyroidism and Thyrotoxicosis in females whereas A Brander et al[19] found similar female dominance in occurrence of Goiterous Lesions. Martin A. Nzegwu et al[21] studied 163 Thyroidectomy cases and found a female to male ratio of 6.4:1 (141 females and 22 males).

An over-all female preponderance was there with our study having a male female ratio of 1:6, very similar to the findings of Martin A. Nzegwu et al.[21] Goiter amongst females was almost three times that amongst that of males with a male: female ratio of 1:3.4, this was in concordance with findings of A Brander et al[19] The M:F ratio in Myxedema (hypothyroidism) and thyrotoxicosis (Hyperthyroidism) was 1:9 and 1:3 respectively while that of thyroiditis and thyroid cancer was 1:2 and 1:2.6 respectively. Similarly M Helfand et al[22] and M P Vanderpump et al[15] also found a higher incidence of both Hypothyroidism and Thyrotoxicosis in females. R. W. V. Flynn et al[24] found that Thyroid dysfunction affected females more than males; the variation ranging from a 2-fold increase in the 80+ age group to an 8-fold increase in younger age groups (a relationship true for both hyper- and hypothyroidism).

Despite the present study had similar findings to the results found by M. P. Vanderpump et al[15], A. Brander et al[6], Martin A. Nzegwu et al[8], M. Helfand et al[9] and R. W. V. Flynn et al[24], However the present study did not show a major lesion based association, when thyroid lesions where compared to gender ratio on an individual basis, suggesting the fact that factors like genetics, geographical distribution, diet and age influence and contribute in the occurrence of various thyroid abnormalities irrespective of the individual's gender.

Dietary factors: There is a growing awareness that a plant-based diet decreases morbidity and mortality associated with a range of chronic disease. However, there are concerns that vegetarian diets may be low in calcium, vitamin D, vitamin B12, and zinc. As well as iodine which is found mainly in iodized salt, breads and dairy sources. Vegetarians may consume less iodine than their omnivorous counterparts[13]. Vegans may be at risk of inadequate iodine intake as animal products tend to be rich in iodine[14]. Study of British, and recently, U.S. vegetarians indicated that vegans are at risk of iodine deficiency by the authors Appleby P. et al[28] and Leung A.M. et al[29] respectively.

The presence of Goitrogens (they are naturally-occurring substances that can interfere with function of the thyroid gland) in Diet is an important factor which decides Thyroid Lesions. They might be Cruciferous vegetables like Cabbage, Cauliflower, Mustard, Turnips; Millet, Peanuts, Spinach and Soybean and Soy products.

Vegetarian diet 63% (160) in the present study was more prone for development of thyroid lesions than non-vegetarian diet 37% (80). The present study showed a statistical significant relationship between thyroid lesions like myxedema and goiters and even thyroid cancers with a vegetarian diet, possibly linked to iodine starvation or goitrogenous/ brassica group of foods interfering with normal iodine metabolism. There was also a significant relationship between thyrotoxicosis, thyroiditis and with non-vegetarian diet, probably due to excess iodine content of the diet. Krajcovicova-Kudlackova M., et al[26], Remer T. et al[27], Appleby P.N et al[28], Leung A.M et al[29], found similar findings in diet as in the present study where in the vegetarians had significant incidence of hypothyroid and goitrogenous disorders as compared to non-vegetarians and in contrast at times non-vegetarian diet consisting of food rich in iodine may result in hyperthyroidism, this is known as the Jod- Basedow phenomenon[17]. The Jod-Basedow effect is hyperthyroidism following

administration of iodine or iodide, either as a dietary supplement or as contrast medium. This phenomenon is thus iodine-induced hyperthyroidism typically presenting in a patient with endemic goiter (due to iodine deficiency), who relocate to an iodine-abundant geographical area. People who have Graves' disease, toxic multinodular goiter, or various types of thyroid adenoma are also at risk of Jod-Basedow effect when they ingest extra iodine.

Consumption of Iodized salt (30 ppm at production point and minimum 15 ppm of Iodine at consumer level) is necessary for Proper Thyroid functioning. Urbanized and more populated regions show a great occurrence of thyroid lesions as compared to the rural and less populated areas. In the present study, Goiter and myxedema showed statistically significant relationship (table 11) with iodine deficiency in thyroid however, lesions like thyrotoxicosis, thyroiditis and thyroid cancer have an increased occurrence with increased intake of iodized salt, probably due to the Jod-Basedow phenomenon.

