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Clinicopathological study of nodular goiter and thyroid malignancy in Tertiary Care Hospital

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***Abstract*---**Nodular goiter is a clinicopathological entity characterized by an increased volume of the thyroid gland with formation of nodules. Nodular goiter occurs due to repeated hyperstimulation of thyroid gland due to iodine deficiency, goitrogens, anti-thyroid drugs and genetic defects. Nodular goiter can have different complications which include tracheal compression, retrosternal extension, malignancy and secondary thyrotoxicosis. The present study attempted to study clinical presentation of nodular goiter and to determine the incidence of thyroid cancer in solitary nodular goiter and multinodular goiter in patients admitted in surgery ward of IGMCRI, Puducherry. Retrospective record-based study and single-center study was carried out between January-2011 to December-2019 on consecutive 230 patients admitted in surgery ward with nodular goiter and age above 18 years. Ethics approval was obtained from Institute Ethics Committee (IEC) of IGMCRI. Demographic variables (age and gender), Diagnosis, FNAC, BIOPSY and Carcinoma frequency was assessed in the present study. Data was entered in Microsoft Excel spreadsheet and the data underwent analysis using descriptive statistics involving tables, graphs and bar diagrams. In our study, majority of the study participants (90.4%) belonged to female gender. Maximum patient cases (34.78%) belonged to adult range within 31-40 years. Majority of the diagnosis (52.2%) belonged to solitary nodular goiter. Majority of the diagnosis (36.5%) identified though FNAC belonged to Colloid Goiter. Biopsy revealed that the majority of the cases (89.6%) were benign. Solitary nodular goiter recorded the maximum cases (n=11) of papillary carcinoma, followed

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by each 5 cases in MNG and Carcinoma. In the present study, evaluation of the modes of presentation revealed that the incidence of solitary nodular goiter with papillary carcinoma was the maximum recorded pathological type. Further, solitary nodular goiter among the other nodular goiters recorded the maximum cases of thyroid malignancy.

***Keywords*---**Nodular goiter, Thyroid, Malignancy, India, Fine Needle Aspiration Cytology, Biopsy.

Introduction

The term "thyroid nodule" refers to a distinct lesion within the thyroid gland that is palpably or radiologically distinct from the surrounding thyroid parenchyma.[1] Nodular goiter is the most common thyroid lesion encountered in surgical pathology practice.[2] Although the nodule may appear solitary clinically, other nodules are often present in the background on ultrasound or pathologic examination. The term multinodular goiter is appropriate when there are multiple nodules. Nodular goiter most commonly is composed of variable-sized large follicles distended with colloid (colloid nodule).[3] The endemic form (endemic goiter) is the result of iodine deficiency in the diet or water and hence a low production of thyroid hormones, leading to compensatory increase in thyroid-stimulating hormone, which stimulates the thyroid follicles to develop hyperplasia (parenchymatous goiter). Subsequently, some follicles undergo involution with massive accumulation of colloid (diffuse colloid goiter), and nodule formation supervenes. The sporadic form of nodular goiter is of unknown pathogenesis.[4]

Thyroid nodules are common, seen in about 8.5% of the population.[5] They are more common among women. Thyroid malignancy consists of thyroid carcinoma which is a relatively rare tumor, but it represents the most frequent form of cancer of the endocrine glands. A personal history of radiation to the neck, detection of calcifications by ultrasound or by neck X-rays, and a family history of thyroid diseases should be considered clinical risk factors for malignancy in nodular goiter. Globally, the female to male ratio is noted to be between 2.5 to 4:1.[6,7] However, the status in Indian scenario is relatively unknown.

In view of this retrospective record-based study conducted in Indira Gandhi Medical College & Research Institute (IGMCRI), Puducherry from January-2011 to December-2019 was aimed to evaluate the modes of presentation, the incidence of various pathological types and percentage of thyroid malignancy in nodular goiters.

Method

This retrospective record-based study and solitary-center study was carried out between January-2011 to December-2019 on consecutive 230 patients admitted in surgery ward with nodular goiter and age above 18 years. This study carried out in Indira Gandhi Medical College & Research Institute (IGMCRI), Puducherry

was aimed to study clinical presentation of nodular goiter and to determine the incidence of thyroid cancer in solitary nodular goiter and multinodular goiter. Inclusion criteria composed of patients clinically diagnosed with nodular goiters, admitted in surgery ward and aged 18 years and above of both male and females. Whereas, patients with Thyroiditis cases, pregnant females, aged less than 18 years and thyrotoxicosis patients were excluded from our study. Data was collected from case records obtained from medical records department. Permission to collect data was sought from the concerned authorities. Confidentiality of data was maintained through the study duration. Demographic variables (age and gender), Diagnosis, FNAC, BIOPSY and Carcinoma frequency was assessed in the present study. Data was entered in Microsoft Excel spreadsheet and the data underwent analysis using descriptive statistics involving tables, graphs and bar diagrams. The study was reviewed by the Institute Ethics Committee (IEC) of IGMCRI and approval was sought.

