RESEARCH ARTICLE

Demographic study of endocrine tumours in northwestern India: a five-year retrospective chart review analysis of 3081 thyroid and other endocrine lesions from Jaipur, Rajasthan

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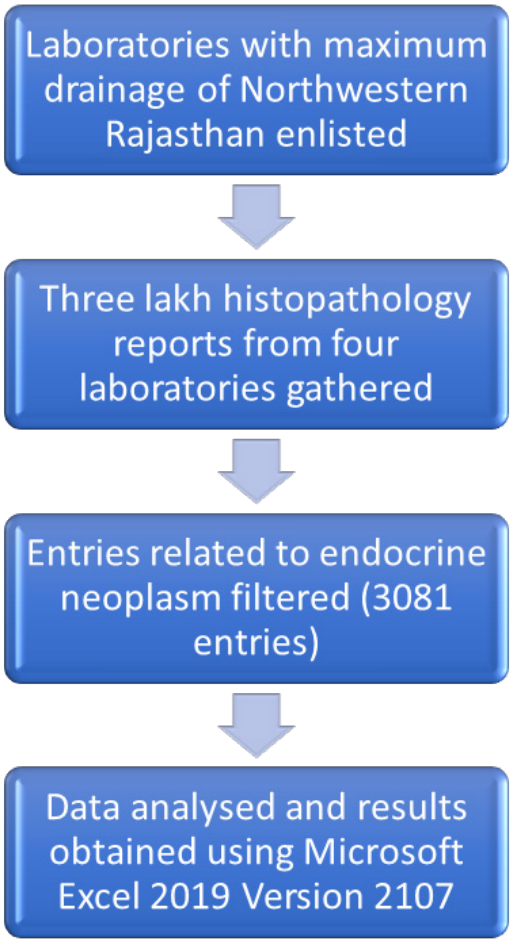

Highlights

- Thyroid diseases are the most common with 96.8% of all endocrine histologies.
- In thyroid histologies, 79.5% were benign as compared to 20.6% malignant.
- Multinodular goitre topped the benign thyroid histologies with 50.3%.
- Adrenal lesions consisted predominantly of pheochromocytoma (60%).
- Only two histologies of parathyroid were found (adenoma and carcinoma).

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Demographic study of endocrine tumours in northwestern India: a five-year retrospective chart review analysis of 3081 thyroid and other endocrine lesions from Jaipur, Rajasthan

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Abstract: Endocrine tumours are commonly encountered in clinical practice. The demographic data in a specific part of the country can be harnessed only from a tertiary care referral center. We aimed to analyze the epidemiological pattern of various histopathological subtypes of four major endocrine glands in the body in Northwestern India. In this retrospective chart review analysis, we reviewed three lakh records of histopathologically proven tumours coming to four major pathology departments and laboratories in Jaipur, Rajasthan over five years; of which 3081 were from patients with endocrine tumours. We included these endocrine tumours in our study and the results were obtained. The collected data were analyzed and results were obtained using Microsoft Excel 2019 Version 2107. Thyroid tumours were the most common tumours (96.8%) with adrenal, parathyroid and pituitary in order. Percentage of malignant cases among the thyroid disorders was 20.55%. Multinodular goitre (50.3%) and papillary carcinoma thyroid (77.67%) topped the benign and malignant thyroid tumours respectively. Females in 21 to 40 years age group were most affected in thyroid tumours. Pheochromocytoma was the most common adrenal tumour (60%) most commonly affecting females in the age group pf 21 to 40 years of age. Parathyroid adenoma constituted the major chunk of parathyroid tumours (86.9%) with no sex predilection and affecting patients mostly in the age group of 31 to 45 years. Pituitary adenoma was found in 34 of 35 cases with a female preponderance and a wide range of affected age groups (21 to 50 years). Different histopathological subtypes of endocrine gland tumours have a varied epidemiological profile in Northwestern India and incorporation of this knowledge will help improve the clinical acumen of the treating personnel in this part of the country.

