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Original Research Article

Changing Trends in the Incidence of Thyroid Lesions in Coastal Regions of South India

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ABSTRACT

Background: Thyroid gland is unique in having a wide spectrum of disorders. The incidence of various lesions varies in different parts of the world and are one of the commonest conditions seen worldwide
Aim of the study: To study the prevalence of thyroid lesions reported over the past decade in coastal area of Pondicherry and to assess the regional differences if any with special preference towards emerging trends in prevalence of thyroid lesions after tsunami and other coastal flooding such as hurricane Thane.
Materials and methods: The materials for the study included thyroidectomy specimens received in pathology department between January 2005 to July 2014. Histopathological examination of the thyroidectomy specimens was done.
Results: A total of four hundred and fourteen thyroid specimens were studied. 89% of the cases were in the age group of 20-59 years. Most of the lesions showed female preponderance with average female to male ratio 5.5:1. 64.3% of the lesions were non-neoplastic lesions and 35.7% of the lesions were neoplasms. Among the non-neoplastic lesions nodular colloid goiter (36.8%) and multinodular goiter (25.2%) formed the majority. Follicular adenoma (23.6%) was the most common benign neoplastic lesion. Papillary carcinoma (63.5%) was the most common malignant neoplastic lesion. In this study there appears to be a progressive increase of all thyroid lesions post Tsunami (2004) as well as post hurricane Thane (2012).
Conclusion: A causal relation of progressive increase in thyroid disease to natural disasters such as Tsunami, hurricane Thane and other periodic seawater flooding in this coastal region requires investigation. Further molecular studies are needed to identify other etiological agents for thyroid carcinomas.

Key words: Thyroid lesions, Histopathology, Tsunami, Iodine intake.

INTRODUCTION

Thyroid disorders are unique in having wide spectrum of diseases ranging from functional, immunological derangements to neoplastic lesions. [1] In India, it is estimated that 42 million people are affected by thyroid diseases. [2] In India, coastal states like Goa, Gujarat, Kerala and hilly areas like Himalayan regions are endemic for thyroid lesions. [3]

Congenital Hypothyroidism is reported to be incident at the rate of 1 in

2640 live births in India, and the most common cause is thyroid dysgenesis. [2] The percentage of subclinical and overt hyperthyroidism in Pondicherry is 0.6% and 1.2% respectively among female population. [4] Hashimoto's thyroiditis is reported ten times more common in coastal areas of country due to excess iodine intake. [5]

Nodular colloid goitre is estimated to affect at least 200 million people worldwide involving all races in all climates. [6] Twelve percent of Indian adults have palpable goitre. [7] Coastal regions are endemic for goitre. It is mandatory to screen, identify the etiological factors to control and prevent goitre in endemic regions. [8]

Thyroid cancer primarily affects the young and middle aged adults, with approximately 122,000 new cases per year globally. Although thyroid tumours accounts for 1% of all cancers globally, they represent the most common endocrine malignancy. [9] The thyroid carcinomas can be caused by environmental, genetic and hormonal factors. The recent advance in molecular biology of thyroid carcinomas has been studied in various countries and has helped in overall outcome. Thyroid neoplasms are the most common lesions necessitating thyroid surgery. [10] Early detection has improvised the treatment regimen and better survival. Reviewing the literature revealed increase in thyroid malignancy in the last 30 years. [11] Low dietary iodine is associated with low papillary to follicular carcinoma ratio. [12]

Different parts around the globe show varying pattern in incidence of different thyroid lesions. There is paucity of available data on thyroid lesions in southern peninsula. The present study is intended to determine the occurrence and frequency of various histopathological types of thyroid lesions in and around Pondicherry and to classify the thyroid neoplasms by recent World Health Organisation (WHO) classification, so that it will be of great help for physicians in further management. The study also aims to know the commonest benign and malignant thyroid neoplasm in this region (Pondicherry).

