

# Histopathological Spectrum of Nephrectomies - A 10 Year Descriptive Study from a Tertiary Care Center in South India

Bhavya P. Mohan<sup>1</sup>, Jaylakshmy Payipatt Leelamma<sup>2</sup>, Letha Vilasinamma<sup>3</sup>, Suresh Bhat<sup>4</sup>

<sup>1</sup>Department of Pathology, Government Medical College, Thrissur, Kerala, India.

<sup>2,3</sup> Department of Pathology, Government Medical College, Kottayam, Kerala, India.

<sup>4</sup>Department of Urology, Government Medical College, Kottayam, Kerala, India.

## ABSTRACT

### BACKGROUND

Nephrectomy is the standard surgical treatment of neoplastic and non-neoplastic lesions in the kidney and provides more insight into the detailed histopathology of renal lesions. We wanted to identify the age groups, gender distribution and different histopathological types and subtypes of non-neoplastic and neoplastic lesions in nephrectomy specimens over a period of ten years.

### METHODS

A retrospective analysis was done over a period of ten years (January 2006 to December 2015). All nephrectomy specimens received in the Department of Pathology, Government Medical College, Kottayam were recorded from histopathology registers and analysed with regard to age, gender and histopathological types.

### RESULTS

A total of 532 lesions was encountered in our analysis. Males (61.8 %) were affected more than females (38.2 %). Lesions were more on the left side (50.8 %) than right side (49.2 %). Non-neoplastic lesions (53 %) outnumbered neoplastic lesions (47 %). Inflammatory and obstructive causes constituted the majority (43.8 %) in non-neoplastic lesions and renal cell carcinoma was the commonest neoplasm (71.2 %).

### CONCLUSIONS

There is a wide age distribution of renal diseases in the present study. Inflammatory and obstructive conditions constituted the most common indication for nephrectomy, followed by malignant tumours.

### KEYWORDS

Renal Cell Carcinoma, Nephrectomy, Pyelonephritis, Simple Renal Cyst, Wilms Tumour

*Corresponding Author:*

*Dr. Jayalakshmy Payipatt Leelamma,  
C - Block, Department of Pathology,  
GMC, Kottayam – 686008,  
Kerala, India.*

*E-mail: jayafloyyd@gmail.com*

*DOI: 10.18410/jebmh/2020/565*

*How to Cite This Article:*

*Mohan BP, Leelamma JP, Vilasinamma L, et al. Histopathological spectrum of nephrectomies - a 10 year descriptive study from a tertiary care center in South India. J Evid Based Med Healthc 2020; 7(47), 2752-2756. DOI: 10.18410/jebmh/2020/565*

*Submission 30-08-2020,*

*Peer Review 05-09-2020,*

*Acceptance 13-10-2020,*

*Published 23-11-2020.*

*Copyright © 2020 Bhavya P. Mohan et al. This is an open access article distributed under Creative Commons Attribution License [Attribution 4.0 International (CC BY 4.0)]*

## BACKGROUND

The kidney excretes the waste products of metabolism, regulates the body's concentration of water and salt, and maintains the appropriate acid balance of plasma. The kidney also serves as an endocrine organ and regulates vitamin D metabolism. Renal diseases are responsible for a great deal of morbidity and mortality.<sup>1</sup> Nephrectomy remains the gold standard for various non-neoplastic and neoplastic conditions of the kidney. It can either be a simple nephrectomy in which only kidney is removed, mainly for non-neoplastic conditions or a radical nephrectomy which involves removal of Gerota's fascia, and its entire contents including kidney, perinephric fat and ipsilateral adrenal gland and is usually performed for neoplastic conditions. Indications for simple nephrectomy include irreversible kidney damage due to symptomatic chronic infection, obstruction, calculus, traumatic injury, renovascular hypertension, congenital dysplasia of the kidney, reflux, polycystic kidney disease etc. Radical or partial nephrectomy is the standard surgical treatment for various renal tumours.<sup>2</sup> A diverse spectrum of benign and malignant renal tumours arise from renal tissue, with patterns that are different in children and adults.<sup>3</sup> There is a paucity of published data on the histopathological spectrum of renal lesions from Kerala. The aim of this study was to determine the relative frequencies of different types of renal lesions, their age and gender distribution, laterality, mean age of presentation and histopathological types, and to compare our findings with those in previously published literature from different parts of the world.