P Laurberg et al[31] observed that thyroid abnormalities in populations with low iodine intake develop goiter and those with high iodine intake develop thyroid hyper function. Fabrizio Aghini-Lombardi et al[20] concluded in their study that in an iodine-deficient community, a progressive increase with age of goiter prevalence, thyroid Nodularity, and functional autonomy was observed. Hyperthyroidism was twice as high as that reported in iodine-sufficient areas, mainly due to an increased frequency of toxic nodular goiter. However the prevalence of both overt and subclinical autoimmune hypothyroidism was not different from those observed in iodine-sufficient areas.

Conclusion

We conclude that the commonest thyroid lesion found was Goiter. Almost all of the thyroid lesions were of hypothyroid in their function with exception of thyrotoxicosis and carcinoma thyroid which were hyperthyroid and euthyroid each. Thyroid lesions were found predominantly in females, though individual thyroid pathology had no co relation based on gender. Age related lesion pathology was significant, with thyrotoxicosis and diffuse goiter occurring below 45 years of age whereas myxedema and nodular goiter occurring above 45 yrs. of age and Vegetarian diet and low iodine uptake was more associated with myxedema, goiters and carcinoma thyroid whereas thyrotoxicosis and thyroiditis are more or less associated with non-vegetarian diet and increased iodized salt uptake. The present study puts emphasis that various epidemiological factors definitely play a significant role in the etiopathogensis of various thyroid pathological lesions.

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Figures and Tables

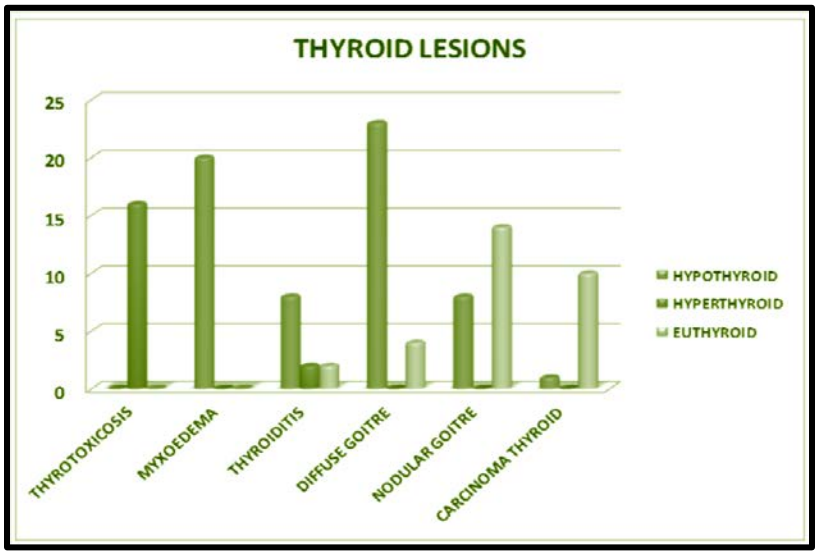

Figure 1: Distribution Of Lesions Based On Thyroid Function

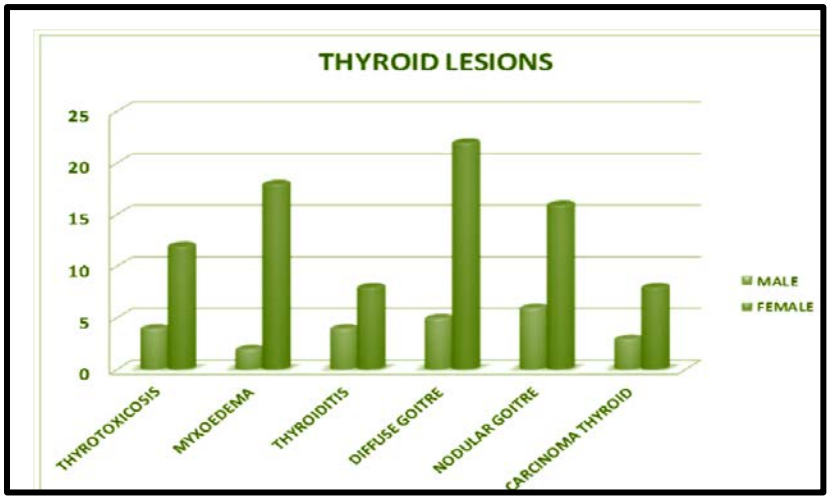

Figure 2: Gender Based Distribution of Thyroid Lesions

Thyroid lesions	20-29 Yrs.	30-39 Yrs.	40-49 Yrs.	50-59 Yrs.	60<	Total
Thyrotoxicosis	19	17	-	-	-	36
Myxedema	-	-	18	16	10	44
Thyroiditis	-	7	15	6	-	28
Diffuse goiter	24	28	08	-	-	60
Nodular goiter	-	14	20	9	5	48
Carcinoma thyroid	5	4	5	7	3	24
Total	**48**	**70**	**66**	**38**	**18**	**240**

Table 1: Age Based Distribution of Thyroid Lesions