MATERIALS AND METHODS

The present study comprised of thyroidectomy specimens received from January 2005 to July 2014 in the Department of Pathology, Mahatma Gandhi Medical College and Research Institute, Pondicherry. This study was approved by Dissertation and Institutional Human Ethics Committees. Four hundred and fourteen thyroidectomy specimens were received during this period. For new cases, on receiving specimens, gross features were noted. Multiple bits were taken from large resected specimens from representative sites, processed and paraffin blocks were made. 4 – 5 micron thick sections were cut with a microtome and stained with Haematoxylin and Eosin stain. For old cases paraffin blocks were retrieved and same procedure was done. Microscopic examination of the thyroid lesions was done to arrive at an accurate histopathological diagnosis and tumours were classified according to recent WHO classification. These findings were analyzed and compared with findings of other authors.

Statistical Analysis

All data was entered into a Data Collection Proforma sheet and were entered into Excel (MS Excel 2011). The Sheet had a visual map of demographic and biographical details like age, sex and histopathological diagnosis. Histological subtypes were classified according to recent WHO classification of thyroid tumors.

Descriptive analyses were reported as mean and standard deviation of continuous variables.

RESULTS

Total specimens received in the Department of Pathology, MGMCRI, Pondicherry during this period of study was 22,676. Out of these, thyroid specimens were 414. The maximum numbers of thyroid specimens were received during 2010 accounting for 2.41% and minimum in 2008 accounting for 1.5% of all cases with an average accounting for 1.82% of total specimens. The year wise occurrence of thyroid lesions is shown in Table 1.

Table 1: Occurrence of thyroid lesions in the study period.

Year of study	Total specimens	Thyroid specimens	Percentage
2005	2081	32	1.54
2006	2423	48	1.98
2007	2426	45	1.85
2008	2397	36	1.5
2009	2504	54	2.16
2010	1867	45	2.41
2011	2260	34	1.50
2012	2278	46	2.02
2013	2742	48	1.75
2014	1698	26	1.53
TOTAL	22676	414	1.82

The study showed that nearly 60.6% of cases were in age group 20 - 39 years affecting mostly fourth followed by third decades. The youngest patients were two, of which one was 2 years old male diagnosed as thyroglossal cyst and another 2 year old female diagnosed as ectopic thyroid tissue. The oldest patient was 73 years male diagnosed as colloid goiter with cystic change. The distribution of thyroid disease in relation to age is shown in Fig 1.

The percentage of thyroid lesions is more in females constituting (350) 84.54% and rest constituted by male cases (64) 15.46% in this study. Female preponderance was seen in all types of thyroid lesions except thyroglossal duct cyst and anaplastic carcinoma, with an average female to male ratio of 5.5:1.

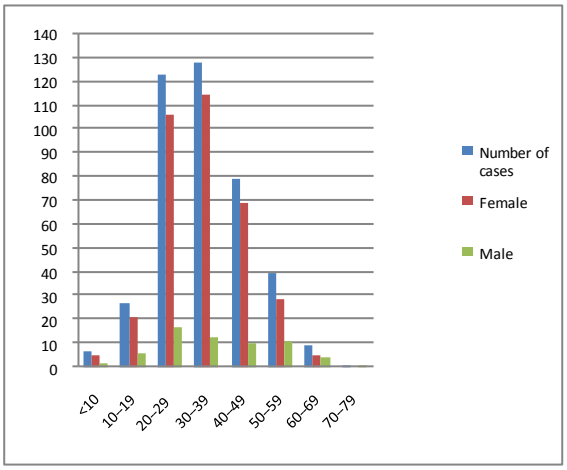

Fig1: Age distribution of thyroid lesions

In this study, out of 414 specimens, 266 (64.3%) were non-neoplastic and 148 (35.7%) were neoplastic lesions.

