

## EPIDEMIOLOGY OF THYROID LESIONS IN WARDHA DISTRICT OF CENTRAL INDIA

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### HOW TO CITE THIS ARTICLE:

Samarth Shukla, Sourya Acharya, Parijat Pansey, Pratibha Dawande, Ankita Tamhane. "Epidemiology of Thyroid Lesions in Wardha District of Central India". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 7, February 16, 2015; Page: 799-810.

**ABSTRACT: AIMS:** To establish a significant predominance of thyroid lesions in and around Wardha district, and to establish specific etiological link for the predominance the thyroid lesions.

**MATERIALS AND METHODS:** This was a hospital based analytical prospective study, conducted in Acharya Vinobha Bhave Rural Hospital (A.V.B.R.H.) involving 108 patients. The study was carried over a duration of 1 year January 2010 to December 2010. Patients attending endocrinological clinics and the newly detected cases of thyroid lesions, within set parameters of study, were the subjects of this study. **OBSERVATION:** Thyroid lesions which we came across in the course of the study were Thyrotoxicosis, Myxoedema, Thyroiditis, Diffuse goitre, Nodular Goitre and Carcinoma Thyroid. These were correlated with epidemiological factors like Age, Sex, Region, Diet and Iodine Intake. Significant relationship between thyroid function, age of patient, diet was seen in comparison to individual thyroid lesions. **CONCLUSION:** Goitre was the commest pathology encountered. Almost all of the thyroid lesions were of hypothyroid in their function with exception of thyrotoxicosis and carcinoma. Thyroid lesions were found predominantly in females, Age related lesion pathology was significant, and vegetarian and non-vegetarian diets along with low and high iodine salt uptake had obvious pathological effects on thyroid.

**KEYWORDS:** Thyrotoxicosis, Myxoedema, Goitre, Carcinoma.

**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.<sup>[1]</sup> The prevalence of goitre 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.<sup>[2]</sup> Iodine deficiency resulting in goiter occurs 187 million people globally as of 2010 (2.7% of the population)<sup>[3]</sup> 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.<sup>[4]</sup>

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

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enlargements in the neck (surgical causes) – encompassing Endemic, Autoimmune Aetiology 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 (T<sub>4</sub>). In the community, the most common aetiology 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.<sup>[5]</sup>

Hyperthyroidism or Thyrotoxicosis is a hypermetabolic state caused by elevated circulating levels of T<sub>3</sub> and T<sub>4</sub> and like Hypothyroidism, it has female predominance (4:1). The most common causes of hyperthyroidism are Graves' disease, followed by toxic multinodular goitre, whilst rarer causes include an autonomously functioning thyroid adenoma or thyroiditis. In epidemiological studies, however, the aetiology is rarely ascertained. The prevalence of hyperthyroidism in women is between 0.5 and 2%, and is 10 times more common in women than in men in iodine-replete communities.<sup>[1]</sup> The Hypo and Hyper thyroidism can be a denovo process as part of an auto immune process or a part of goitrogenic, inflammatory or neoplastic lesion of thyroid besides being secondary to associated endocrine organs (pituitary, hypothalamus).

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.

## **AIM AND OBJECTIVES:**

### **AIM:**

- I. To establish specific etiological link for the predominance the thyroid lesions in and around Wardha district.

### **OBJECTIVES:**

- I. To find out the prevalence of thyroid lesions in the adult population of Wardha district, Maharashtra.
- II. To study and analyze the aetiopathological factors for causation of those thyroid lesions.

**MATERIAL AND METHODS:** This was a hospital based cross sectional analytical study conducted in Acharya Vinobha Bhave Rural Hospital (A.V.B.R.H.) a 909 bedded rural tertiary hospital of Datta Meghe Institute of Medical Sciences University Sawangi, Wardha.

**DURATION OF STUDY:** The Duration of study was 1 year from January 2010 to December 2010.

**SAMPLE SIZE:** A Sample Size of 108 Subjects was studied.

### **STUDY PARTICIPANTS:**

### **INCLUSION CRITERIA:**

1. All the patients attending the endocrinological clinics in Acharya Vinobha Bhave Rural Hospital having a history and or clinical signs and symptoms of thyroid disorder during the study period.