***Keywords*:** Endocrine tumour; Papillary carcinoma; Pheochromocytoma; Parathyroid carcinoma; Rajasthan

INTRODUCTION

The term 'endocrine tumours' has been used for many years in literature to describe various different entities especially the malignant lesions in the endocrine glands along with neuroendocrine tumours and carcinoid tumours. In this study, we use this term to broadly describe both the benign lesions and the malignant lesions arising in thyroid, adrenal, parathyroid and pituitary glands. Endocrine tumours arising in thyroid gland are the most common endocrine tumours in the body and the second most common endocrine disease after diabetes mellitus. (Gharib *et al*., 1994; Kapoor *et al*., 2018) Lesions arising from the adrenal gland, parathyroid gland and pituitary gland are less commonly seen and analyzed. The age group and gender predilection of these tumours vary significantly from each other. There is a paucity of data regarding the same in the national cancer registry from this part of this country [Report of National Cancer Registry Programme2020 (Internet), 2021]. Only a few studies from this region regarding the prevalence of various tumours across the body have been done previously (Sharma *et al*., 1992; Sharma *et al*., 1994, Sharma *et al*., 2009; Bang *et al*., 2012). Hence, we analyzed retrospectively the demographic profile of the patients suffering from these tumours and the prevalence of each histopathological subtype of these tumours in Northwestern India.

Endocrine tumours occur in almost all glands of the body and each gland has its own histopathological subtypes. Post-thyroidectomy, many types of benign and malignant diagnoses are found. Similarly, adrenal, parathyroid and pituitary glands harbour a variety of tumours both of benign and malignant form. The age group and the gender predilection of each histological subtype of different endocrine glands also vary from each other.

MATERIALS AND METHODS

This is a retrospective analysis, undertaken over a period of 5 years at the OPD of our hospital. Histopathological data of three lakh patients coming to Department of Pathology of our institute was collected using the hospital information system; and from three other institutes was collected manually. A total of 3081 patients with histopathologically proven tumours in thyroid gland, adrenal gland, parathyroid gland and pituitary gland were included in our study after ethical clearance from institutional ethics committee. The collected data was analyzed and results were obtained using Microsoft Excel 2019 Version 2107.

RESULTS AND DISCUSSION

Thyroid tumours

Out of all the 3,081 cases that were retrospectively analyzed in our study, thyroid diseases were found to be the most common with 2963 cases (96.8%), followed by adrenal, parathyroid and pituitary with 45, 38 and 35

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cases, respectively. Kapoor *et al*. (2015) and Nagarkar *et al.* (2018) suggest that thyroid disorders are the most commonly seen endocrine disorders after diabetes mellitus. However, there has been no study in the English literature until the publication of our study which has compared the prevalence of various endocrine tumours with their histological subtypes as a whole. Of all the studies that were reviewed, most of the published studies were focused on thyroid tumours; indirectly suggesting that thyroid tumours are more prevalent than other endocrine tumours in the body.

It is crucial to know whether the thyroid lesion, the surgeon is dealing with, is benign or malignant as malignant diagnosis almost always warrants surgery while benign diagnosis can be followed up (Polyzos *et al*., 2007). Among the thyroid diseases, 2,354 cases (79.45%) were the total number of benign diseases as compared to 609 cases (20.55%) of malignant nature. Sengupta *et al*. (2012) showed that the benign thyroid diagnoses comprised of 155 out of 178 cases (87.07%). In another study, of 65 cases, 46 were (70.77%) benign in nature (Gopinath *et al*., 2020). Acharya *et al*. (2019) also had similar distribution of benign and malignant thyroid lesions with 77 cases of 87 studied cases found to be benign in nature (88.5%). Rates of thyroid malignancies in various other studies were 6%, 11.8%, 20%, 20% and 22%, respectively (Dorairajan *et al*., 1996; Rout *et al*., 2011; Kapoor *et al*., 2018; Gupta *et al*., 2020; Sarangi *et al*., 2021).

