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Original research article

A study on Histopathological profile of thyroid neoplasms

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Abstract

Of all the histopathological forms, papillary thyroid carcinoma (PTC) is the most common histological subtype of thyroid malignancy, representing about 80-90% of all thyroid malignancies. Until now, histopathological studies have described a number of variants of papillary thyroid carcinoma: classic, follicular, solid, encapsulated, diffuse sclerosing, tall-cell, micro papillary, etc. A total of one hundred fifty two cases of thyroidectomy were done during the study period of which forty five cases were thyroid neoplasms. Detailed clinical history and investigations related to the case were obtained and noted. The specimens were fixed in 10% formalin, grossed according to the standard grossing protocol and then processed by paraffin embedding. Sections were cut serially at a thickness of 4-5 microns. Multiple sections were taken from each case and routine Haematoxylin and Eosin staining was done. The findings were noted in proforma. Of the 34 PTC classic and its variants, PTC classic were 16 (47.1%) and variants were 18 (52.9%). Out of 18 PTC variants, FVPTC were 12 (66.6%), EFVPTC and micro papillary carcinoma were 3 (16.7%) each.

Keywords: Papillary thyroid carcinoma, Histopathological Profile, PTC

Introduction

Thyroid cancer represents about 1.5% of all epithelial malignancies worldwide, and it is considered to be the most common endocrine neoplasm [1]. In the last 15-20 years, the incidence of the disease has been increasing progressively in many countries, due to the improved methods for detection of the disease, mainly through increased accuracy of thyroid ultrasound and application of fine-needle aspiration, followed by cytological examination [2].

Of all the histopathological forms, papillary thyroid carcinoma (PTC) is the most common histological subtype of thyroid malignancy, representing about 80-90% of all thyroid malignancies [3]. Until now, histopathological studies have described a number of variants of papillary thyroid carcinoma: classic, follicular, solid, encapsulated, diffuse sclerosing, tall-cell, micropapillary, etc. [4]. The PTC is conventionally diagnosed based on characteristic nuclear features, whereas follicular carcinoma of thyroid is diagnosed based on the presence of invasion [5]. The follicular variant of PTC was broadly recognized in the mid-1970s as a tumour composed of neoplastic follicles rather than papillae, but with follicular cells showing nuclear features characteristic of PTC. Two main subtypes are known to occur: infiltrative (or non-encapsulated) and encapsulated. Encapsulated FVPTC (EFVPTC) has increased in incidence by an estimated 2-to 3-fold over the past 2 to 3 decades and makes up 10% to 20% of all thyroid cancers currently [6]. On histological sections, although classical PTC is easy to be distinguished by cytological features, the distinction of FVPTC from FC and FA can be challenging. The distinction of the follicular neoplasms from FVPTC is not simply a matter of tumour classification but also meaningful on clinical ground. Accurate diagnosis is very critical for management of patients and prognosis.

Methodology

This study was undertaken in the Department of Pathology. It is a prospective study that includes all the thyroid neoplasms reported in the Department of Pathology.

A total of one hundred fifty- two cases of thyroidectomy were done during the study period of which forty-five cases were thyroid neoplasms. Detailed clinical history and investigations related to the case were obtained and noted. The specimens were fixed in 10% formalin, grossed according to the standard grossing protocol and then processed by paraffin embedding. Sections were cut serially at a thickness of 4-5 microns. Multiple sections were taken from each case and routine Haematoxylin and Eosin staining was done. The findings were noted in proforma. The data was entered into excel sheet and analyzed

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using SPSS 23 software. Frequencies and percentage of all the variables were computed.

Results

The youngest patient was 16 years old and the oldest was 71 years. The mean age of the presentation was 40 years. The patient age groups were divided into 4 categories as shown in Figure 1. Maximum cases were in the age group 21 to 40 years (44.5%) closely followed by 41 to 60 years (40%).

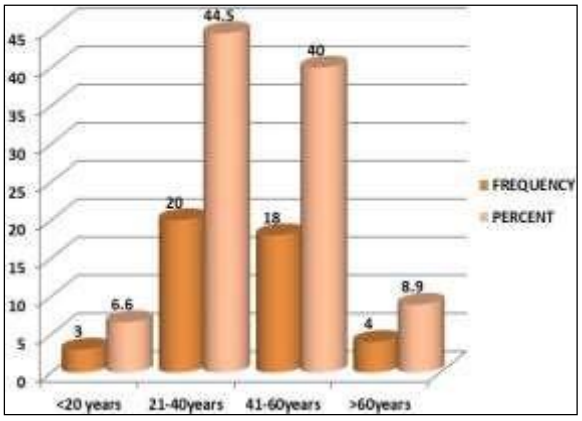

Fig 1: Frequency of age groups in thyroid neoplasms

In the present study, out of 45 cases, 38 (84.5%) cases were females and 7 (15.5%) cases were males as depicted in Figure 2. Female to male ratio was 6.4:1.