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2. All cases of thyroid lesions presenting as lump or nodule in neck with without lymphadenopathy attending the surgery OPD at Acharya Vinobha Bhave Rural Hospital during the study period.

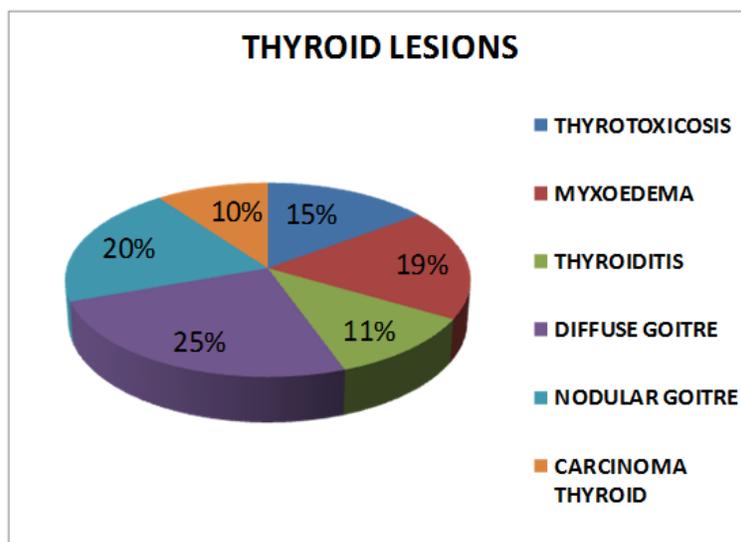
## EXCLUSION CRITERIA:

1. All genetic/ congenitally affected thyroid patients.
2. Antenatal cases with thyroid abnormalities.
3. All cases of thyroid disorders caused due to drug intake/side effects.
4. Patients having thyroid complications due to surgery.
5. Patients undergoing treatment for thyroid disorders.

**OBSERVATIONS AND RESULTS:** The present epidemiological study on thyroid lesions was carried out in this tertiary care rural hospital of central India, AVBRH Sawangi (Meghe), Wardha, from January 2010 to December 2010, the total number of newly diagnosed thyroid based disorders were 108.

The cases had the following distribution of thyroid lesions- thyrotoxicosis 16, myxoedema 20, thyroiditis 12, Diffuse Goitre 27, Nodular Goitre- 22, Carcinoma Thyroid- 11.

Total cases in the present study were 108.



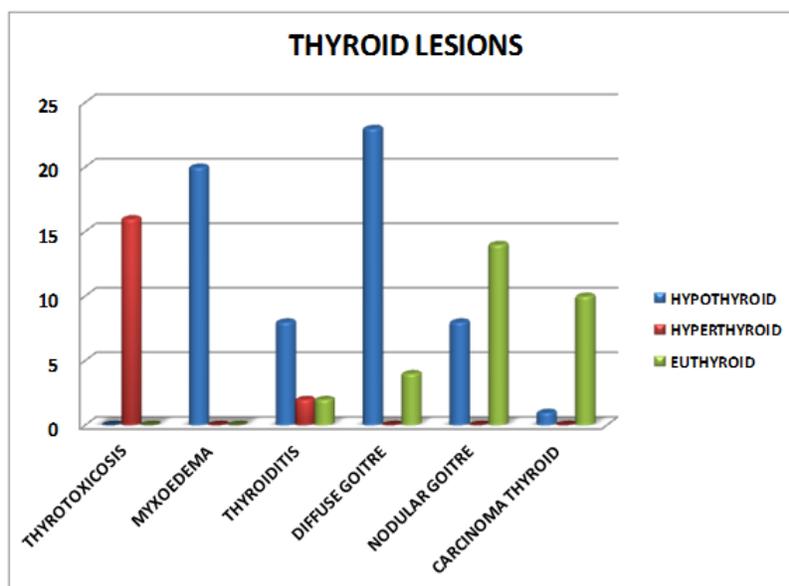
**Graph 1**

**Table/Graph 1** depicts Distribution of thyroid lesions in the present epidemiological study.

Cases of Goiter were maximum (45%), amongst which diffuse goiter (25%) were slightly more than nodular goiters (20%). Cases with clinical symptomatology without evident thyroid enlargement were next in presentations totaling to 34 out of which patients of myxoedema were 19% and those of thyrotoxicosis were 15%. The other two categories of thyroid lesions were thyroiditis which were 11% and the least in frequency of presentation was thyroid cancers (10%).