Table 2: Percentage of histopathological types of thyroid lesions and their incidence in different gender and age groups

	Age groups	<10		10-19		20-29		30-39		40-49		50-59		60-69		70-79	Total	%
SL. no	Types of thyroid lesions	F	M	F	M	F	M	F	M	F	M	F	M	F	M	M		
1	Thyroglossal duct cyst	3	2	4	4	0	4	1	0	0	1	0	0	0	0	0	19	4.6
2	Ectopic thyroid tissue	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
3	Lymphocytic thyroiditis	0	0	1	1	8	0	3	0	2	0	1	0	0	1	0	17	4.1
4	Hasimoto's thyroiditis	0	0	0	0	10	2	8	0	9	0	1	0	0	0	0	30	7.3
5	Grave's disease	0	0	0	0	1	0	3	0	2	1	1	0	0	0	0	8	1.9
6	Nodular colloid goiter	0	0	6	0	23	3	27	3	17	4	8	3	3	0	1	98	23.7
7	Multinodular colloid goiter	0	0	1	0	17	1	23	1	13	1	7	2	1	0	0	67	16.2
8	Adenomatoid goiter	0	0	2	0	5	1	6	4	5	0	3	0	0	0	0	26	6.3
9	Follicular adenoma	1	0	1	0	11	0	10	2	4	0	4	1	0	1	0	35	8.5
10	Papillary carcinoma	0	0	5	0	26	6	26	3	15	0	3	5	1	1	0	94	22.7
11	Follicular carcinoma	0	0	1	1	5	0	6	0	2	0	1	0	0	0	0	16	3.9
12	Poorly differentiated carcinoma	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.2
13	Anaplastic carcinoma	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.2
14	Medullary carcinoma	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.2
	Grand total	5	2	21	6	106	17	115	13	69	0	29	11	5	4	1	414	100

In this study, 14 different histopathological types of thyroid lesions were found to be incident. Maximum incidence was found to be that of nodular colloid goiter (23.7%). The least incidence was for poorly differentiated carcinoma, anaplastic carcinoma, medullary carcinoma and ectopic thyroid (0.2% each). The percentage of histopathological types of thyroid lesions and their incidence in different gender and age groups is shown in Table 2.

Among the non-neoplastic lesions, nodular colloid goiter accounted for 36.8% of cases and multinodular goiter for 25.2%. The least incidence was for ectopic thyroid (0.4%), which was a single female case. The percentage of non-neoplastic thyroid lesions is shown in Fig 2.

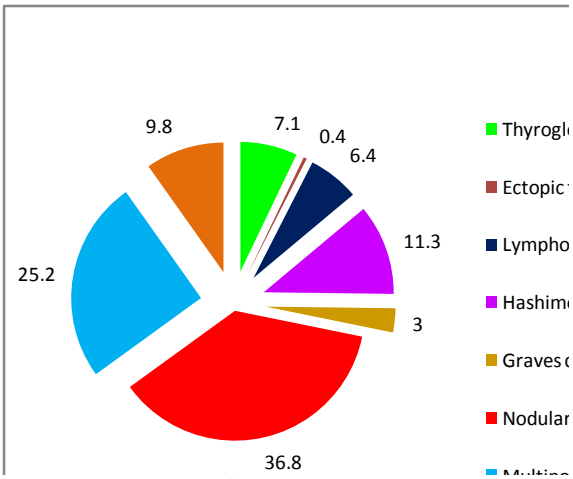

Fig 2: Percentage of non-neoplastic thyroid lesions

Out of 148 thyroid neoplasms in this study, benign lesions accounted for 23.6% (35) and malignant lesions accounted for 76.4% (113). Papillary carcinoma (63.5%) was the most common malignant thyroid neoplasm and follicular adenoma (23.65%) was the most common benign thyroid neoplasm. In this study, poorly differentiated carcinoma was reported in single 35 years old female, anaplastic carcinoma was reported in 61 years old male patient and medullary carcinoma was reported in a 39 years old female patient constituting 0.7% each. As shown in table 1, most of the thyroid neoplastic lesions had their peak incidence in the age group of 30-39.

