e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(3); 120-126

Original Research Article

Histopathological Spectrum of Lesions in Nephrectomy Specimens in Northwest Rajasthan

Durga Shankar Jaipal[1], Ankita[2], Devesh Parashar[3]

[1,2]Assistant Professor, Department of Pathology, SP Medical College, Bikaner, Rajasthan
[3]Assistant Professor, Department of Pathology, Dr. SN Medical College, Jodhpur, Rajasthan

Received: 18-12-2023 / Revised: 21-01-2024 / Accepted: 26-02-2024
Corresponding author: Dr. Ankita
Conflict of interest: Nil

Abstract:

Background: The kidneys are vital for excretion and hormone production, impacting blood pressure regulation and red blood cell production. Pathological processes, including end-stage renal disease (ESRD) and cancer, may require nephrectomy. Non-neoplastic indications for nephrectomy include ESRD complications, hypertension, and infections. Renal cell carcinoma (RCC) is prevalent, especially in the Asian region, albeit underreported. Histopathological evaluation post-nephrectomy aids in diagnosing renal tumors, crucial for treatment planning.

Methods: This is a retrospective study for the period of two years from Jan 2021 to Dec 2022. We included all the nephrectomy specimens from patients aged above 18 years, received during the study period. Clinical data was collected from patient's records. Autolysed specimen, Inadequate and improperly fixed specimens and specimens of pediatric patients were excluded from this study. Biopsy specimens were processed as per routine histopathological technique. The specimens received were fixed in 10% buffered formalin. Gross examination was done, and findings recorded. The tissues were sectioned as per protocol and processed by wax block method. Slides were stained with hematoxylin and eosin (H&E) stain and examined under a light microscope.

Results: In the present study, we received a total of 86 nephrectomy specimens. Out of 86, 23 (26.74%) were simple nephrectomies and 63 (73.26%) were radical nephrectomies. We observed 61 (70.93%) neoplastic lesions and the remaining 25 (29.07%) were non neoplastic. The most common clinical presentation was pain in the flank region in 59 (68.67%) cases, while hematuria was present in 24 (27.91%) of cases. The age of the patients ranged from 22-76 years of age (mean ± std. dev. 58.14 ± 8.78 years). We observed slight female predominance with 45 (52.33%) patients were females and 41 (47.67%) were males with a male to female (M:F) ratio of 0.91:1. There was clustering of cases in the sixth and seventh decade of life with 27 (31.40%) and 24 (27.91%) cases respectively. Out of 25 (29.07%) non neoplastic lesions, on histopathological examination, chronic pyelonephritis was the most common type of lesion constituting 13 (15.12%) of all cases. Second most common lesions encountered were Xanthogranulomatous pyelonephritis and hydronephrosis due to renal stones with 3 (3.49%) and 4 (4.65%) cases. Others were cystic kidney disease with 3 (3.49%) cases and pyonephrosis with 2 (2.33%) case. Out of the 61 neoplastic lesions of various histomorphological categories, there were 7 cases of benign lesions and 54 malignant lesions. The most common lesion encountered was renal cell carcinoma with 46 cases (53.49%), in which different histological differentiations found were, clear cell type with 33 (38.37%) cases, 8 (9.3%) papillary type, 4 (4.65%) chromophobe type and 2 (2.33%) sarcomaoid type. Other than renal cell carcinoma, there were 5 (5.81%) cases of adenosquamous carcinoma, 2 (2.33%) cases of primitive neuroendocrine tumor, and 3 (3.49%) cases of transitional cell carcinoma. In benign lesions there were 4 (4.65%) cases of oncocytoma and 3 (3.49%) cases of angiomyolipoma.

Conclusion: Nephrectomy specimens reveal a diverse array of lesions, some of which may be challenging to diagnose accurately through clinical and radiological means. Therefore, it is imperative that each nephrectomy specimen undergoes thorough histopathological examination to establish a correlation between clinical presentation and morphological features, ensuring appropriate management.