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## DISTRIBUTION OF LESIONS BASED ON THYROID FUNCTION:



**Graph 2**

**Table/Graph 2:** Depicts the categorization of thyroid lesions as per the clinical thyroid profile of the patients into hyperthyroid, hypothyroid and euthyroid.

A total of 14% (16) patients presented with thyrotoxicosis with elevated  $T_3$  and  $T_4$ , 18.5%(20) cases with myxoedema presented with hypothyroid thyroid profile levels, with Low  $T_3$  and  $T_4$  levels and raised or modest TSH levels. Cases with thyroiditis mainly presented as hypothyroid patients 7% (8) with 1.8% (two) cases each of hyperthyroid and euthyroid state. Goitres both diffuse and nodular presented maximally with a hypothyroid state 21% (23) and 7% (8) respectively, Number of euthyroid cases were maximum in Nodular goiter 13% (14) as compared to diffuse goiter 3%. (4) Carcinoma thyroid patients most commonly presented with an euthyroid state 9% (10 cases) 0.9% (one) case was of hypothyroid profile.

## AGE BASED DISTRIBUTION OF THYROID LESIONS:

THYROID LESIONS	20-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	60-above yrs	Total
THYROTOXICOSIS	8	8	-	-	-	(16)
MYXOEDEMA	-	-	8	8	4	(20)
THYROIDITIS	-	2	8	2	-	(12)
DIFFUSE GOITRE	11	11	07	-	-	(27)

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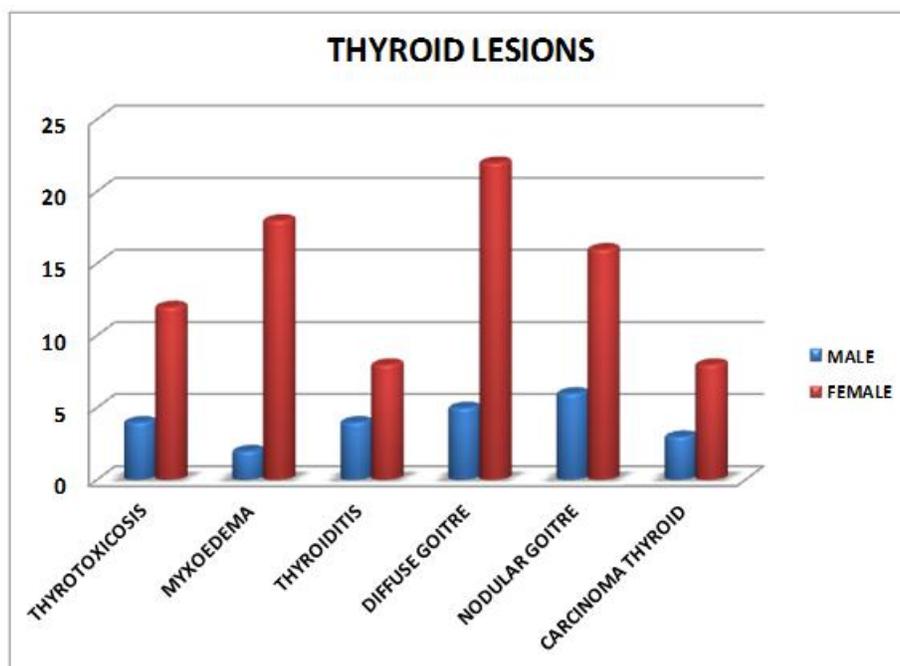
NODULAR GOITRE	-	4	10	6	2	(22)
CARCINOMA THYROID	1	2	3	3	2	(11)
<b>TOTAL</b>	<b>(16)</b>	<b>(27)</b>	<b>(33)</b>	<b>(19)</b>	<b>(08)</b>	<b>(108)</b>