All the neoplastic cases had female preponderance except anaplastic carcinoma. The percentage of histopathological types of neoplastic thyroid lesions is shown in Fig 3.

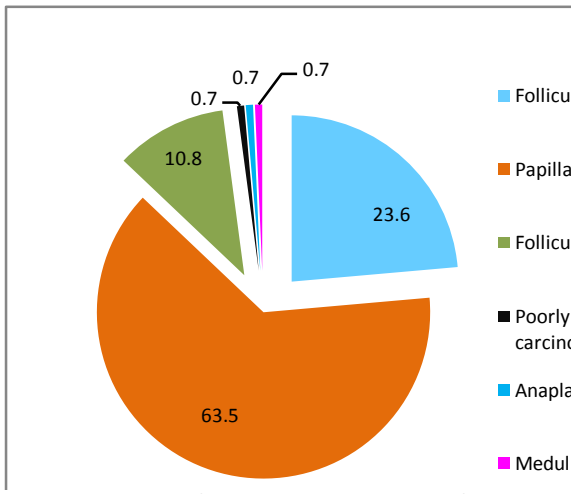

Fig 3: Percentage of histopathological types of neoplastic thyroid lesions

DISCUSSION

On reviewing literature, it was found that different studies done inside and outside India had many varying factors like number of cases, duration of study and type of study, which might be the cause for the discrepancy in frequency when compared with studies of other authors. In the present study, findings were discussed below.

In the study conducted in our institute, the overall percentage of thyroid specimens accounted for 1.82% of all the total surgical specimens received. The occurrence of thyroid lesions was comparable with Ahmed et al, [13] Patil et al [14] and Pradeepkumar et al. [10]

In this study also there is a significant increase of all causes thyroid lesions post Tsunami through 2006 to 2009

following a decrease to a minimum of 34 cases in 2011 and then there is an increase to 48 cases seen in 2013. Even though there appears to be an overall increase in a longitudinal basis, which is not very consistent, this could due to periodic fluctuations in the seawater flooding due to lesser storms and hurricanes such as Thane in 2011.

Peak incidence of all thyroid lesions in the present study was in the age group of 30-39 years, which was in comparison to studies conducted by Senugupta et al [15] and Pradeepkumar et al. [10]

In this study the percentage of thyroid lesions were higher in females (84.5%) than males (15.5%), which is similar to studies conducted by Dhruva Sharma et al [16] in Ajmer, India (84.2%) and Rahman et al [17] in Pakistan (82.4%).

The incidence of non-neoplastic lesions in this study was 64.35% and neoplastic lesions were 35.7% that was similar to study conducted by Ahmed et al. [13,18] The variation in the incidence rates of neoplastic and non-neoplastic thyroid lesions in different studies could be due to geographical and racial factors.

The incident rates of different types of thyroid lesions in the present study and in studies conducted elsewhere are given in the table 3.

Table 3: Comparison of histopathological types of thyroid lesions

Types of thyroid lesions	Present study (%)	Khan et al (2013) [18] (%)	Patil et al (2013) [14] (%)	Pradeepkumar et al (2012) [10] (%)	Ahmed et al (2013) [13] (%)	Rahman et al (2013) [17] (%)
Thyroglossal duct cyst	4.6	1.96	1.47	-	2	3.7
Ectopic thyroid tissue	0.2	-	1.47	-	-	-
Lymphocytic thyroiditis	4.1	13.72		12.28	1	2.78
Hashimoto's thyroiditis	7.3		2.94		9	
Grave's disease	1.9	-		2.63	2	-
Thyroid cyst	-	-	4.41	-	-	-
Nodular colloid goiter	23.7	1.96	14.71	34.5	49	75
Multinodular colloid goiter	16.2	23.52	14.71		-	
Adenomatoid goiter	6.3	9.8	1.47	-	6	-
Follicular adenoma	8.5	26.47	41.18	28.65	23	10.19
Papillary carcinoma	22.7	18.62	13.24	20.47	6	5.55
Follicular carcinoma	3.9	3.92	1.47	1.46	1	1.85
Poorly differentiated carcinoma	0.2	-	-	-	-	-
Anaplastic carcinoma	0.2	-	1.47	-	-	0.9
Medullary carcinoma	0.2	-	1.47	-	1	-