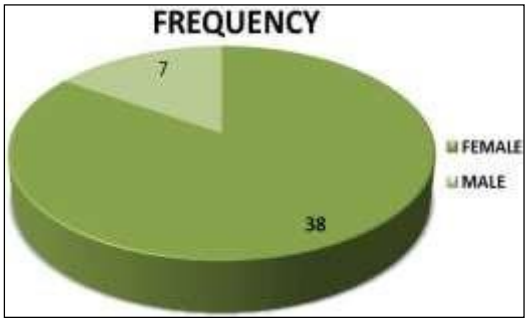

Fig 2: Gender distributions in thyroid neoplasms

Out of 45 thyroidectomy specimens, total thyroidectomy specimen was the most common (53.4%) as shown in Figure 3.

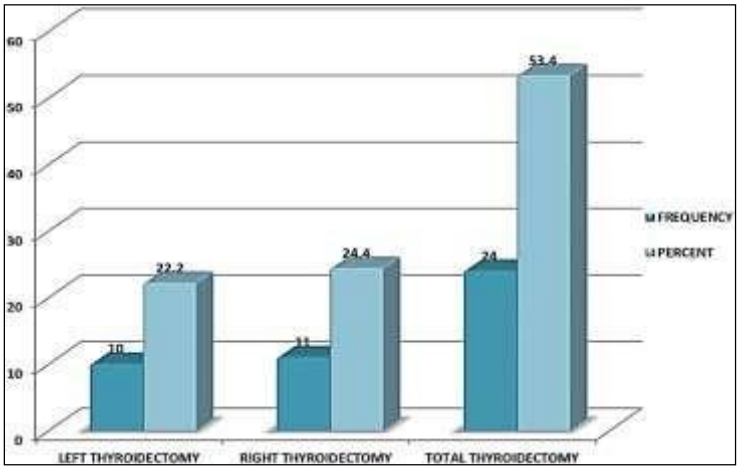

Fig 3: Distribution of Nature of thyroidectomy specimens

Out of 45 cases, there were 7 (15.5%) benign neoplasms and 38 (84.5%) malignant neoplasms as shown in Figure 4. All the 7 benign neoplasms were follicular adenoma (FA) (100%) and out of 38 malignant cases, 34 (89.5%) cases were papillary thyroid carcinoma (PTC) classic/conventional and its variants, 3 (7.9%) cases were follicular carcinoma (FC) and 1 (2.6%) case was poorly differentiated carcinoma

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(PDC).

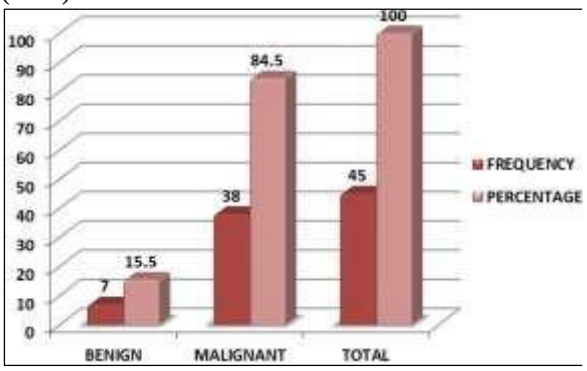

Fig 4: Distribution of thyroid neoplasms

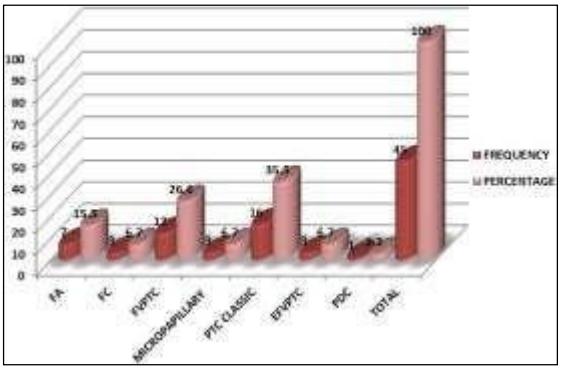

Fig 5: Distribution of histological types in thyroidectomy specimens

Of the 34 PTC classic and its variants, PTC classic were 16 (47.1%) and variants were 18 (52.9%). Out of 18 PTC variants, FVPTC were 12 (66.6%), EFVPTC and micro papillary carcinoma were 3 (16.7%) each.