Table 3

**Table/Graph 3:** depicts Age wise distribution of Thyroid Lesions.

Though the thyroid lesions do not have an obvious age related distribution, Thyrotoxicosis is more evident <40yrs of age whereas Myxoedema, has its occurrence in the latter years >40yrs in the present study group. Thyroiditis was found mainly in the age group 40-49 yrs. Goitres on the whole were again widely spread across the age spectrum, however considering spectral growth of goiters, the diffuse goiter majority of cases were found from early twenties to 50yrs. Nodular goiter out of a total of 22 cases 18 presented beyond 40yrs of age and above. Neoplastic lesions were broadly spread across the age spectrum from late twenties to 60 yrs and above forming around 10% cases. In the study, the Thyroid Lesions were found predominantly in Females i.e. 77% (84 patients) but were found less in Males 13% i.e. (14 patients). The male: female ratio was 1: 6, for over all thyroid related disorders combined.

### GENDER BASED DISTRIBUTION OF THYROID LESIONS:



**Graph 4**

**Table/ Graph 4:** Sex wise Distribution of Various Thyroid Lesions.

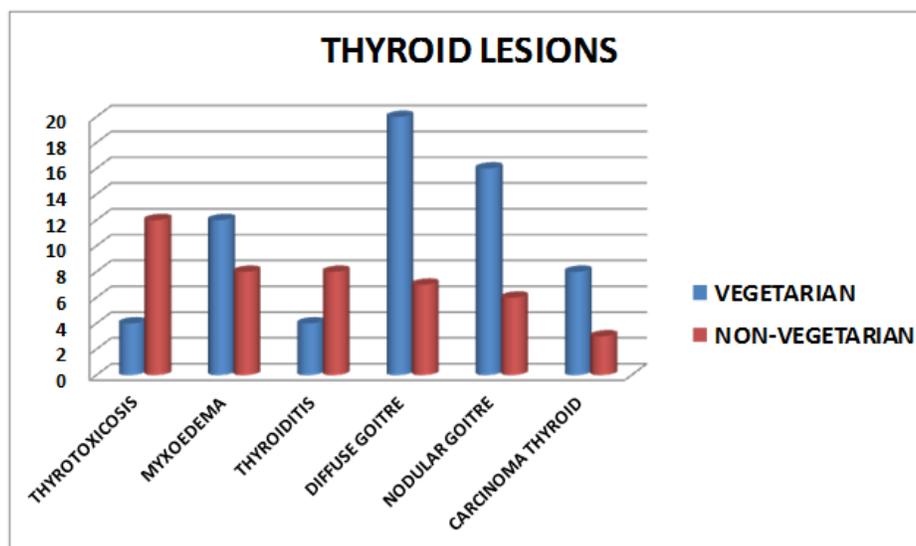
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Graph depicts the Sex wise Distribution of the Various Thyroid Lesions separately. Mainly females were found to be affected. More females were found to have Diffuse Goitre 20% (22) followed by Myxoedema 16% (18), Nodular Goitre 14% (16), thyrotoxicosis 11% (12) and Thyroiditis 7% (8), and Carcinoma Thyroid was 7% (8).

Amongst Males which were much less affected with thyroid disorders, were found to be affected as follows. Males were found to have goiter as the commonest thyroid lesion, Nodular Goitre 5.5% (6) Diffuse Goitre 4% (5), followed by thyrotoxicosis 3% (4) and Thyroiditis 3% (4), Carcinoma Thyroid were 2.7% (3), whereas cases of Myxoedema 1% (2).

Goitre amongst females was almost three times that amongst that of males with a male:female ratio of 1:3.4, The M:F ratio in Myxoedema (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.