## METHODS

This was a retrospective analysis done over a decade (January 2006 to December 2015). All nephrectomy specimens received in the Department of Pathology, Government Medical College, Kottayam, during this period were analysed with respect to histopathological features. The patients who underwent core needle biopsies from their renal masses were excluded. In each patient, the details such as age, sex, laterality of lesion, type of nephrectomy and final histopathological diagnosis were recorded as per proforma. Grossing of the formalin fixed nephrectomy specimens was done according to the standard protocol. For neoplastic lesions, the tumour was identified and gross features, i.e. size, colour, location, capsular and vascular involvement, haemorrhagic areas, etc., were noted. For non-neoplastic lesions, size of kidney, corticomedullary differentiation, cysts, presence of stones, hydronephrosis / hydroureter, yellowish areas etc. were recorded. After routine paraffin processing, sections of 6 µm thickness were cut and routinely stained with haematoxylin and eosin stain. Detailed light microscopic features were studied and recorded. Special stains and immunohistochemistry were used as and when required. The final diagnosis was arrived at after correlating the clinical features, gross and microscopic findings. All the diseases were classified as

neoplastic or non-neoplastic and a specific diagnosis was given wherever possible. The non-neoplastic diseases were further classified as inflammatory and obstructive lesions, congenital malformations, cystic diseases and vascular lesions. Histological typing of all neoplasms into benign and malignant was done according to WHO (World Health Organization) classification (2004) and histological prognostic factors i.e., nuclear grade, capsular invasion, infiltration into the peri-renal fat and vascular invasion were evaluated in malignant tumours. The data was then subjected to descriptive statistical tabulation and analysis. Mean age of presentation was also obtained in each case. This study was approved by Institutional Ethics Committee (IRB No.59 / 16).

## RESULTS

A total of 532 lesions were encountered during the study period. The distribution of renal lesions according to laterality is shown in table 1. Out of the total lesions, 270 (50.8 %) were left sided and 262 (49.2 %) were right sided.

Age wise distribution of renal lesions in nephrectomy specimens is represented in figure 1. Maximum number of lesions were found in 41 to 50 years age group (20.7 %), followed by 51 to 60 years age group (19.6 %). Minimum number was noted in the 21 to 30 years age group (4.9 %). The lowest age noted in this study is 1 month (n = 2, 1 male and 1 female each) while highest being an 85 years old female.

Gender wise distribution of lesions is depicted in figure 2. Males (61.8 %, n = 329) were affected more than females (38.2 %, n = 203). Non-neoplastic lesions (53 %, n = 282) outnumbered neoplastic lesions (47 %, n = 250). Patients with neoplastic lesions were older (mean age 51.3 years) than those with non-neoplastic lesions (mean age 30.6 years) (Table 2).

### Non-Neoplastic Lesions

Table 3 shows various non-neoplastic lesions with mean age of presentation. Inflammatory and obstructive lesions constituted the majority (n = 233, 43.8 %) followed by congenital (n = 45, 8.5 %), cystic (n = 2, 0.4 %) and vascular (n = 2, 0.4 %) lesions.

Among inflammatory and obstructive lesions, commonest one was chronic pyelonephritis with hydronephrosis (n = 109) followed by hydronephrosis (n = 37) and chronic pyelonephritis (n = 36) (Table 4). Cases of chronic calculus pyelonephritis with hydronephrosis (n = 20), hydronephrosis with interstitial nephritis and atrophic kidney (n = 6), tuberculous pyelonephritis, chronic pyelonephritis with pyonephrosis and xanthogranulomatous pyelonephritis (XGPN) (n = 4 each), hydronephrosis with calculi and XGPN (n = 3), acute pyelonephritis, pyonephrosis and chronic glomerulonephritis (n = 1 each) were also encountered. The mean age of patients with inflammatory and obstructive lesions ranged from 2.5 to 76 years.