Keywords: Nephrectomy, Renal Cell Carcinoma, Chronic Pyelonephritis.

Introduction

The kidneys, crucial for excretory functions, also play a key role in endocrine activities, producing renin-angiotensin to regulate blood pressure and secreting erythropoietin for hemopoiesis [1]. These vital organs are susceptible to various pathological processes, contributing significantly to morbidity.

Conditions such as end-stage renal disease (ESRD) and malignant neoplasms may necessitate surgical intervention, specifically the removal of the kidney through nephrectomy [2]. Simple nephrectomy addresses irreversibly damaged, non-functioning kidneys affected by benign pathological issues like extensive renal stone disease or neglected pelvi-ureteric junction (PUJ) obstruction. On the other hand, radical nephrectomy becomes necessary for treating diverse malignant neoplastic conditions affecting the kidney.

The most common non neoplastic indication for nephrectomy is end-stage renal disease, which can lead to significant complications such as severe bleeding. Other less common indications for nephrectomy include uncontrollable hypertension, persistent pain, and recurrent infections. Nephrectomy is often performed for distinct but related conditions like obstructive nephropathy, hydronephrosis, and chronic pyelonephritis, making it the most frequent type of nephrectomy specimen for non-neoplastic renal diseases in both adults and children. Conditions such as xanthogranulomatous pyelonephritis and cystic renal dysplasia also warrant nephrectomy. Renal cell carcinoma (RCC) accounts for 3% of all adult cancers and 85% of all kidney tumours [3]. Incidence of RCC is lower in Asian region, particularly in India, probably owing to lack of reporting [4]. The incidence is expected to rise in India due to increasing life expectancy, rising awareness, better diagnostic facilities and growing prevalence of risk factors such as obesity [5]

Precise diagnosis of the majority of renal tumors is typically not achievable until after surgery, emphasizing the essential role of histopathological evaluation. A comprehensive and careful examination of nephrectomy specimens is necessary to determine the histological type and document recognized prognostic indicators, including tumor size, histological subtype, nuclear grade, and stage, particularly in cases involving malignant renal neoplasms [6]. This study is undertaken to study the histopathological spectrum of lesions in nephrectomy specimens in a tertiary care centre in western Rajasthan.

Methods

This is a retrospective study carried out in the department of Pathology, Sardar Patel medical college, Bikaner for the period of two years from Jan 2021 to Dec 2022. We included all the nephrectomy specimens from patients aged above 18 years, received during the study period. Clinical data was collected from patient's records. Autolysed specimen, Inadequate and improperly fixed specimens and specimens of pediatric patients were excluded from this study. Biopsy specimens were processed as per routine histopathological technique. The specimens received were fixed in 10% buffered formalin. Gross examination was done, and findings recorded. The tissues were sectioned as per protocol and processed by wax block method. Slides were stained with hematoxylin and eosin (H&E) stain and examined under a light microscope.

Results

In the present study, during the study period we received a total of 86 nephrectomy specimens. Out of 86, 23 (26.74%) were simple nephrectomies and 63 (73.26%) were radical nephrectomies. [Image 1] We observed 61 (70.93%) neoplastic lesions and the remaining 25 (29.07%) were non neoplastic. [Image 2] The most common clinical presentation was pain in the flank region in 59 (68.67%) cases, while hematuria was present in 24 (27.91%) of cases. Other presenting complaints included oliguria in 16 (18.60%) cases, burning micturition in 13 (15.12%) cases and weight loss was present in 27 (31.40%) of cases. [Table 1]