Results

Table 1
Distribution of Gender in the study population

Gender	Frequency (N)	Percentage (%)
Male	22	9.6
Female	208	90.4

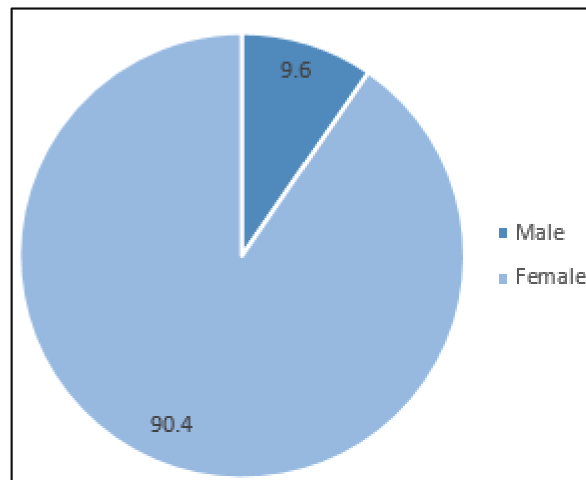

Figure 1: Distribution of Gender in the study population

From the above table 1 and figure 1 over distribution of gender in the study population, it was observed that there was higher female preponderance in our study population. Majority of the study participants belonged to female gender (n=208/230, 90.4%), whereas the remaining cases (n=22/230, 9.6%) belonged to male gender. The male: female ratio was 1:0.10 in our study population.

Table 2
Distribution of age in the study population

Age	Frequency (n)	Percentage (%)
<20	8	3.5
20-30	45	19.6
31-40	80	34.8
41-50	63	27.4
51-60	24	10.4
>60	10	4.3

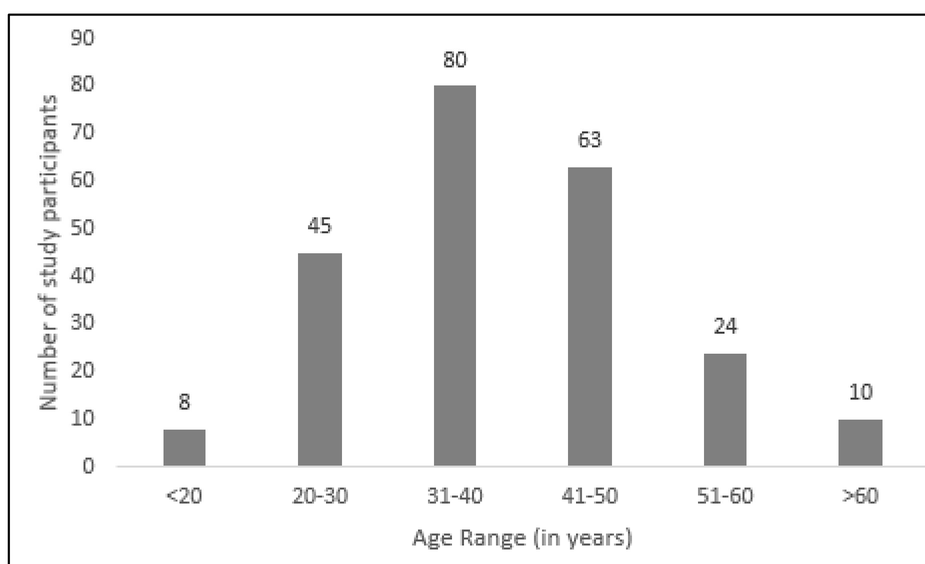

Figure 2: Distribution of age in the study population

From the above table 2 and figure 2, it was observed that the distribution of age in the study population was measured in the six different age ranges. The age range began from <20 years of age, followed by 20-20 years, 31-40 years, 41-50 years, 51-60 years and > 60 years. In our study, the maximum patient cases (n=80/230, 34.78%) belonged to adult range within 31-40 years, followed by patient cases (n=63/230, 27.39%) belonging to adult range within 41-50 years. The sub-adult age group having an adult range within 20-30 years recorded the third highest number of cases (n=45/230, 19.56%) in our study. The senile (>60 years) and the teenage (<20 years) age group recorded the least number of cases (n=10/230, 4.34% and n=8/230, 3.47%), respectively.