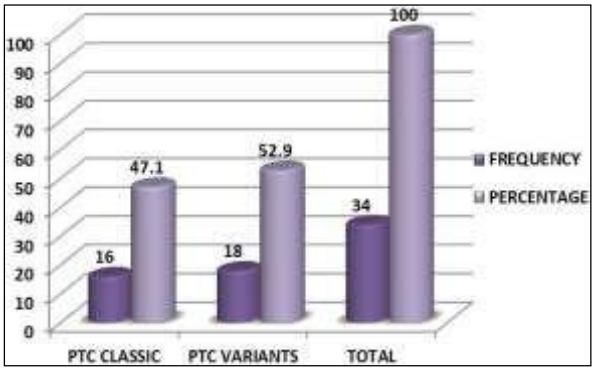

Fig 6: Distribution of PTC classic and its variants

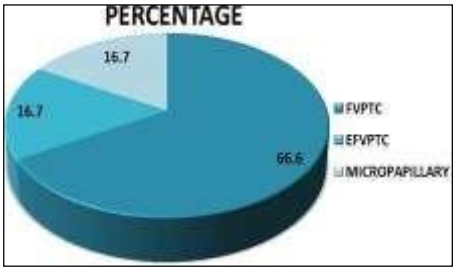

Fig 7: Distribution of PTC variants

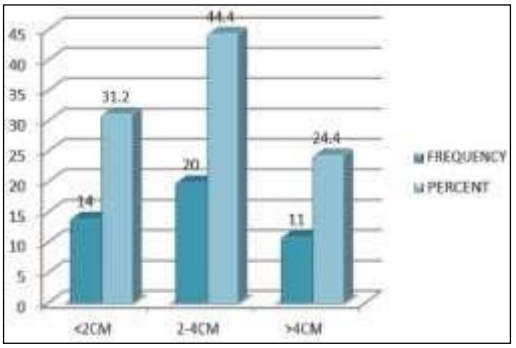

Fig 8: Distribution of tumour size in neoplastic thyroid lesions

Tumour size was divided based on pTNM (pathological-Tumour, Lymph node, Metastasis) staging. Maximum number of cases was seen between 2 to 4 cms (44.4%) as depicted in figure 8.

Out of 45 cases of neoplastic thyroid lesions, tumour was seen in right thyroid lobe in 24 (53.4%) cases, 13 (28.9%) cases tumour was seen in left lobe and in only 8 (17.7%) cases tumour was seen bilaterally. Out of 45 cases, 32 (71.1%) cases were unifocal and 13 (28.9%) cases were multifocal.

All 45 cases of thyroidectomy specimens were evaluated for the appearance of tumour and the results are depicted in table 1.

Table 1: Distribution of tumour appearance in thyroid neoplasms

Tumour Appearance	Frequency	Percentage
Solid-Cystic	10	22.2
Cystic	1	2.2
Solid	34	75.6
Total	45	100

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Tumour capsule was assessed whether it is complete or incomplete capsule. In total of 45 cases of neoplastic thyroid lesions, complete capsule was seen in 13 (28.9%) cases and incomplete capsule was seen in 32 (71.1%) cases.

Out of 38 malignant cases, capsular invasion was present in 14 (36.8%) cases and absent in 24 (63.2%) cases as depicted in Table 2. The capsular invasion was observed in all the 3 (100%) cases of FC and 14 out of 38 (36.8%) cases of PTC showed capsular invasion.

Table 2: Distribution of capsular invasion in thyroid neoplasms

Capsular Invasion	Frequency	Percentage
Present	14	36.8
Absent	24	63.2
Total	38	100

Out of 45 cases of neoplastic thyroid lesions, only follicular and papillary architectures was seen in 24 and 9 cases respectively while 12 cases had both types of patterns.

All 45 cases of thyroidectomy specimens were assessed for nuclear features of PTC including enlargement, crowding, ground-glass (optical clear/Orphan Annie) nuclei, nuclear grooves and intranuclear inclusions. A three-point scoring criterion for the nuclear features of papillary thyroid carcinoma was done for all the 45 cases of thyroid neoplasms and the results are depicted in table 3.