In our study, patients with benign thyroid tumours presented with the diagnoses of multinodular goitre (50.3%), follicular adenoma (16.3%), Hashimoto's thyroiditis (11.2%), diffuse colloid goitre (9.4%), granulomatous thyroiditis (8.1%) and others (4.7%) in decreasing order of frequency as shown in the figure 1.

Kapoor *et al*. demonstrated 33 cases (84.6%) of goitre (including multinodular and diffuse) and 6 cases (15.4%) of follicular adenoma among all analysed benign thyroid cases (Kapoor *et al*., 2018). Sengupta *et al*. study found 91.6% of colloid goitre cases and 8.39% of granulomatous thyroiditis cases (Sengupta *et al*., 2012). The distribution of benign cases in study by Gopinath *et al*. also showed a similar distribution with 54.4% of colloid goitre, 39.1% of thyroiditis and 6.49% of follicular adenoma cases. (Gopinath *et al*., 2020). Acharya *et al*. showed in their study that multinodular goitre comprised of maximum number of benign thyroid diagnoses with 46.15% followed by diffuse colloid goitre (42.3%), Hashimoto's thyroiditis (6.40%), granulomatous thyroiditis (2.56%) and follicular adenoma (2.56%) (Acharya *et al*., 2019).

Among malignant disorders, the order of frequency of various histopathological subtypes is similar in most previous studies. In our study, papillary carcinoma was the most common histological subtype among the malignant thyroid disorders accounting to 77.67% of all malignant thyroid disorders followed by follicular carcinoma (13%), medullary carcinoma (2.46%), squamous cell carcinoma (1.64%) and anaplastic carcinoma (1.31%) in decreasing orders as shown in figure 2.

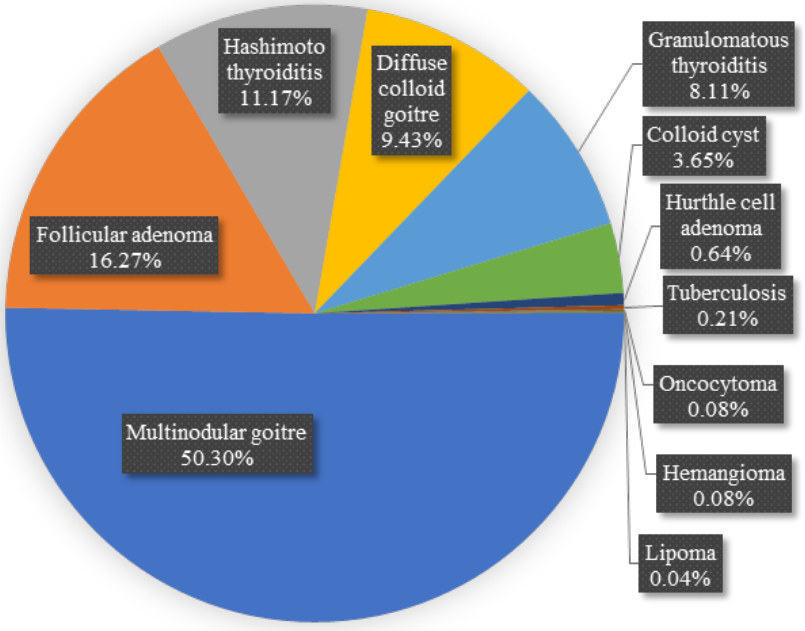

Figure 1: Distribution of benign thyroid tumours according to the histopathological subtypes.