## DIET (VEGETARIAN/NON-VEGETARIAN) WISE DISTRIBUTION OF THYROID LESIONS:



**Graph 5**

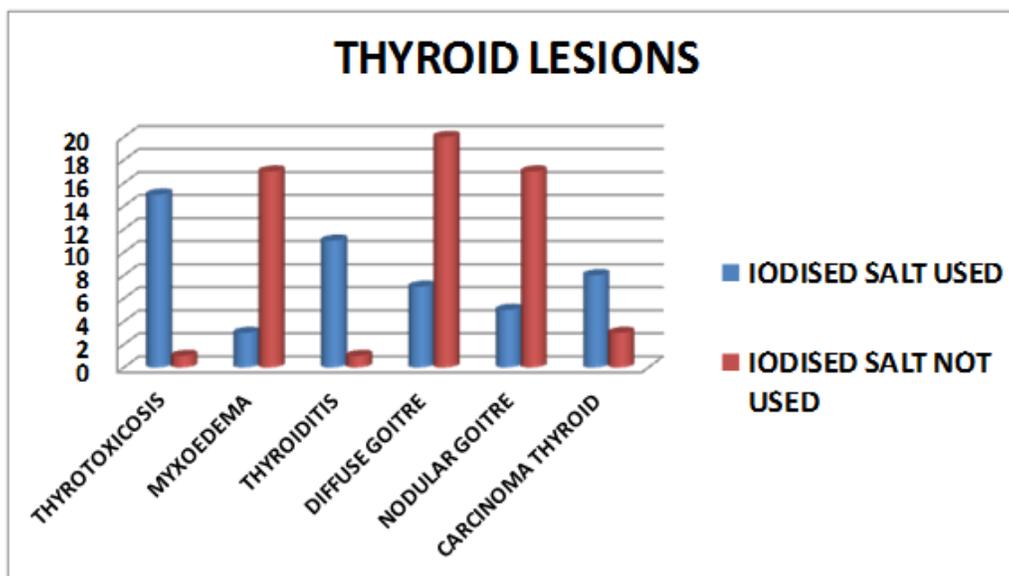
**Table/Graph 5:** depicts Dietary Pattern of Various Thyroid Lesions.

The particular graph depicts vegetarian and non-vegetarian dietary patterns amongst various thyroid disorders. Thyrotoxicosis at 11% (12 cases) and Thyroiditis at 7% (8 cases) were predominant amongst the non-vegetarians as compared to vegetarians suffering from Thyrotoxicosis and Thyroiditis both at 3% (4), Myxoedema was slightly higher amongst the vegetarians 11% (12) in comparison to the non-vegetarians 7% (8 cases). Goiters and carcinoma thyroid were more commonly seen amongst the Vegetarians that is 7% (8), 33% (36) and 7%<sup>(8)</sup> cases respectively as against the same disorders in the non-vegetarians 3% (4) 12% (13) and 2% (3) in that order.

Vegetarian diet 61% (66) in the present study was more prone for development of thyroid lesions, in comparison to incidence of thyroid lesions with non-vegetarian diet 39% (42).

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## DIET (IODIZED/NON-IODIZED SALT) WISE DISTRIBUTION OF THYROID LESIONS:



Graph 6

**Table/Graph 6:** Usage of Iodized Salt and Non-Iodized Salt in various Thyroid Lesions.

Thyroid disorders both, thyrotoxicosis 13% (15) cases and thyroiditis 10% (11) cases as had iodized salt as to opposed to 0.9 % (one case) each having non-iodized salt. Carcinoma thyroid 7% (8) cases had iodized salt as opposed to 2% (3) who were having non-iodized salt intake, whereas

Myxoedema 15% (17) cases had a diet of non-iodized salt as opposed to 2% (3) having normal iodized salt, both diffuse and nodular goiters 34% (37) cases who had non-iodized salt as opposed to 11%(12) cases with normal iodized salt in their diets.

**DISCUSSION:** 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 regional Belt encompassing Wardha and the surrounding places has a high incidence and prevalence of thyroid lesions. The Epidemiological parameters like Sex, Age and Diet were considered in our study and correlated with each individual thyroid lesion.

**LESION BASED DISTRIBUTION:** Out of 108 cases of thyroid lesions, Cases of Goiter were maximum (45%), amongst which diffuse goiter (25%) were slightly more than nodular goiters (20%). Cases of myxoedema 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%).