Dysplastic kidney constituted the entire spectrum of congenital lesions (n = 45) with a mean age of 3.2 years.

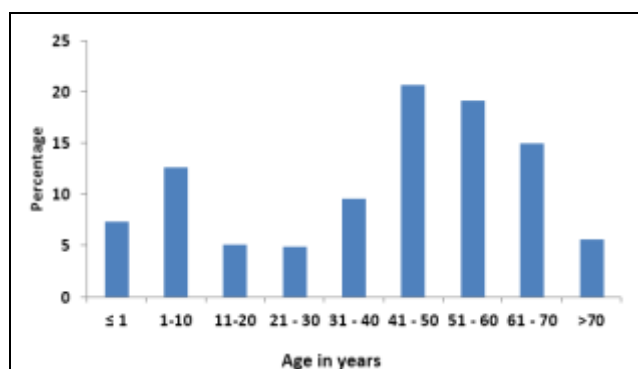
Simple renal cyst (n = 2) with a mean age of 63 years and infarcted kidney (n = 2) with a mean age of 34.5 years were the lesions forming cystic and vascular causes respectively.

**Neoplastic Lesions**

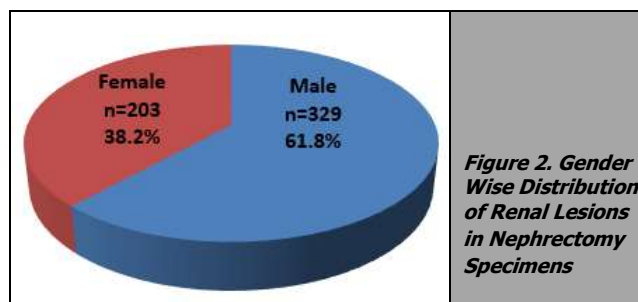
Among neoplastic lesions, malignant tumours clearly outnumbered (n = 224; 42.5 % of total lesions) benign tumours (n = 24; 4.5 %). Mean age of malignant tumours was 52 years while that of benign tumours was found to be 45 years (Table 3). Table 4 depicts the distribution and mean age of various neoplastic lesions. Commonest tumour (as well as the commonest malignant tumour) in this study was Renal Cell Carcinoma (RCC) (n = 178; 54.4 %) with a mean age of 54.4 years followed by Transitional Cell Carcinoma (TCC) (n = 24; mean age = 62.4 years), oncocytoma (n = 11; mean age = 56.3 years) and Wilms tumour (n = 10; mean age = 2.6 years).

and 21.3 years respectively), 2 cases of tubulopapillary adenoma (mean age = 46 years) and 1 case each of paraganglioma (mean age = 30 years), neuroblastoma (mean age = 4 years), pleomorphic liposarcoma (mean age = 70 years) and neuroendocrine tumour (Grade 1) (mean age = 56 years).

Commonest benign tumour in this study was thus noted to be oncocytoma followed by angiomyolipoma.



**Figure 1. Age Wise Distribution of Renal Lesions in Nephrectomy Specimens**



**Figure 2. Gender Wise Distribution of Renal Lesions in Nephrectomy Specimens**

Side of Lesion	Frequency	Percent
Right	262	49.2
Left	270	50.8
<b>Total</b>	<b>532</b>	<b>100.0</b>

**Table 1. Distribution of Renal Lesions According to Laterality**

Type of Lesion	N	Percent	Age in Years	
			Mean	SD
Non neoplastic	282	53	30.6	23.4
Neoplastic	250	47	51.3	17.5
<b>Total</b>	<b>532</b>	<b>100</b>	<b>40.3</b>	<b>23.2</b>

**Table 2. Typing and Mean Age of Renal Lesions**

Other tumours we noted in this study were spindle cell sarcoma and angiomyolipoma (n = 5 each; mean age = 51.2 and 37.8 years respectively), clear cell sarcoma (n = 4; mean age = 16.3 years), mixed epithelial stromal tumour and multicystic nephroma (n = 3 each; mean age = 38.7