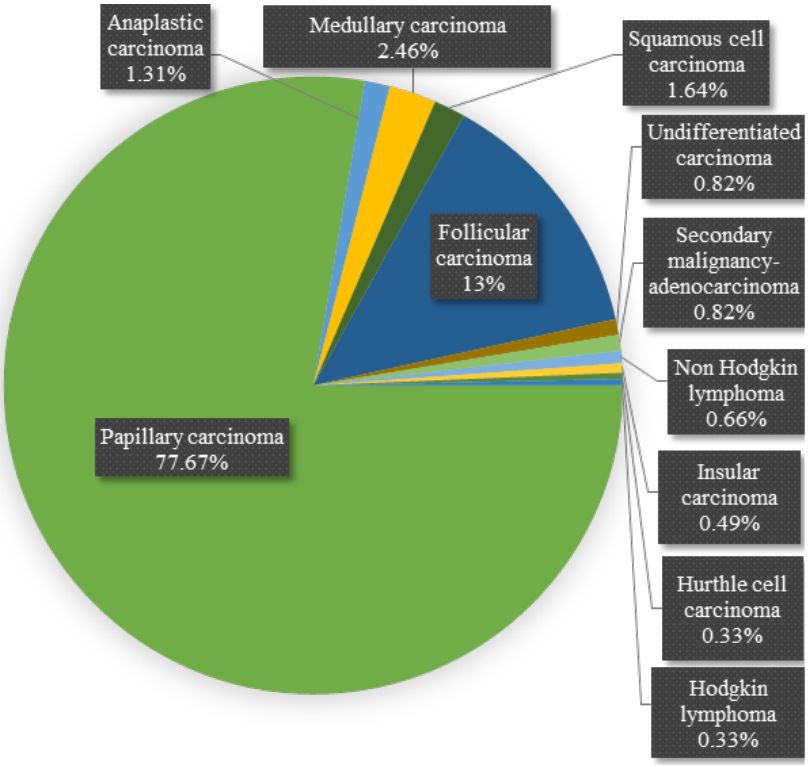

Figure 2: Distribution of malignant thyroid tumours according to the histopathological subtypes.

Acharya *et al.* (2019) and Unnikrishnan *et al*. (2011) showed similar results with exception of lymphoma instead of squamous cell carcinoma. Gopinath *et al*. showed 63.15% cases of papillary carcinoma followed by 36.84% cases of follicular carcinoma, with no other malignant histological subtype identified in their study (Gopinath *et al*., 2020). In a study conducted Kapoor *et al*. (2018), papillary carcinoma, follicular carcinoma and medullary carcinoma were 72.72%, 18.18% and 9.09%, respectively. Overall, papillary carcinoma was the most common thyroid malignancy in multiple studies (Arora *et al*., 2012; Htwe *et al*., 2012; Sarangi *et al*., 2021). In contrast, Nagarkar *et al*. had follicular carcinoma as the maximum number of cases (58.6%) followed by papillary carcinoma (35.4%), medullary type (4%) and anaplastic carcinoma (2%). (Nagarkar *et al*., 2015)

Thyroid disorders are more common in females compared to males (Tucker *et al*., 1991; Acharya *et al*., 2019) with 95.4% cases occurring in females (Gopinath *et al*., 2020). Male: female ratio in Kapoor *et al*., Nagarkar *et al*., Sengupta *et al*. and Sarangi *et al*. studies were 1:7, 1:2, 1:4 and 1:9 respectively. (Sengupta *et al*., 2012; Nagarkar *et al*., 2015; Kapoor *et al*., 2018; Gopinath *et al*., 2020). In our study too, thyroid disorders predominated in the female gender in both benign and malignant etiologies. The mean sex ratio (male: female) among the malignant etiologies was 1:3; while it was 1:9 in benign etiologies with a maximum of 1:23 in Hashimoto's thyroiditis. Hormonal factors could be the cause of female predominance. (Nagarkar *et al*., 2015)

Most affected age groups in different histopathological subtypes in thyroid gland is 20 to 40 years of age (Sengupta *et al*., 2012), 31 to 50 years of age (Gopinath *et al*., 2020), 31 to 40 years of age, (Kapoor *et al*., 2018; Sarangi *et al*., 2021) 51 to 70 years of age. (Nagarkar *et al*., 2015). In our study, we separately analyzed for most commonly affected age groups as per the histopathology. We found that the average age group of patients affected by papillary carcinoma and follicular carcinoma were 21 to 40 years (median age: 36 years) and 21 to 50 years (median age: 40 years) respectively. The average age group of patients affected by multinodular goitre, follicular adenoma, Hashimoto's thyroiditis, diffuse colloid goitre, diffuse granulomatous thyroiditis was 21 to 50 in all subtypes with a median age of 35, 32, 35, 35 and 37 respectively.