The age of the patients ranged from 22-76 years of age (mean ± std. dev. 58.14 ± 8.78 years). Out of 86 patients, we observed slight female predominance with 45 (52.33%) patients were females and 41 (47.67%) were males with a male to female (M:F) ratio of 0.91:1.[Table 2][Image 3] There was clustering of cases in the sixth and seventh decade of life with 27 (31.40%) and 24 (27.91%) cases respectively. Out of 25 (29.07%) non neoplastic lesions, on histopathological examination, chronic pyelonephritis was the most common type of lesion constituting 13 (15.12%) of all cases. Second most common lesions encountered were Xanthogranulomatous pyelonephritis and hydronephrosis due to renal stones with 3 (3.49%) and 4 (4.65%) cases. Others were cystic kidney disease with 3 (3.49%) cases and pyonephrosis with 2 (2.33%) case. [Table 3]

Out of the 61 neoplastic lesions of various histomorphological categories, there were 7 cases of benign lesions and 54 malignant lesions. The most common lesion encountered was renal cell carcinoma with 46 cases (53.49%), in which different histological differentiations found were, clear cell type with 33 (38.37%) cases, 8 (9.3%) papillary type, 4 (4.65%) chromophobe type and 2 (2.33%) sarcomaoid type. Other than renal cell carcinoma, there were 5 (5.81%) cases of adenosquamous carcinoma, 2 (2.33%) cases of primitive neuroendocrine tumor, and 3 (3.49%) cases of transitional cell carcinoma. In benign lesions there were 4 (4.65%) cases of oncocytoma and 3 (3.49%) cases of angiomyolipoma. [Table 3]

Table 1: Presenting complaints of cases in the present study

Chief Complaint	No. of Cases	Percent
Flank Pain	59	68.60%
Oliguria	16	18.60%
Haematuria	24	27.91%
Weight loss	27	31.40%
Burning Micturition	13	15.12%

Table 2: Age group wise distribution of cases in the present study

Age Group	No. of Cases	Percent
21 - 30	8	9.30%
31 - 40	9	10.47%
41 - 50	7	8.14%
51 - 60	27	31.40%
61 - 70	24	27.91%
71 - 80	11	12.79%
	86	

Table 3: Diagnosis of cases in the present study

S. No.	Diagnosis	No. of Cases	Percent
1	Chronic Pyelonephritis	13	15.12%
2	Xanthogranulomatous Pyelonephritis	3	3.49%
3	Pyonephrosis	2	2.33%
4	Hydronephrosis	4	4.65%
5	Cystic Renal Disease	3	3.49%
	Total Non-neoplastic	25	29.07%
6	Oncocytoma	4	4.65%
7	Angiomyolipoma	3	3.49%
	Renal Cell Carcinoma	46	53.49%
	Clear cell	32	37.21%
	Papillary	8	9.30%
	Chromophobe	4	4.65%
	Sarcomatoid Change	2	2.33%
	Primitive Neuroendocrine tumor	2	2.33%
	Adenosquamous Carcinoma	4	4.65%
	Transitional Cell Carcinoma	2	2.33%
	Total neoplastic	61	70.93%
	Grand Total	86	

