

# A Histopathological spectrum of nephrectomy specimens in a tertiary hospital of Raipur city (C.G.) India

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## Abstract

**Introduction-** Kidneys are one of the major organs of the human body that serve several essential functions. Their main function is to regulate the balance of electrolytes in the blood, along with maintaining pH homeostasis. Kidneys are affected by various non-neoplastic and neoplastic pathological processes. Kidneys with end stage renal disease can give rise to major complications such as massive bleeding for which nephrectomy may be indicated. Radical or partial nephrectomy is the treatment of choice for a great proportion of patients with renal tumors. **Materials and Methods-** This was a retrospective study carried out in the Department of Pathology in Pt. J. N. M. Medical College Raipur, Chhattisgarh, India. A total of 54 nephrectomy specimens received during the period were included in the study. Paraffin blocks and slides along with case records were retrieved and studied. **Results-** Patients with a male to female ratio of 1.3:1. Maximum cases of chronic pyelonephritis were seen in the age group of 31-40 years. Among 54 nephrectomy cases, 16(29.6%) cases were non-neoplastic lesions and 38 (70.4%) of the cases were neoplastic lesions. Among 20 cases of renal cell carcinoma, clear cell renal carcinoma 9 (45%) cases was the most frequent followed by papillary RCC 7 (30%) cases. Other tumors included 2 (10%) cases of unclassified RCC, one (05%) case each of chromophobe RCC, medullary RCC and collecting duct RCC. **Conclusion-** A wide histopathological range of lesions comprised of neoplastic and non-neoplastic lesions was found. Increase in availability of early diagnosis and appropriate better treatment facilities causes decrease in need of surgical treatment for inflammatory lesions of kidney.

**Keywords-** Histopathological spectrum, Nephrectomy, Xanthogranulomatous pyelonephritis,

## Introduction

Kidneys are one of the major organs of the human body that serve several essential functions. Their main function is to regulate the balance of electrolytes in the blood, along with maintaining pH homeostasis. They also remove waste products of metabolism from blood and produce erythropoietin to maintain hematopoiesis and an important enzyme, renin to maintain blood pressure [1].

Kidneys are affected by various non-neoplastic and neoplastic pathological processes. Common clinical conditions involving the kidney include the nephritic and nephrotic syndromes, renal cysts, acute kidney injury, chronic kidney disease, urinary tract infection, nephrolithiasis, urinary tract obstruction and various cancers of the kidney [2]. Because of widespread use of imaging, increased number of renal lesions is being

discovered. These renal conditions can be managed medically or surgically. Surgical removal of the kidney is known as nephrectomy. Nephrectomy is the standard surgical procedure performed in irreversible kidney damage and in the case of renal malignancies [1].

Nephrectomy is of many types; partial, simple and radical nephrectomy. Partial nephrectomy involves removing a small portion of the kidney. A simple nephrectomy performed for living donor transplant purposes requires removal of the kidney and a section of the attached ureter. Radical nephrectomy involves removing the entire kidney including adrenal gland and the fatty tissue surrounding the kidney [3].

Kidneys with end stage renal disease can give rise to major complications such as massive bleeding for which nephrectomy may be indicated. Other less frequent indications for nephrectomy intractable hypertension, pain, and repeated infections. Kidney removed for one of

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the distinct but related conditions such as obstructive nephropathy, hydronephrosis, and chronic pyelonephritis is the most frequent type of nephrectomy specimen for nonneoplastic renal diseases in both adults and children.

Xanthogranulomatous pyelonephritis is also an indication for nephrectomy. Nephrectomy is the treatment modality in cystic renal dysplasia [4].

Renal tumours comprise a diverse spectrum of neoplastic lesions with patterns that are relatively distinct for children and adults. A wide variety of both benign and malignant tumours arise from different components of the renal parenchyma, notably tubular epithelium. Radical or partial nephrectomy is the treatment of choice for a great proportion of patients with renal tumors [4, 5].

Accurate diagnosis of most renal tumours is not possible before surgery and histopathological evaluation is essential. A detailed and meticulous histopathological examination of nephrectomy specimen is required to establish histological type and to record accepted histopathological prognostic determinants i.e. tumor size, histological subtype, nuclear grade and stage in cases of malignant renal neoplasms [6].