Table 3
Distribution of clinical presentation of thyroid cases in our hospital

Diagnosis	Frequency (n)	Percentage (%)
SNG*	120	52.2
MNG**	79	34.3
Carcinoma	17	7.4
Colloid goiter	12	5.2
Toxic SNG	1	0.4
Toxic MNG	1	0.4

*SNG: SolitarySolitary nodular goiter, **: Multi nodular goiter

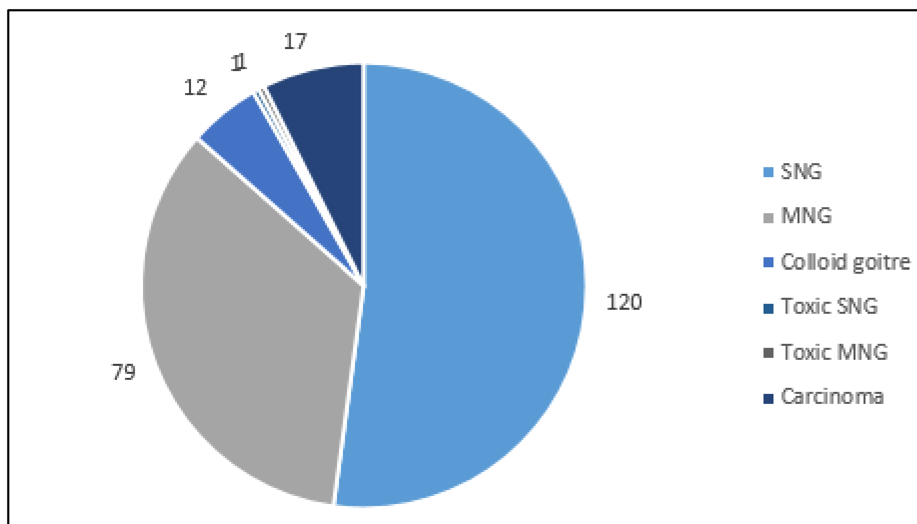

Figure 3: Distribution of clinical presentation of thyroid cases in our hospital

From the above table 3 and figure 3 it is clear that there were six different clinical presentation of thyroid cases were recorded. The six different clinical types were Solitary nodular goiter, Multi nodular goiter, Carcinoma, Colloid goiter, Toxic Solitary nodular goiter and Toxic Multi nodular goiter. Majority of the diagnosis belonged to solitary nodular goiter (n=120/230, 52.2%), followed by multi nodular goiter (n=79/230, 34.3%). Diagnosis of Carcinoma and Colloid goiter was recorded in 7.4% and 5.2% cases, respectively. One case each of Toxic Solitary nodular goiter and Toxic Multi nodular goiter was also recorded.

Table 4
Distribution of diagnosis through Fine Needle Aspiration Cytology among the study population

FNAC	Frequency (n)	Percentage (%)
Colloid Goiter	84	36.5
Nodular Goiter	74	32.2

Follicular adenoma	41	17.8
Papillary carcinoma	17	7.4
Thyroiditis	6	2.6
Hurtle cell carcinoma	5	2.2
Anaplastic carcinoma	1	0.4
Medullary carcinoma	1	0.4
Follicular papillary	1	0.4