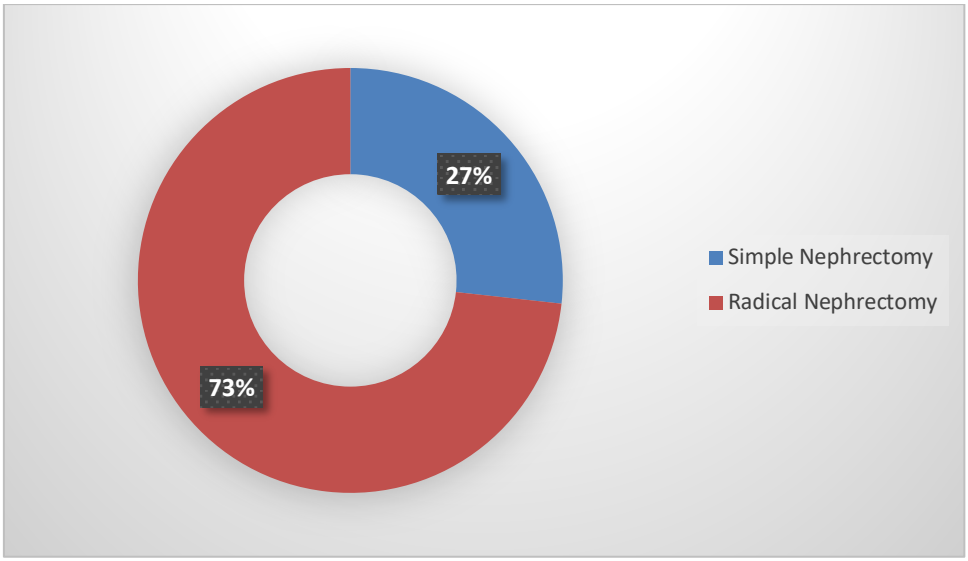

Image 1: Percentage of different types of nephrectomies in our study

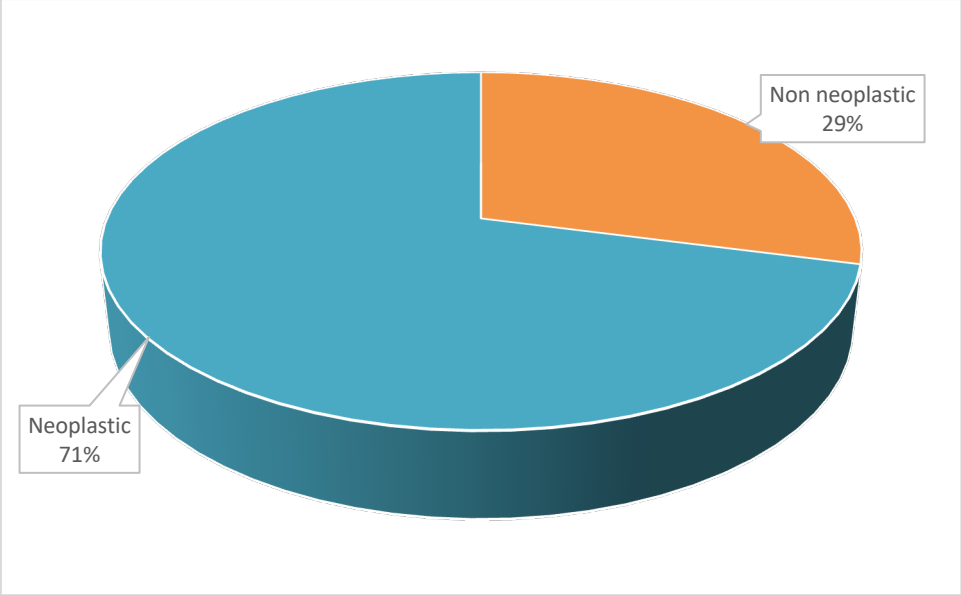

Image 2: Distribution of cases as Neoplastic and Non neoplastic

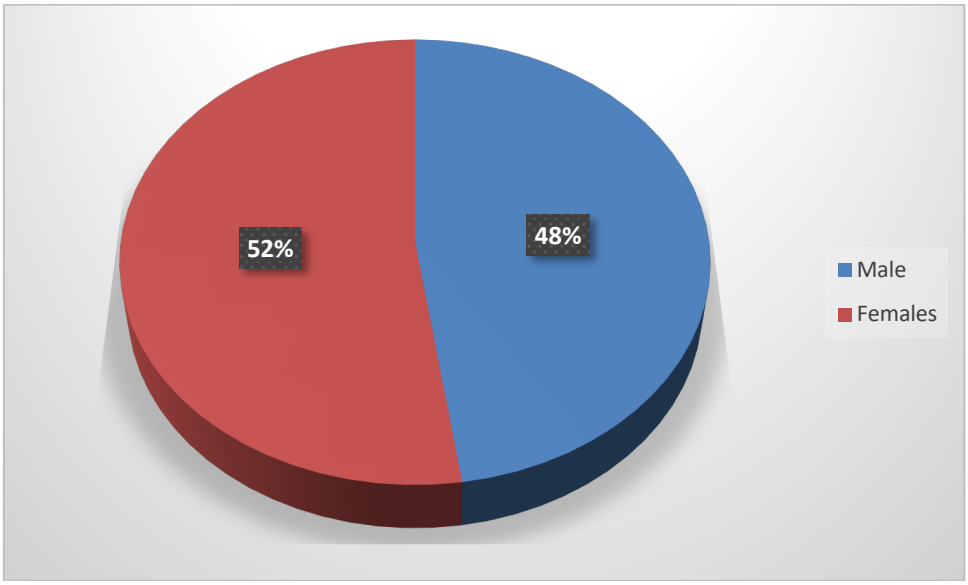