Histological subtype according to the Heidelberg classification<sup>5</sup> of Renal cell carcinoma include clear cell ("conventional") adenocarcinoma (80%), papillary (15%), chromophobe (5%), collecting duct (1%), and unclassified (4%).

Primary squamous cell carcinoma of the kidney is a very rare entity. The incidence of renal squamous cell carcinoma among renal tumor is in the range of 0.5-0.8% [7].

Wilm's tumor though ranked fifth in frequency among childhood solid tumours and it is the most common childhood abdominal malignancy. It is seen primarily in infants, 50% of the cases before the age of 3 years and 90% before the age of 6 years. Benign neoplasms are adenoma, oncocytoma & metanephric adenoma and angiomyolipoma [7, 8, 9].

**Results**

Maximum cases of chronic pyelonephritis were seen in the age group of 31-40 years. Majority of renal cell carcinoma seen in patients between 31-60 years of age group, while Wilms' tumor was mainly seen in patients below the age of 10 years.

Highest percentage of patients belonged to 0-10 years age group with 33.3% (18cases), followed by those in the age group 31-40 with 22.2% (12 cases). 57.4% were men & 42.6% were women [Table-1].

**Table-1: Age & Sex wise distribution of nephrectomy cases.**

**Materials and Methods**

**Type of study-** Retrospective study

**Study setting-** Department of Pathology in Pt. J. N. M. Medical College Raipur, Chhattisgarh, India.

**Sampling methods & Sample collection-** Universal sampling method. A total of 54 nephrectomy specimens received during the period from January 2013 to September 2018 were included in the study.

**Inclusion criteria-** Nephrectomy Specimen of any age and sex having non neoplastic or neoplastic (benign and malignant) lesions that undergone histo-pathological examination following surgery was included in this study.

**Exclusion criteria-** The patients who underwent core needle biopsies from their renal masses were excluded.

**Ethical approval:** The study was approved by the Institutional Ethics Committee.

**Procedure-** Patient particulars were recorded in detail including investigations like USG & CT scan findings. The cases were reviewed with respect to age, sex, pathological diagnosis, clinical presentation, laboratory investigations. All the nephrectomy specimens were fixed in 10% formalin, specimens were inspected, and gross findings, weight and dimensions were recorded. Grossing of formalin fixed specimen and processing of tissue was done according to standard protocol and bits were taken from representative areas.

The selected blocks were then processed through, ascending concentration of alcohol, cleared by xylene, embedded in paraffin and cut at 3-4 $\mu$  thickness. Sections from each block were stained conventionally by Haematoxylin and Eosin stain. Because of present study were a retrospective case, paraffin blocks and slides along with case records were retrieved and studied.

**Statistical methods-** Data was recorded in MS EXCEL and checked for its completeness and correctness then it was analysed by suitable statistical software.

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Age distribution (years)	No.	Percentage (%)
0 to 10	18	33.33
11 to 20	1	1.85
21 to 30	8	14.81
31 to 40	12	22.22
41 to 50	6	11.11
51 to 60	7	12.96
61 to 70	1	1.85
71 to 80	1	1.85
<b>Sex</b>		
<b>Male</b>	31	57.4%
<b>Female</b>	23	42.6%

Table-2: Distribution of lesions in nephrectomy cases

Lesion	No of cases (n= 54)	Percentage (%)
Non-neoplastic	16	29.6
Neoplastic	38	70.4
<b>Total</b>	<b>54</b>	<b>100</b>

Among 54 nephrectomy cases, 16(29.6%) cases were non-neoplastic lesions and 38 (70.4%) of the cases were neoplastic lesion [Table 2].

Table No.-3: Histopathological spectrum of nephrectomy cases

Histopathological finding	Number	Percentage
<b>Non- neoplastic</b>	16	29.62
CPN with hydronephrosis	7	13.0
CPN	4	7.4
Abscess	2	3.7
Hydronephrosis	1	1.9
Xanthogranulomatous Pyelonephritis	1	1.9
Polycystic kidney diseases	1	1.9
<b>Neoplastic</b>	38	70.4
<b>Benign</b>		
Angiomyolipoma	1	1.9
<b>Malignant</b>		
Renal cell carcinoma	20	37.0
Wilms tumor	16	29.6
Squamous cell carcinoma	01	1.9

Out of 38 neoplastic lesions only one (2.6%) case underwent nephrectomy for a benign renal tumor. The rest of the cases underwent nephrectomy for malignant tumors were 37 (97.4%) cases.