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A. Brander et al<sup>[6]</sup> found solitary Nodular Goitre in 79% and Thyroiditis in 3.2% patients. Fabrizio Aghini-Lombardi et al<sup>[7]</sup> 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<sup>[8]</sup> in their study found that the most common entity is Multinodular Goiter 72(44.2%). Simple Colloid Goitre 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. Goitres 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 goitres occur in younger age groups (<45yrs) in comparison to myxoedema and nodular goiter which occur in elderly population (>40yrs of age). Thyroiditis are 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 Goitre, all the other thyroid lesions were more prevalent above 40 yrs of age as found by M Helfand et al<sup>[9]</sup> 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<sup>[7]</sup> 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<sup>[10]</sup> 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<sup>[11]</sup> 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 Goitre) which correlated with the studies of Fabrizio Aghini-Lombardi et al,<sup>[7]</sup> M Helfand et al<sup>[9]</sup> Guth S et al<sup>[10]</sup> and R. W. V. Flynn et al.<sup>[11]</sup> However in contrast, Martin A Nzegwu et al<sup>[8]</sup> in their study found that Multinodular Goitre occurs at the mean age group of 39.5 yrs. Simple Colloid Goitre 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 has so much gender bias as that found in endocrine gland, the thyroid gland. Thyroid disorders ranging from hormonal imbalances due thyrotoxicosis, myxoedema, inflammatory conditions (autoimmune, infective) thyroiditis, goiters and thyroid cancers each one of these disorders are much more prevalent amongst women than in men.<sup>[12]</sup> Disparities between men and women have

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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 goitre formation as well as tumorigenesis.

In the present study, the Thyroid Lesions were found predominantly in Females i.e. 77% (84 patients) but were found less in Males 13% i.e. (14 patients). The male: female ratio was 1:6, for over all thyroid related disorders combined.

M P Vanderpump et al<sup>[5]</sup> 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<sup>[9]</sup> also found a higher incidence of both Hypothyroidism and Thyrotoxicosis in females whereas A Brander et al<sup>[6]</sup> found similar female dominance in occurrence of Goiterous Lesions. Martin A. Nzegwu et al<sup>[8]</sup> 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<sup>[8]</sup> Goitre 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.<sup>[6]</sup> The M:F ratio in Myxoedema (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<sup>[9]</sup> and M P Vanderpump et al<sup>[5]</sup> also found a higher incidence of both Hypothyroidism and Thyrotoxicosis in females. R. W. V. Flynn et al<sup>[11]</sup> 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,<sup>[5]</sup> A. Brander et al,<sup>[6]</sup> Martin A. Nzegwu et al,<sup>[8]</sup> M. Helfand et al<sup>[9]</sup> and R. W. V. Flynn et al<sup>[11]</sup> However the present study did not show a major lesion based association, when thyroid lesions were 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.<sup>[13]</sup> Vegans may be at risk of inadequate iodine intake as animal products tend to be rich in iodine.<sup>[14]</sup> Study of British, and recently, U.S. vegetarians

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indicated that vegans are at risk of iodine deficiency. Appleby P. Net al,<sup>[15]</sup> and Leung A.M., et al<sup>[16]</sup> 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 61% (66) in the present study was more prone for development of thyroid lesions in comparison to incidence of thyroid lesions with non-vegetarian diet 39% (42). The present study showed a statistical significant relationship between thyroid lesions like myxoedema 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,<sup>[13]</sup> Remer T. et al.<sup>[14]</sup> Appleby P.N et al,<sup>[15]</sup> Leung A.M et al,<sup>[16]</sup> 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.<sup>[17]</sup> 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 Iodised salt (30 ppm at production point and minimum 15 ppm of Iodine at consumer level) is necessary for Proper Thyroid functioning. Urbanised and more populated regions show a great occurrence of thyroid lesions as compared to the rural and less populated areas. In the present study, Goitre and myxoedema 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 the Jod-basedow phenomenon.

P Laurberg et al<sup>[18]</sup> observed that thyroid abnormalities in populations with low iodine intake develop: goiter and those with high iodine intake develop thyroid hyperfunction. Fabrizio Aghini-Lombardi et al<sup>[7]</sup> 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 prevalences of both overt and subclinical autoimmune hypothyroidism were not different from those observed in iodine-sufficient areas.

**CONCLUSION:** We conclude that the commonest thyroid lesion found was Goitre. 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

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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 45yrs of age whereas myxoedema and nodular goiter occurring above 45 yrs of age and Vegetarian diet and low iodine uptake was more associated with myxoedema, 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 etiopathogenesis of various thyroid pathological lesions.

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Date of Submission: 30/01/2015.  
Date of Peer Review: 31/01/2015.  
Date of Acceptance: 06/02/2015.  
Date of Publishing: 10/02/2015.