Image 3: Gender wise distribution of cases in the present study

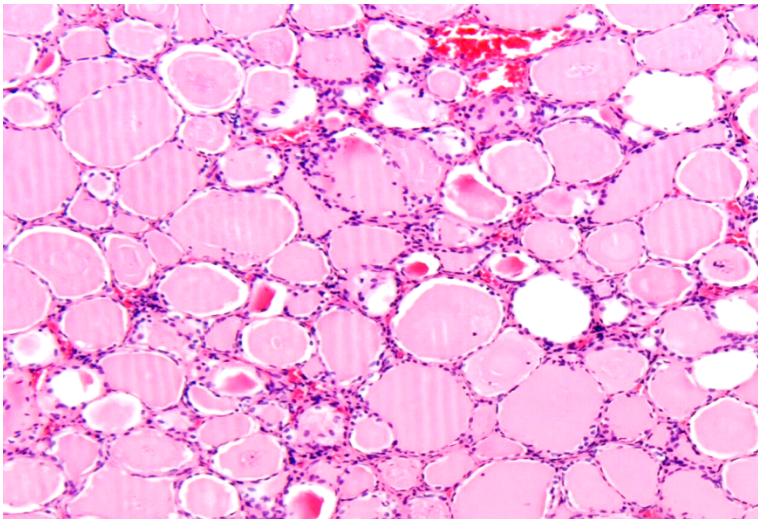

Image 4: Section showing chronic pyelonephritis showing thyroidisation of renal tubules (H&E, 40x)

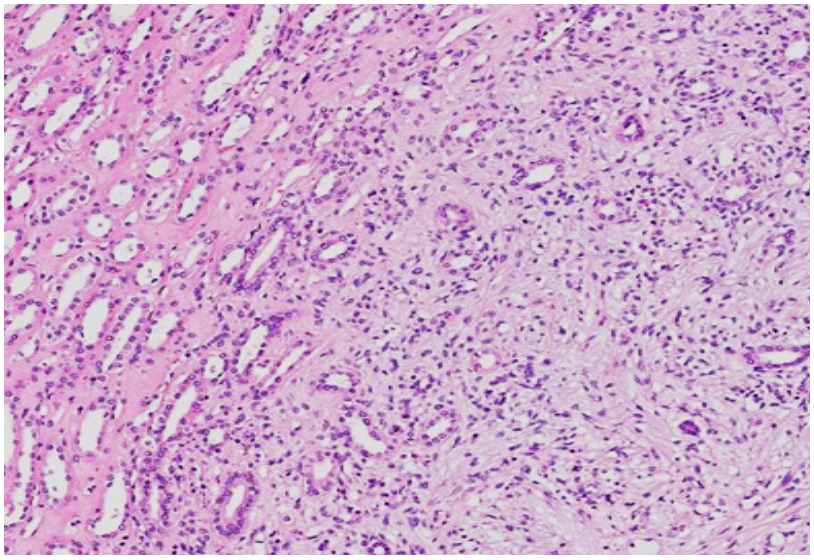

Image 5: Section showing tubules and clear cell type RCC (H&E, 10x)