Among the non-neoplastic lesions, chronic pyelonephritis with hydronephrosis 07 (13.4%) cases was the most common inflammatory condition for which nephrectomy was done. It was followed by CPN 4 (7.4%) cases; renal abscess 2(3.7%) cases and one (1.9%) case each of hydronephrosis, xanthogranulomatous pyelonephritis and polycystic kidney disease.

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**Neoplastic diseases:** Renal neoplasm's constituted 38 cases, malignant tumors 37 (97.4%) cases were outnumbered compared to benign 1 (2.6%) case. Angiomyolipoma 01(1.9) case was the benign tumor seen in the present study. Among the malignant tumor, renal cell carcinoma was commonest 20(37.0%) cases; followed by wilms tumor 16 (29.6%) cases. It was noted that single (1.9%) case of squamous cell carcinoma of renal pelvis [Table-3].

**Table-4: Histological variants of renal cell carcinoma.**

Histopathological variant	No. of cases	Percentage
Clear cell	09	45.0
Papillary	06	30.0
Undifferentiated	02	10.0
Medullary	01	05
Chromophobe	01	05
Collecting duct	01	05
<b>Total</b>	<b>20</b>	<b>100</b>

Among 20 cases of renal cell carcinoma, clear cell renal carcinoma 9 (45%) cases was the most frequent followed by papillary RCC 6 (30%) cases. Other tumors included 2 (10%) cases of unclassified RCC, one (05%) case each of chromophobe RCC, medullary RCC and collecting duct RCC [Table-4].

## Discussion

In the present study, out of 54 nephrectomy cases 16 (29.6%) cases were non-neoplastic and 38(70.4%) cases were neoplastic, similar higher incidence of neoplastic lesions of 52.9% and 58.46% were reported in other studies also. [10, 11]. Number of nephrectomies done for non-neoplastic conditions has declined because of better antibiotic availability and minimally invasive techniques used these days for treatment of kidney stones. Also, patients are being treated at an earlier stage. However, a higher incidence of nonneoplastic lesions of 63.8% and 78.1% were reported in studies done by Chitra et al and K. Ramakrishna et al respectively [10, 11, 12, 13].

**Non-Neoplastic diseases-** The non-neoplastic category included both inflammatory as well as congenital disorder. Out of 16 cases of non-neoplastic disorders, infective /inflammatory pathology formed a predominant subgroup comprised of 15 cases. Hence, there is a need to emphasize the importance of early diagnosis and proper treatment of urinary tract infections and nephrolithiasis.

Among the non-neoplastic lesions, Chronic pyelonephritis with hydronephrosis (07 cases) was the most common condition for which nephrectomy was done which was similar to study done by Vikram KS et al and Amin et al was, followed by CPN (04) cases) and renal abscess (02 cases), with one case each of hydronephrosis, Xanthogranulomatous pyelonephritis and polycystic diseases of childhood [4,10]. Pyelonephritis is seen in all age group. In the present study majority of pyelonephritis were seen between 4th

to 6th decade This was comparable to the study conducted by Aniff et al, Chaitra et al, Amin et al and Bharti et al [4,12,14,15]. It was observed slightly female predominance over male in cases of chronic pyelonephritis as a pure lesion and associated with hydronephrosis and Xanthogranulomatous pyelonephritis, similar to Abdulghafoor et al and Chitra et al [3, 12].

Globally the incidence of xanthogranulomatous pyelonephritis is 0.6 to 1% with female preponderance. It was encountered with only one case (1.9%) in a 33-year-old female patient, this is similar to study done by Swarnalata Ajmera et al who have reported similar incidence. Savita D et al and Shaila et al also noted similar type of observation in their studies [11, 16, 17].