Type of Lesion	N	Percent	Age in Years	
			Mean	SD
Inflammatory & Obstructive	233	43.8	35.5	21.8
Congenital	45	8.5	3.2	4.7
Cystic disease	2	0.4	63.0	1.4
Vascular cause	2	0.4	34.5	14.8
Benign	24	4.5	45.0	18.8
Malignant	226	42.5	52.0	17.3
<b>Total</b>	<b>532</b>	<b>100</b>	<b>40.3</b>	<b>23.2</b>

**Table 3. Distribution and Mean Age of Non-Neoplastic and Neoplastic Renal Lesions**

Type of Lesion	N	Age in Years	
		Mean	SD
Chronic pyelonephritis	36	34.4	22.7
Chronic pyelonephritis + Hydronephrosis	109	35.0	21.4
Chronic calculous pyelonephritis + Hydronephrosis	20	57.1	10.5
Tuberculous pyelonephritis	4	52.0	13.5
Xanthogranulomatous pyelonephritis (XGPN)	4	53.0	6.1
Hydronephrosis	37	28.1	18.7
Chronic pyelonephritis + Pyonephrosis	4	35.0	23.1
Pyonephrosis+ Calculi + Focal XGPN	1	54.0	
Hydronephrosis + Interstitial nephritis	6	21.7	16.6
Hydronephrosis + Calculi+ XPGN	3	48.0	7.9
Acute pyelonephritis	1	16.0	
Pyonephrosis	1	76.0	
Chronic Glomerulonephritis	1	51.0	
Atrophic kidney	6	2.5	1.4
Dysplastic kidney	45	3.2	4.7
Simple renal cyst	2	63.0	1.4
Infarcted Kidney	2	34.5	14.8
Tubulopapillary adenoma	2	46.0	11.3
Oncocytoma	11	56.3	12.1
Angiomyolipoma	5	37.8	15.8
Mixed Epithelial Stromal Tumour	3	38.7	6.0
Multicystic nephroma	3	21.3	31.9
Renal Cell Carcinoma	178	54.4	12.1
Transitional cell Carcinoma	25	62.4	10.1
Clear cell Sarcoma	4	3.5	25.8
Wilm's tumour	10	2.6	1.6
Spindle cell sarcoma	5	51.2	12.4
Paraganglioma	1	30.0	
Neuroblastoma	1	4.0	
Pleomorphic liposarcoma	1	70.0	
Neuroendocrine tumour (Grade 1)	1	56.0	
<b>Total</b>	<b>532</b>	<b>40.3</b>	<b>23.2</b>

**Table 4. Distribution and Mean Age of Subtypes of Non-Neoplastic and Neoplastic Renal Lesions (n = 532)**

Study	Number of Cases (n)	Non-Neoplastic (%)	Neoplastic (%)
Rafiq et al. (2007)	154	76.6	23.4
Aiman et al. (2013)	140	77.2	22.8
Amin et al. (2015)	70	54.3	45.7
Suryawanshi et al. (2017)	33	75.7	24.3
Present study	532	53	47

**Table 5. Studies Comparing Incidence of Non Neoplastic and Neoplastic Kidney Lesions**

**DISCUSSION**

Nephrectomy in simple terms is surgical removal of the kidney. Indications range from congenital and inflammatory diseases to neoplasms and injuries. In the present study, out of 532 nephrectomy specimens studied, non-neoplastic lesions comprised 53 % and neoplastic lesions comprised 47

%. Thus, non-neoplastic lesions formed a good-sized majority of the cases (Table 2). A similar pattern was observed in other studies (Table 5).<sup>4,5,6,7</sup>

The majority of our patients were males (61.8 %) and females constituted 38.2 %, with M: F ratio of 1.6:1 (Figure 2). Our ratio was in accordance with studies conducted by Amin et al., Suryawanshi et al. and Vikram et al.<sup>6, 7, 8</sup>

Left sided lesions were noted more than right sided lesions (Table 1). It was similar to the study done by Dutta et al. whereas Amin et al. noted right sided dominance of lesions.<sup>6, 9</sup>

The mean age was higher for neoplastic than non-neoplastic lesions (Table 2). This was in accordance with Rafiq et al., Aiman et al. and Vikram et al.<sup>4, 5, 8</sup> Majority of the cases in our study belonged to the age group of 41 - 50 years and the least number of cases were seen between 21 - 30 years, followed by 11 - 20 years (Figure 1).