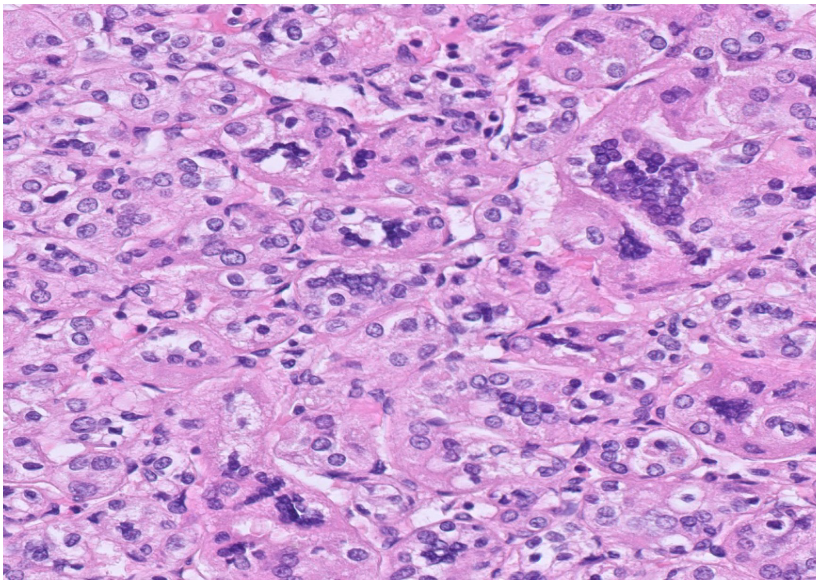

Image 6: Section showing clear cell type RCC (H&E, 40x)

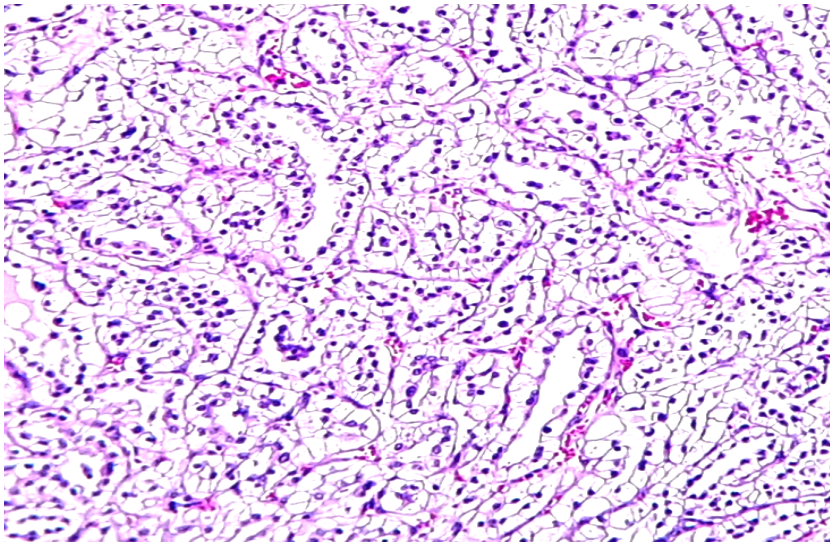

Image 7: Section showing papillary type RCC (H&E, 40x)

Discussion

Nephrectomy serves as the primary treatment option for patients presenting with both benign and malignant mass lesions in the kidney. The most prevalent malignant tumor in adults is renal cell carcinoma (RCC), while Wilms tumor predominates in childhood. Urothelial tumors of the calyces and pelvis are considerably rare. RCC constitutes 1 to 3% of all visceral cancers and 85% of renal cancers. It predominantly affects older individuals, typically in their sixth and seventh decades, with a higher incidence among males (2 to 3:1 ratio). Risk factors include tobacco use, obesity, hypertension, estrogen therapy without opposing progesterone, asbestos exposure, chronic renal failure, acquired cystic disease, and tuberous sclerosis complex. Most renal carcinomas occur sporadically, although familial variants (4%) such as Von Hippel-Lindau (VHL) Syndrome, Hereditary (familial) clear cell carcinoma, and Hereditary papillary carcinoma also exist [7,8].