For most of the lesions the incidence rates were comparable. Some authors [5,10] have reported higher incidence of Hashimoto's thyroiditis in coastal areas of the country. In our series also there has been a significant increase in combined incidence of all thyroiditis, as also for Hashimoto's thyroiditis which is much more compared to mainland areas as reported by Patil et al. [14]

Among the non-neoplastic lesions found in this study, nodular colloid goiter and multinodular colloid goiter formed the majority, which is in agreement to other studies done by Patil et al [14] and Pradeepkumar et al. [10]

Among the neoplastic lesions, the incidence rates of follicular adenoma are lesser and papillary carcinoma is higher in this study compared to other studies mentioned above. The incidence of follicular adenoma in the present study was comparatively lesser (8.5%) to other studies. The probable reason behind that could be the kind of population included in our study. Majority of the cases included in our study belonged to the coastal population where generally the intake of iodinated salt and

salted foods is higher compared to other geographical areas. Follicular adenoma has common association with iodine deficiency and irradiation, [9] so the reduced incidence of follicular adenoma in this present study could be due to sufficient iodine intake in this population generally.

The incidence rate of papillary carcinoma in the present study was slightly higher (22.7%) compared to other studies. This could also be explained with increased dietary intake of iodine in this coastal population studied. [19] Pradeepkumar et al [10] has reported increased incidence of papillary carcinoma post Tsunami (2004). In our series also there is a steady increase in incidence of papillary carcinoma year wise with a maximum number of cases occurring in 2013.

Thus the present study gives valuable demographic and epidemiological information about the different types of thyroid lesions that were incident over a significant amount of period i.e. ten years from 2005 to 2014 in a tertiary care hospital setup catering to coastal population predominantly from Pondicherry and nearby areas of Tamil Nadu.

CONCLUSION

Histopathological evaluation of thyroid lesions is challenging and mandatory as the diagnosis varies from non-neoplastic to rare neoplastic lesions. There is an overall increase in all types of thyroiditis including Hashimoto's thyroiditis. Present study shows increase in papillary carcinoma in comparison with other authors and emphasizes the female predominance. Hence, screening females for neck swellings will be beneficial in management of patients and early detection can change the treatment regimen. Higher incidence of papillary carcinoma insists the need for people awareness program and preventive measures. Incidental higher Iodine intake, in addition to already iodized salt, consequent to coastal flooding may also be causative factor in higher incidence of papillary carcinoma. Inspite of iodized diet, the prevalence of thyroid malignancy remains high stating that there may be different etiology unrelated to iodine deficiency, which can be of further interest for future studies. Further studies with IHC and molecular backup for thyroid tumors will throw light on the genetic and molecular profile of the tumors. Progressive increase in incidence of various thyroid lesions, papillary carcinoma in particular calls for investigation of more causal factors in this coastal region prone to natural upheavals such as Tsunami, hurricanes and seawater flooding. A prudent prospective comprehensive study along with investigation of environmental factor including food, water and soil are necessary for prevention of morbidity as well as burden on the health resources. Examination and constant monitoring of Iodine content of soil, water and food in the affected areas as well as search for any other environmental factors are recommended. But nevertheless, this study provides current hospital based epidemiological data on age at presentation, gender distribution and commonest histopathological variants of thyroid lesions in a large tertiary care hospital catering the urban and rural population of Pondicherry and nearby areas of Tamil Nadu.

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