After doing histopathological analysis of the specimens, we found that among the non-neoplastic conditions, inflammatory and obstructive lesions constituted the vast majority of cases (43.8 %). The commonest subtype in non-neoplastic group was chronic pyelonephritis with hydronephrosis (38.6 %) followed by hydronephrosis (13 %) and chronic pyelonephritis (12.7 %) (Table 4). Chronic pyelonephritis has been reported as the most common non neoplastic indication for nephrectomy in studies by Aiman et al. and Vikram et al., but in a study from Pakistan by Rafiq et al., it was renal calculi.<sup>4, 5, 8</sup> In our study, renal calculi were seen in 8.5 % cases.

There were only four cases of tuberculosis in our study (1.4 %). It can be attributed to Kerala's thorough implementation of the active case finding strategy to test every resident of the state for tuberculosis. Ghalayini et al. reported 2.1 % tuberculous kidneys in a study done in Jordan.<sup>10</sup>

We encountered four cases (0.75 %) of xanthogranulomatous pyelonephritis in a study period spanning 10 years. Aiman et al., observed 5.7 % cases, Suryawanshi et al., 18 % cases and D'Costa et al., 10 % cases in adults and children.<sup>5, 7, 11</sup> Also, we came across cases of interstitial nephritis with hydronephrosis (n = 6, 2.1 %), pyonephrosis (n = 1, 0.4 %), acute pyelonephritis (n = 1, 0.4 %) and chronic glomerulonephritis (n = 1, 0.4 %) (Table 4).

Congenital malformations accounted for 15.9 % of all non-neoplastic renal lesions. Dysplastic kidney constituted the entire spectrum of congenital lesions (n = 45) with a mean age of 3.2 years. Adamson et al. have reported a mean age of 1.8 years.<sup>12</sup>

Simple renal cyst (n = 2) with a mean age of 63 years and infarcted kidney (n = 2) with a mean age of 34.5 years were the lesions forming cystic and vascular causes respectively.

Among neoplastic lesions, malignant tumours clearly outnumbered (n = 224; 42.5 % of total lesions) benign tumours (n = 24; 4.5 %). Renal cell carcinoma constituted 71 % of all renal tumours. Similar finding was noted by Beisland et al., who had 72.7 % cases of RCC. Mean age of

RCC was 54.4 years which is keeping in with the observation made by Albasari et al.<sup>13, 14</sup>

The second most common malignant neoplasm was TCC which comprised 10 % of renal tumours. The mean age of TCC was 62.4 years. Vikram et al. also found TCC to be the second most common malignant neoplasm in their study.<sup>8</sup>

There were ten cases of Wilms tumour (4 %) which constituted the most common paediatric tumour, the mean age being 2.6 years. Amin et al. reported eight cases and mean age was 3.5 years.<sup>6</sup> The second most common paediatric tumour was clear cell sarcoma (1.6 %) and the mean age was 3.5 years.

Primary sarcomas constitute only 2.5 % of malignant renal tumours in adulthood in the current study, there was a single case of pleomorphic liposarcoma and 5 cases of spindle cell sarcoma. One case each of paraganglioma, neuroblastoma and neuroendocrine tumour (Grade 1) were listed in this study. Because of the rarity of these tumours, it was difficult to present a detailed comparison of these tumours from literature.

Oncocytoma constituted 4.4 % of all renal tumours and the mean age was 56.3 years. Albasari et al. had a similar incidence in their study.<sup>14</sup> Oncocytoma is a benign renal epithelial neoplasm. It accounts for approximately 3 - 7 % of all renal cortical neoplasms.<sup>15</sup>

Angiomyolipoma constituted 2 % of all renal tumours. The mean age was 37.8 years. Popat et al. reported two cases (2.5 %) of angiomyolipoma falling in the age group of 40 - 60 years.<sup>16</sup> None of the patients in this study showed features of tuberous sclerosis.