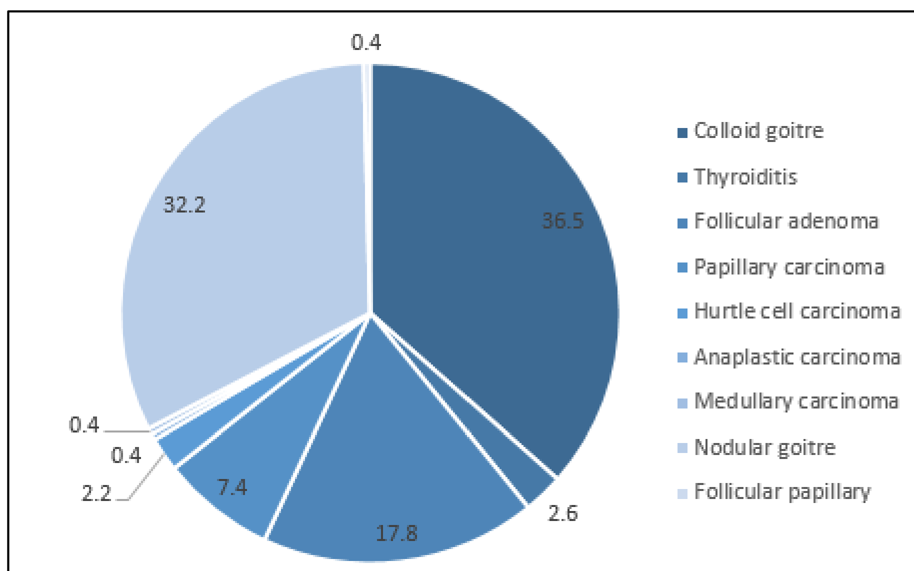

Figure 4: Distribution of diagnosis through Fine Needle Aspiration Cytology among the study population

From the above table 4 and figure 4 over distribution of diagnosis through Fine Needle Aspiration Cytology among the study population, it is clear that there were nine different pathological types recorded. Colloid Goiter, Thyroiditis, Follicular adenoma, Papillary carcinoma, Hurtle cell carcinoma, Anaplastic carcinoma, Medullary carcinoma, Nodular Goiter and Follicular papillary. Majority of the diagnosis identified though FNAC belonged to Colloid Goiter (n=84/230, 36.5%) followed by Nodular goiter (n=74/230, 32.2%). Additionally, FNAC diagnosis revealed 17.8% and 7.4% cases of Follicular adenoma and Papillary carcinoma, respectively. Inflammation of thyroid (Thyroiditis) was recorded in 2.5% cases. Whereas, Hurtle cell carcinoma was recorded in 2.2% cases. One case each of Anaplastic carcinoma, Medullary carcinoma and Follicular papillary was also recorded.

Table 5
Distribution of diagnosis through Biopsy among the study population

BIOPSY	Frequency (n)	Percentage (%)
Papillary carcinoma	22	9.6

Medullary carcinoma	1	0.4
Anaplastic carcinoma	1	0.4
Benign	206	89.6%

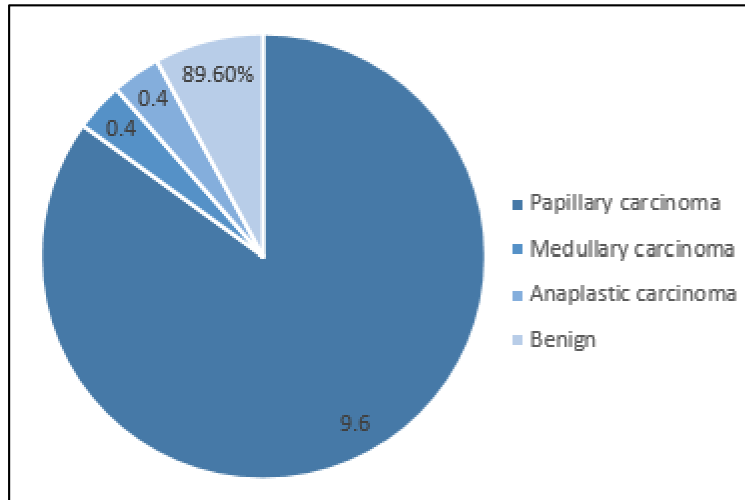

Figure 5: Distribution of diagnosis through Biopsy among the study population

From the above table 5 and figure 5 over distribution of diagnosis through biopsy among the study population, it is clear that there were three different types of thyroid malignancies and benign cases recorded. Majority of the cases (n=206/230, 89.6%) were benign. Papillary carcinoma was recorded in 9.6% of cases. One case each of Medullary carcinoma and Anaplastic carcinoma was also recorded through biopsy diagnosis.

Table 6
Distribution of different carcinomas among the study population with nodular goiter

	Papillary carcinoma	Medullary carcinoma	Anaplastic carcinoma	Benign	Total
SNG	11	0	0	109	120
MNG	5	0	1	73	79
Colloid	0	0	0	12	12
Toxic SNG	0	0	0	1	1
Toxic MNG	1	0	0	0	1
Carcinoma	5	1	0	11	17