**Neoplastic diseases-** Nephrectomy is a standard treatment offered to patients who present with benign as well as malignant mass lesions in the kidney. Most common malignant tumor in adults is renal cell carcinoma (RCC) and Wilms tumor in childhood. Rare are urothelial tumors of calyces and pelvis [12].

It affects older individuals usually in the 6th and 7th decades and show male preponderance (2 to 3:1). Most renal carcinomas are sporadic. Familial variants (4%) consisting of Von Hippel-Lindau (VHL) Syndrome, Hereditary (familial) clear cell carcinoma and Hereditary papillary carcinoma [10]. In the present study, a total of 38 neoplastic lesions were reported. Maximum cases were malignant tumors (37 cases-97.4%) as compared to benign cases (1 case-2.6%), Renal cell carcinoma was the commonest malignancy with an incidence of 52.6%.

Wilms tumor was second most common malignant lesion, it was observed a total of 16 cases (42.1%) in the present study. This was similar to the findings of Aniff et al and Shaila et al who observed that the majority of malignant neoplasm of the kidney were renal cell carcinomas [4, 11].

Incidence of renal cell carcinoma was more in male gender 13 cases (65%) than female gender 07(35%). Aniff et al, Nushrat et al, Amin et al and Savita et al also observed male predominance in their studies [4, 11, 14, 16].

Among the renal cell carcinomas it was observed that left sided involvement was more 14 cases (70%) than right side 06 cases (30%), concordance to that observed by Swarnlata Ajmera et al -63.3% in left kidney and 36.7% in right kidney, similar findings were also noted by Nushrat et al, Amin et al and Savita et al in their studies [5, 11, 14, 16].

Majority of the renal cell carcinomas were seen in 3<sup>rd</sup> to 6<sup>th</sup> decades of life. This observation is similar to the study done by Chitra et al [12].

In the present study commonest type of renal cell carcinoma was clear cell type accounting for 09 cases (45%) followed by 6 cases (30%) of papillary type. This is in accordance with many other studies like Shaila et al, Chitra et al and Bharti et al [11, 12, 15].

It was observed 2 cases (10%) of undifferentiated carcinoma in the present study and one each case of Medullary type, Chromophobe type and Collecting duct type RCC.

Similar type of observation is seen in the study done by Vikram Narang et al that studied 82 cases of RCC and observed 1 case each of Chromophobe RCC, collecting duct RCC [10].

Primary squamous cell carcinoma of the kidney is a very rare entity. The incidence of renal squamous cell carcinomas among malignant renal tumors is in the range of 0.5-0.8%, as reported by Li et al. and Blacher et al. In the present study, it was noted only one case of squamous cell carcinoma was seen in a 47-year-old man. Similar type of observation is seen in the study done by Kotta et al and Aniff et al [1, 11].

In the present study, 16 cases (42.1%) of Wilm's tumor were seen among all malignant renal tumors, which is concordance with the study done by Amin et al. The youngest patient was 6 months old and the oldest patient

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was 27 years of age. Majority of cases (13) were seen in pediatric age group (0- 10-year age group) [14].

### Conclusion

A wide histopathological range of lesions comprised of neoplastic and non-neoplastic lesions was found in the current study. Wilms tumor was the most common childhood tumor and in adults renal cell carcinoma was most common malignancy where aschronic pyelonephritis (CPN) with hydronephrosis was most common non-neoplastic lesion. The trend may indicate, in the present time increase in availability of early diagnosis and appropriate better treatment facilities causes decrease in need of surgical treatment for inflammatory lesions of kidney.

### What this study adds to existing knowledge?

There is a scarcity of studies on this topic in the present study area. The present study gives an overview of the morphological patterns of lesions in nephrectomy specimens in middle India. So, the appropriate diagnostic and treatment modalities should be developed to address the same.

### Author's contribution

**Dr. Ajay Singh Thakur:** Conception, Design, Supervision, Materials, Data collection/ processing, Analysis, Literature review, Writer, Critical Review.

**Dr. Renuka Gahine:** Design, Supervision, Materials, Data collection/processing, Analysis, Literature review, Writer, Critical Review.

**Dr. Bimla Banjare:** Design, Supervision, Materials, Data collection/processing, Analysis, Literature review, Writer.

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**Permission from IRB:** Yes

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