There were 3 cases each of mixed epithelial stromal tumour and multicystic nephroma with mean age of 38.7 and 21.3 years respectively. One case of tubulopapillary adenoma with mean age of 46 years was also encountered in our study. Suryawanshi et al. has reported a case of multicystic nephroma in 40 - 60 age group.<sup>7</sup> Abdulghafoor S. Abdulkareem et al. observed one case each of adenoma and multicystic nephroma in their study.<sup>17</sup>

## CONCLUSIONS

There is a wide age distribution of renal diseases in the present study. Inflammatory and obstructive conditions constituted the most common indication for nephrectomy, followed by malignant tumours. Detailed histopathological examination is crucial in the management protocol of renal lesions as it is necessary to classify the lesions and grade the tumours.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

Authors would like to acknowledge Dr. Anju C., Assistant Professor for providing guidance and Dr. Abinaya Devi, Senior Resident for the assistance given in collecting the data.

**REFERENCES**

- [1] Alpers CE, Chang A. The kidney. In: Kumar V, Abbas AK, Aster JC, eds. Robbins and Cotran Pathologic basis of disease. Philadelphia: Elsevier 2015: p. 897.
- [2] Algaba F, Trias I, Scarpelli M, et al. Handling and pathology reporting of renal tumour specimens. *Eur Urol* 2004;45(4):437-443.
- [3] Moch H, Amin MB, Argani P, et al. World Health Organization Classification of Tumours of the Urinary System and Male Genital Organs. Lyon: IARC Press 2016: p. 12.
- [4] Rafique M. Nephrectomy: indications, complications and mortality in 154 consecutive patients. *J Pak Med Assoc* 2007;57(6):308-311.
- [5] Aiman A, Singh K, Yasir M. Histopathological spectrum of lesions in nephrectomy specimens: a five-year experience in a tertiary care hospital. *J Sci Soc* 2013;40(3):148-154.
- [6] Amin AN, Pai P, Upadhyaya K. A histopathological spectrum of nephrectomy specimens in a tertiary hospital in Southern India. *Int J Biol Med Res* 2015;6(3):5173-5178.
- [7] Suryawanshi KH, Damle RP, Dravid NV, et al. Histomorphological analysis of lesions in nephrectomy specimens: a 4 years study in a rural hospital in India-our experience. *Annals of Pathol and Laboratory Medicine* 2017;4(3):A-230.
- [8] Vikram N, Bhavna G, Ashneet W, et al. Histomorphological spectrum of nephrectomy specimens- a tertiary care centre experience. *National Journal of Laboratory Medicine* 2016;5(2):51-54.
- [9] Datta B, Moitra T, Chaudhury DN, et al. Analysis of 88 nephrectomies in a rural care centre of India. *Saudi J Kidney Dis Transpl* 2012;23(2):409-413.
- [10] Ghalayini IF. Pathological spectrum of nephrectomies in a General Hospital. *Asian J of Surgery* 2002;25(2):163-169.
- [11] D'Costa GF, Nagle SB, Wagholikar UL, et al. Xanthogranulomatous pyelonephritis in children and adults - an 8 year study. *Indian J Pathol Microbiol* 1990;33(3):224-229.
- [12] Adamson AS, Nadjmalidin AS, Atwell JD. Total nephrectomy in children: a clinicopathological review. *Br J Urol* 1992;70(5):550-553.
- [13] Beisland C, Medby PC, Sander S, et al. Nephrectomy-indications, complications and post-operative mortality in 646 consecutive patients. *Eur Urol* 2000;37(1):58-64.
- [14] Albasri AM, El-Siddig AA, Hussainy AS, et al. Clinicopathologic patterns of adult renal tumours. *Saudi J Med Med Sci* 2017;5(3):242-247.
- [15] Mittal MK, Sureka B. Solid renal masses in adults. *Indian J Radiol Imaging* 2016;26(4):429-442.
- [16] Popat VC, Kumar MP, Udani D, et al. A study on culprit factors ultimately demanding nephrectomy. *Internet J Urol* 2010;7(1):8.
- [17] Abdulkareem AS, Hassawi BA, Ahmed Z. Nephrectomy. A clinicopathological study. *J Am Sci* 2015;11(8):97-101.