In the present study a total of 86 nephrectomy specimens were included which included the majority of radical nephrectomy specimens. In our study flank pain was the most common clinical symptoms (68.60%), while other presenting complaints were hematuria in 24 (27.91%) cases, oliguria in 16 (18.60%), burning micturition in 13 (15.12%) and weight loss was present in 27 (31.40%) of cases, which was similar to the study of A Aiman et al [9] who found that 90 out of 140 patients under study presented with flank pain.

In the current study, the number of cases involving neoplastic disorders (61 cases, 70.93%) exceeded those attributed to non-neoplastic conditions (25 cases, 29.07%) with the ratio of 2.44: 1. This finding aligns with previous studies conducted by Bersland et al. (30.8% non-neoplastic) and Danenport et al. (48.6% non-neoplastic) [10,11]. The decrease in nephrectomies performed for non-neoplastic conditions can be attributed to improved antibiotic availability and the utilization of minimally invasive techniques for treating kidney stones, resulting in earlier intervention.

We observed a female predominance, with a male-to-female ratio of 0.9:1, which was consistent with findings by A Aiman et al [9] and 1:1.05 observed by Mohammad Rafique. However, there was male predominance in most other studies by Neggada et al. (1.6:1) and Eke N et al. (1.6:1) [12,13]. This variation may be due to the geographical variations and the occupational differences. The most common age group undergoing nephrectomies in our study was the sixth and seventh decade. In our study the most common age group was 51-60 years with 31.40% cases.

In the present study, out of 25 (29.07%) non neoplastic lesions, chronic pyelonephritis was the most common type of lesion constituting 13 (15.12%) of all cases. Second most common lesions encountered were Xanthogranulomatous pyelonephritis and hydronephrosis due to renal stones with 3 (3.49%) and 4 (4.65%) cases. Others were cystic kidney disease with 3 (3.49%) cases and pyonephrosis with 2 (2.33%) case. Similar results were reported by Amin et al [9] and Narang V et al [14]. Globally the incidence of xanthogranulomatous pyelonephritis is 0.6 to 1% with female preponderance. However, in our study, it was encountered with 3 (3.49%) cases, which is higher than the global prevalence.

Out of the 61 neoplastic lesions, there were 7 cases of benign lesions and 54 malignant lesions. The most common lesion encountered was renal cell carcinoma with 46 cases (53.49%), in which different histological differentiations found were, clear cell type with 33 (38.37%) cases, 8 (9.3%) papillary type, 4 (4.65%) chromophobe type and 2 (2.33%) sarcomaoid type. This is in accordance with many other studies like Shaila et al, Chitra et al and Bharti et al [15-17]. Other than renal cell carcinoma, there were 5 (5.81%) cases of adenosquamous carcinoma, 2 (2.33%) cases of primitive neuroendocrine tumor, and 3 (3.49%) cases of transitional cell carcinoma. In benign lesions there were 4 (4.65%) cases of oncocytoma and 3 (3.49%) cases of angiomyolipoma.

Conclusion

The current study offers a comprehensive understanding of the histological characteristics observed in nephrectomy specimens within our institution and compares them with studies conducted globally. Nephrectomy specimens reveal a diverse array of lesions, some of which may be challenging to diagnose accurately through clinical and radiological means. Therefore, it is imperative that each nephrectomy specimen undergoes thorough histopathological examination to establish a correlation between clinical presentation and morphological features, ensuring appropriate management.

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