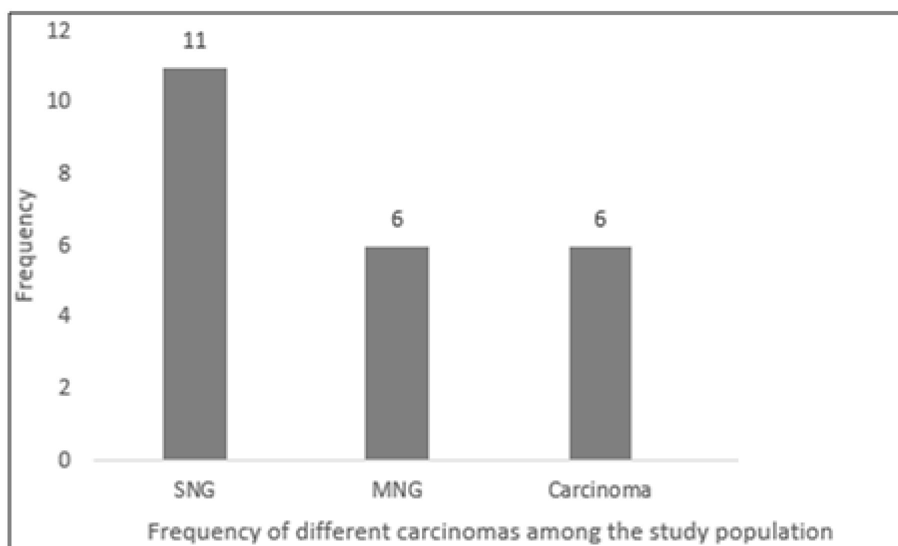

Figure 6: Distribution of different carcinomas frequency among the study population with nodular goiter

From the above table 6 and figure 6 over distribution of different carcinomas among the study population with nodular goiter, it was noted that three different carcinomas were recorded for cases with nodular goiter. The three different carcinomas constituted of Papillary carcinoma, Medullary carcinoma and Anaplastic carcinoma. Out of the different types of nodular goiter stated in above table 6, maximum cases were benign cases in SNG, MNG, Colloid goiter and Toxic MNG. One of cases of toxic SNG was diagnosed as papillary carcinoma.
Solitary nodular goiter recorded the maximum cases (n=11) of papillary carcinoma, followed by each 5 cases in MNG and Carcinoma.

Discussion

Two hundred and thirty patients presenting with nodularity of the thyroid gland were studied and evaluated in terms of age and gender, clinical examination and diagnosis through FNAC and BIOPSY. The results were analyzed as depicted in the table and figure number 1 to 6. Of the 230 cases, the male:female ratio was 1:10 or female:male ratio was 9.45:1 respectively. This was in agreement to study undertaken by Borsaikia and Patar (2016)[8] showed that 83% were females and female to male ratio was 5:1. Table 2 showed the age distribution of the patients studied. Maximum patient cases (n=80/230, 34.78%) belonged to adult range within 31-40 years. However, in the western literature, the analysis of 1280 cases of Multinodular goiter, the age incidence was maximum between 40 – 49 years.[9]

In our study, thyroiditis was reported in 2.6% of patients. Our study did not show any concomitant incidence of thyroiditis with malignancy, however the available literature suggests the incidence of malignancy in thyroiditis.[10,11] In a meta-analysis conducted by Thomas, the mean rate of papillary thyroid cancer among patients with Hashimoto's thyroiditis ranged from 1.12% to 40.11% and Hashimoto's thyroiditis patients had an increased risk (OR=2.12) of developing

malignancy compared to normal individuals.[12] However, we are of a view that further prospective studies are required before coming in to any conclusion. FNAC is very useful in the diagnosis and management of MNG. Malignancy can still come as a surprise on postoperative histopathological examination, even when there is no suspicion of malignancy clinically and with FNAC.[13] We also evaluated the incidence of malignancy in toxic SNG and MNG. Our study reported to have malignancy in one case of toxic MNG. However, in the study conducted by Pacini, after reviewing 179 patients who underwent thyroidectomy for thyrotoxicosis, 7.5 % patients with toxic MNG had malignancy.[14] Similar study was also conducted by Preece *et al* in 2014.[15] Padmawar MR *et al* studied the clinicopathological study of multinodular goiter at AVBRH. Out of 57 patients 35 underwent histopathological examination of which 28 cases (80%) were benign and 7 cases (20%) were malignant.[16]

Conclusion

In conclusion, the present study highlighted higher female preponderance in our study population. The current study recorded that the maximum patient cases belonged to adult range within 31-40 years. Majority of the diagnosis identified in this study through FNAC belonged to the Colloid Goiter. Majority of the cases identified through histopathology were benign. Further, this study evaluated different modes of presentation and revealed that the incidence of solitary nodular goiter with papillary carcinoma was the maximum recorded pathological type. Further, solitary nodular goiter among the other nodular goiters recorded the maximum cases of thyroid malignancy.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institute Ethics Committee (IEC) of IGMCRI

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