Adrenal tumours

Adrenal gland lesions are the second most common endocrine lesions affected in our study. Resected adrenal lesions consisted predominantly of pheochromocytoma (27 cases; 60%) followed by adrenocortical carcinoma (15.6%), adrenocortical adenoma (8.9%), neuroblastoma (8.9%) and others (6.7%) as shown in figure 3.

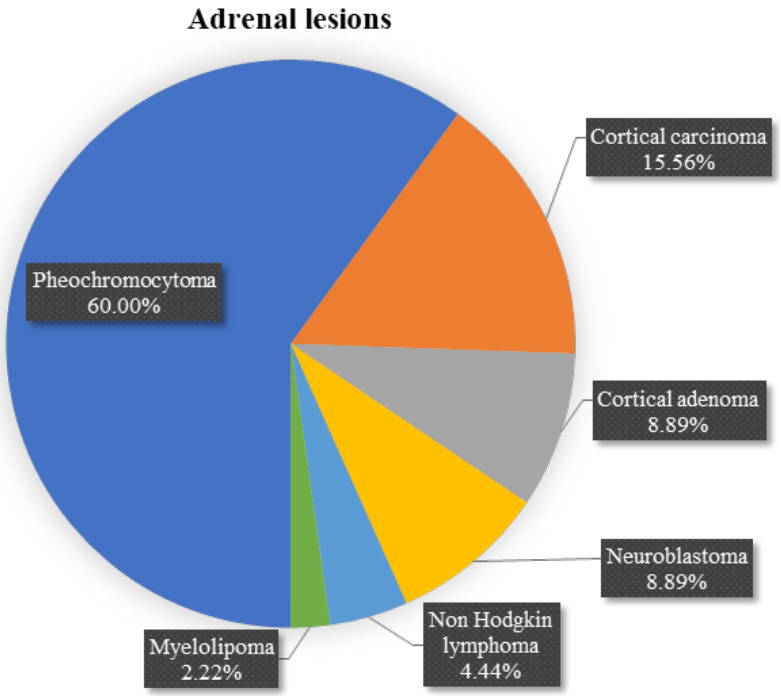

Figure 3: Distribution of adrenal tumours according to the histopathological subtypes.

Since, adrenal metastases are not resected, this histopathological subtype was not found in our study although it's a common histopathological subtype in the literature on adrenal tumours. Ebbehoj *et al*. was one of the largest studies on epidemiological aspect of adrenal tumours and it found 1,077 cases (83.7%) of adenoma and hyperplasia, 96 cases (7.5%) of metastases, 85 cases (6.6%) of other benign tumours, 14 cases (1.1%) of pheochromocytoma and only less than 1 % cases of adrenocortical carcinoma, lymphoma and neuroblastoma each (Ebbehoj *et al*., 2020). Aron *et al*. showed similar frequency of histopathological subtypes with 41% of adrenal adenomas, 19% of metastases, 10% of adrenocortical carcinomas, 9% of myelolipomas, 8% of pheochromocytoma and 13% of others (Aron *et al*., 2001) Two following studies showed a different pattern of involvement. Gaurav *et al*. showed 47.92% of pheochromocytoma, 18.75% of adrenocortical carcinoma and 33.33% of myelolipoma and other benign tumours together. (Gaurav *et al*., 2020) Khanna *et al*. found 42.85% of adrenocortical carcinoma, 28.57% of myelolipoma, 14.28% of pheochromocytoma and other benign lesions each (Khanna *et al*., 2015)

Most studies analyzed the affected age group considering all adrenal lesions as a whole. The most commonly affected age groups with their median ages were 31 to 40 years (median: 34.3 years), (Gaurav *et al*., 2020) 41 to 50 years (median: 46 years) (Adrenal Gland Tumor - Statistics [Internet], 2021), 41 to 50 years (median: 48.6 years), (Khanna *et al*., 2015), 51 to 60 years (median: 55 years) (Bilimoria *et al*., 2008). Ebbehoj *et al*. analyzed each histological subtype separately like in our study and they found that most commonly affected age group for adrenocortical adenoma, pheochromocytoma and other benign tumours were 41 to 65 years of age while >65 years of age for adrenal metastases (Ebbehoj *et al*., 2020). In our study, the most common age group affected by pheochromocytoma was 21 to 40 years (median: 35 years) and adrenocortical carcinoma was 41 to 50 years (median: 45 years).