Table 3: Distribution of nuclear features in thyroid neoplasms

Nuclear Features	Frequency		Percentage	
	Present	Absent	Present	Absent
Enlargement	33	12	73.4	26.6
Crowding	32	13	71.2	28.8
Ground-Glass	36	9	80	20
Nuclear Grooves	28	17	62.3	37.7
Intranuclear Inclusions	21	24	46.7	53.3

Out of 38 malignant cases, margins of 33 (86.8%) cases were uninvolved and 5 (13.2%) cases were involved by tumour.

The Angioinvasion and lymphatic invasion was assessed in 38 malignant cases, the angioinvasion was present in 28.9% and absent in 71.1% in the present study. The results of lymphatic invasion are depicted in Figure 9.

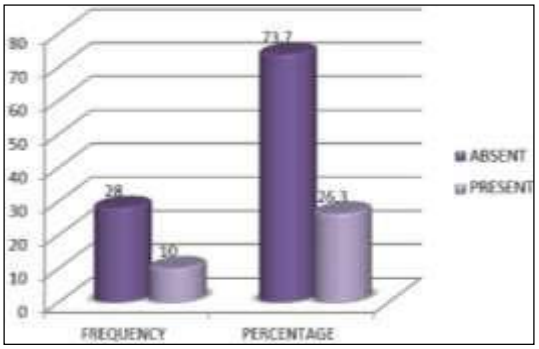

Fig 9: Lymphatic invasions in thyroid neoplasms

Maximum number of the cases were pT3NXMX (15) followed pT2NXMX (11) as shown in Table 4. The tumour was divided into two categories based on pathological staging: early stage (T1/T2) and late stage (T3/T4). In the present study, 50% each was seen in early stage and late stage respectively.

Table 4: Frequency distribution of pathological TNM staging of malignant neoplasms

pTNM	Frequency	Percentage
pT1aN1bMX	1	2.6
pT1aNXMX	5	13.2
pT1bNXMX	2	5.3
pT2NXMX	11	28.9
pT3N1bMX	1	2.6
pT3N1MX	3	7.9
pT3NXMX	15	39.5
TOTAL	38	100.0

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Discussion

Most of the malignancies of the thyroid are amenable to medical or surgical management. The reported incidence of malignancies is increasing because of improved method of detection. Accurate diagnosis is therefore important for proper management of the patient. The reported incidence of both benign and malignant lesions in surgically treated thyroid diseases varied widely between different geographical areas of the world.

In the present study, age range was between 16 to 71 years in the neoplastic lesions and the mean age of the presentation was 40 years which was similar to studies done by Ijomone *et al.* [6], Shashidhar *et al.* [7], Rahman MA *et al.* [8] and Rangaswamy M *et al.* [9]. PTC was seen in the age range of 21 to 71 years while FC was seen in the age range of 21 to 51 years in the present study while compared to Solomon R *et al.* [11] study where PTC was seen in the age range of 17 to 70 years and FC was seen in the age range of 17 to 80 years.

In our study, the highest frequency (44.5%) of thyroid neoplasms was seen between 21-40 years of age which is similar to the studies done by Shashidhar *et al.* [8] and Islam R *et al.* [10].

In this study, females (84.5%) predominance was observed over male (15.5%) which was similar to studies conducted by Bharathidhasan I *et al.* [12], Kantasueb S *et al.* [13], Rahman MA *et al.* [14] and Patel KA [15]. The female to male ratio in the present study was 6.4:1, similar to Bharathidhasan I *et al.* [12] study and other studies done by Kantasueb S *et al.* [13], Rahman MA *et al.* [14], Patel KA [15], Sangall G, *et al.* [16] and Alzahrani AS *et al.* [17]. Majority of PTC and all cases of FC, PDC and FA were seen in females in present study which is similar to other studies.

The majority of specimens studied in the present study were of total thyroidectomy 53.4% followed by right hemithyroidectomy 24.4% and left hemithyroidectomy 22.2%. There is not much difference between right and left thyroidectomy specimens in this study. The study done by Der EM *et al.* [18] observed 43.1% of total thyroidectomy specimens and 56.9% of lobectomies.

In the present study, malignant neoplasms were predominant accounting for 84.5% and benign neoplasms were 15.5% compared to other studies where malignant neoplasms was predominant but the frequency of benign neoplasms was high. A study done by Kantasueb S *et al.* [13] the frequency was 73.3% of malignant neoplasms and 26.7% of benign neoplasms whereas, Ijomone *et al.* [7] study showed predominant benign neoplasms 50.6% and malignant neoplasms were 45.4%, while study by Shashidhar *et al.* [8] showed 60.41% benign neoplasms and 39.68% of malignant neoplasms.