Sex predilection was 1:1 in most studies (Khanna *et al*., 2015; Gaurav *et al*., 2020). Pheochromocytoma affected more females than males with a sex ratio of 1:2. Comparatively, more males were affected than females in adrenal adenoma and carcinoma with a mean sex ratio of 3:1. Ebbehoj *et al.* had same sex ratio for pheochromocytoma (1:2) while it was 1:1 for other adrenal lesions each (Ebbehoj *et al*., 2020).

Parathyroid tumours

Parathyroid gland resections yield various subtypes of which adenoma, hyperplasia and carcinoma are commonly found (Bhansali *et al*., 2005) In our study only two histological subtypes were found (parathyroid adenoma and parathyroid carcinoma in order of frequency). The adenomas constituted of 33 cases and carcinoma of 5 cases accounting to 86.9% and 13.1% respectively. The frequency in other studies were almost the same being 89% for adenomas, 6% for hyperplasia and 5%for carcinomas (Soin *et al*., 1994; Bhansali *et al*., 2005; Sathe *et al*., 2009).

There was no sex predilection in both the histological subtypes as concordant with other studies (Soin *et al*., 1994; Fanthome *et al*., 2006; Nayyar *et al*., 2020), except in Maskey *et al*. and Jena *et al*. studies where there was a slight female preponderance for parathyroid adenoma (Maskey *et al*., 2013; Jena *et al*., 2016).

31 to 45 years was the most commonly affected age group for parathyroid adenoma (Soin *et al*., 1994; Maskey *et al*., 2013), while 41 to 60 for parathyroid carcinomas (Fanthome *et al*., 2006; Nayyar *et al*., 2020) While in our study, 31 to 40 years (median: 40 years) was the most affected age group in parathyroid adenoma while 41 to 50 years (median: 42 years) in parathyroid carcinoma.

Pituitary tumours

Pituitary adenomas follow glioma and meningioma in order of frequency among the neurosurgical tumours (Ostrom *et al*., 2013). In our study, maximum cases in pituitary gland biopsies were pituitary adenomas (34 cases) and only a single case of pituicytoma. The type of pituitary adenoma in most studies was prolactinomas and ACTH secreting pituitary tumours (Tearada *et al*., 1995; Zerehpoosh *et al*., 2015). The drawback in our study was that the type of pituitary tumours could not be assessed due to lack of information regarding the same in the retrospectively collected data.

Pituitary adenomas affect a wide range of age groups. In our study too, the age group affected equally patients from 21 to 50 years of age with a median age of 37 years. Dutta *et al*. suggested that the most affected age group by pituitary adenoma is 21 to 55 years of age with a median age of 38 years (Dutta *et al*., 2016). Other studies showed that the most affected age group was 40 to 50 years of age (median: 41 years) (Zerehpoosh *et al*., 2015) and 40 to 70 years of age (Leibowitz *et al*., 1971).

The sex ratio studied in the Zerehpoosh *et al*. study was 3:2 (Zerehpoosh *et al*., 2015) while Terada *et al*. showed a female preponderance (Terada *et al*., 1995). The male: female ratio in our study was 3:1.

CONCLUSION

The thyroid gland disorders are most common endocrine disorders, of which benign are more common than the malignant counterparts. Multinodular goitre and papillary carcinoma are the most common histopathologies among the benign and malignant respectively. Thyroid disorders are common in females of 20 to 40 years of age. Pheochromocytoma was the most common adrenal gland disorder with female predilection and commoner in age group of 20 to 40 years of age. Pituitary and parathyroid disorders are the next common endocrine disorders, but are rare to occur. This study gives a comprehensive idea about various endocrine disorders occurring in Northwestern India.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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