The incidence rates of follicular adenoma (15.5%) are lesser and papillary carcinoma of thyroid is higher in this study compared to other studies. Similar results were observed in the study done by Bharathidhasan I *et al.* [12] where follicular adenoma accounted 8.5% of benign neoplasms. The present study showed papillary carcinoma of thyroid (PTC) (89.5%) as the most common malignant neoplasm followed by follicular carcinoma (7.9%) and 1 (2.6%) case of poorly differentiated carcinoma. This observation is consistent with several other studies. There were 47.1% of PTC classic/conventional and 52.9% variants of PTC as compared to study done by Der EM *et al.* [18] where PTC classic/conventional was 64.7% and variants of PTC were 35.3% which was low compared to the present study. Among the variants of PTC, FVPTC was 66.6%, EFVPTC and micro papillary carcinoma was 16.7% each, and this finding was similar to Der EM *et al.* [18] study.

In this study, tumour size ranged from 0.5 to 9.5 cms compared to study done by Kantasueb S *et al.* [13] and Cordioli MI *et al.* [19] where size ranged from 0.1 to 10 cms. Majority of cases seen were between 2 to 4cms (20 (44.4%)), 14 (31.2%) cases were less than 2cms and 11 (24.4%) cases were above 4cms in size. A study done by Liu Z *et al.* [20] most of tumour seen were less than 1 cm. In our study, tumour was seen more on right robe 53.4% followed by left lobe 28.9% and bilaterally in 17.7% similar Figures was seen by Kantasueb S *et al.* [13] study. In majority of the cases tumour seen was unifocal 71.1% and 28.9% were multifocal which is similar to study done by Cordioli MI *et al.* [19]. On gross, most of the tumours were solid in appearance (75.6%), solid-cystic in 22.2% and only 2.2% tumours were cystic whereas, study done by Rahman MM *et al.* [14] showed 20% of cystic degeneration of the tumour which is high compared to the present study. Tumour capsule in the present study was complete in 46.6% cases and incomplete in 53.4%.

In present study, capsular invasion was present in 36.8% (14) of cases and absent in 63.2% (24) cases compared to studies done by Furlan JC *et al.* [21] where capsular invasion was present in 53.1% and absent in 46.9%. The capsular invasion was observed in all the 3 (100%) cases of FC and 14 out of 38 (36.8%) cases of PTC showed capsular invasion while the study done by Furlan JC *et al.* [149] showed capsular invasion in 73.5% cases of FC and 49.8% cases of PTC.

In this study, 53.4% cases showed follicular architectural pattern, 20.0% cases showed papillary architectural pattern and 26.6% cases showed both follicular and papillary pattern compared to study done by Cordioli MI *et al.* [19] where papillary pattern was 57.5%, follicular pattern was 17.0%, 14.9% was both papillary and follicular and 10.6% cases had other patterns. In the present study, 73.4% cases showed large nucleus, nuclear crowding was seen in 71.2% of cases, nuclear clearing/ground glass appearance was seen in 80% cases whereas, nuclear grooves and intranuclear inclusions were seen in

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62.3% and 46.7% of cases respectively. A study done by Rahman MM *et al.* [14] showed 95% cases had large nuclei, 55% of cases had nuclear clearing, 95% cases had nuclear grooves and 72.5% cases had intranuclear inclusions.

In the present study, angioinvasion was present in 28.9% cases and absent in 71.1% cases where as lymphatic invasion was present in 26.3% cases and absent in 73.7%. The Figures in the present study are higher compared to study done by Der EM *et al.* [18] where lymphatic invasion was 9.6% and angioinvasion was 6.9% and lower compared to study done by Cordioli MI *et al.* [19] where lymphatic invasion and angioinvasion was 29.59% and 57.44% respectively. Tumour staging was done based on pathological TNM staging. In this study most of cases were pT3NXMX 39.5%. The tumour was divided into two categories based on pathological staging: early stage (T1/T2) and late stage (T3/T4). In the present study, 50% each was seen in early stage and late stage compared to the study done by Cordioli MI *et al.* [19] where early stage was 52.1% and late stage was 47.9%.

Conclusion

- Majority of the specimens were of total thyroidectomy (53.4%).
- The benign neoplasms were 15.5% and malignant thyroid neoplasms were 84.5%.
- All the benign neoplasms were follicular adenoma and the most common malignant neoplasm was papillary thyroid carcinoma classic and its variants (89.4%) followed by follicular carcinoma (7.8%) and poorly differentiated carcinoma (2.6%).

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