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ORIGINAL ARTICLE

SPECTRUM OF LESIONS IN NEPHRECTOMY SPECIMENS IN TERTIARY CARE HOSPITAL

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ABSTRACT: CONTEXT: Nephrectomy is a standard surgical procedure in urological practice performed in end stage/nonfunctioning kidney or in suspected malignant neoplasm. **AIM:** A retrospective & prospective review of histopathological lesions including rare lesions encountered in different age group & genders amongst nephrectomy specimens received in department of pathology. **METHODOLOGY:** Study included total 106 nephrectomy cases over a period of 5 years, (March 2010 to February 2015.) **RESULT:** In this study the most common lesions were inflammatory (77.36%), {vast majority being chronic nonspecific pyelonephritis (60.38%),} followed by malignant neoplasm (18.8%) & benign neoplasms (3.77%). Most common age group was 4th to 5th decade for inflammatory lesions, and 6th to 7th decade for malignant lesions. Clear cell sarcoma kidney in a child & transitional carcinoma in an adult were the rare lesions encountered. **CONCLUSION:** Common lesion encountered was chronic nonspecific pyelonephritis, followed by renal cell carcinoma. Clear cell sarcoma kidney in a child, & transitional carcinoma in an adult were the rare lesions in the study.
KEYWORDS: Nephrectomy, Renal cell carcinoma, Clear cell sarcoma, Mesoblastic nephroma.

INTRODUCTION: Kidneys are vital organs of the body with multiple functions. They are essential for not only excretory function but also to maintain water and salt metabolism along with acid base balance. In addition they maintain the blood pressure through renin-angiotensin mechanism and produce erythropoietin required for hematopoiesis.

Nephrectomy is the standard surgical procedure performed in the context of end stage renal disease and in the case of suspected malignant renal disease. The most common indication for nephrectomy is loin pain, hematuria, mass in the abdomen and a radiological evidence of minimal excretory activity of the kidney through procedures of IVP and ultrasound.[1] Simple nephrectomy is indicated in patients with irreversible kidney damage and also indicated to treat Reno vascular hypertension while radical nephrectomy is the treatment of choice for renal cell carcinoma (RCC).[2]

Among the non-neoplastic indications in nephrectomies, non-functioning kidney in obstructive nephropathies and chronic pyelonephritis are the most common.[3] The management of severely diseased tuberculous kidney is indisputable and mandatory.[4] Among neoplastic lesions in kidney renal cell carcinoma accounts for 80-85 percent of malignant kidney tumors.[5] Nephroblastoma (Wilms tumor) is the most common malignant pediatric renal tumor usually seen at age 2-5 years. Multicystic nephroma is a rare benign cystic lesion of kidney & it is grouped under mixed epithelial & stromal tumor in WHO classification of renal tumors.[6] Clear cell sarcoma kidney & congenital mesoblastic nephroma (CMN) are rare in children.

AIMS AND OBJECTIVES: The objective of the present study is assess the spectrum and frequency of the different pathological lesions:

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- To study the histopathological features of lesions in the nephrectomy specimen.
- To analyze the neoplastic lesion of kidney according to age, gender, site and histopathology.
- To evaluate the rare case of renal neoplasm.

METHODOLOGY: The present study was conducted in the Department of Pathology in collaboration with the Department of Urology and Pediatric surgery of this institute, and included all nephrectomy specimens received in this department over a period of 5 years from March 2010 to February 2015. The study was included retrospective 3 years and prospective 2 years. A total of 106 cases were included in the study. For retrospective cases, paraffin blocks and slides along with case records were retrieved and studied. All the nephrectomy specimens were fixed in 10% formalin and thorough gross examination was done as per standard guidelines.

Grossing of formalin fixed specimen and processing of tissue was done according to standard protocol. H & E stained sections were studied. Special stains & immunohistochemistry was also done where ever needed. Patient particulars were recorded in detail including investigations like USG & CT scan findings. The cases were reviewed with respect to age, sex, right or left, pathological diagnosis, clinical presentation, laboratory investigations.

RESULT: The present study included all 106 nephrectomy cases received during the study period. Among them female patients were 61 cases (57.55%), male patients were 45 cases (42.45%) (Table-1). Youngest age was 11 days (CMN), and oldest age was 72 years (TCC).

Highest percentage of patients undergoing nephrectomy belonged to 41-50 years age group with 27.36% (29cases). Lowest percentage of patients belonged to <10 years age group with 6.6% (7 cases) (table-1).

Among 106 nephrectomies received during the study period 82 cases (77.36%) were non neoplastic, 4 cases (3.77%) were benign neoplastic, 20 cases (18.87%), chronic pyelonephritis (CPN) was the commonest disease encountered - 64 cases (60.38%) were malignant neoplastic cases.

Age(years)	**<10**	**11-20**	**21-30**	**31-40**	**41-50**	**51-60**	**>61**	**Total**	**%**
Female	4	6	10	11	16	7	7	61	57.55
Male	3	6	6	8	13	8	1	45	42.45
Total	**7**	**12**	**16**	**19**	**29**	**15**	**8**	**106**	100
%	6.60	11.32	15.09	17.92	27.36	14.15	7.55	100	

Table 1: Age & sex wise distribution of renal lesions

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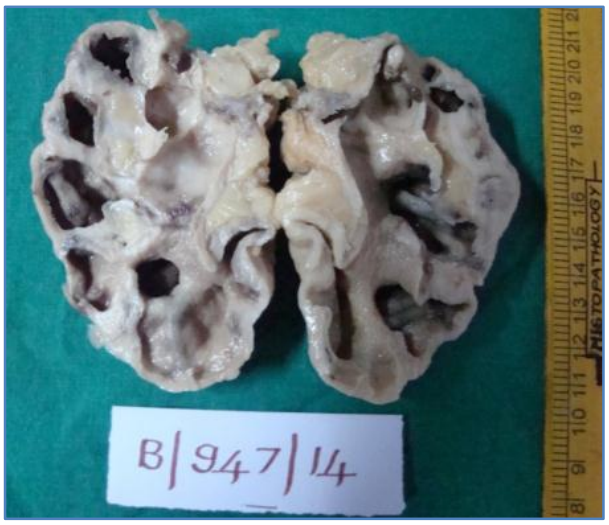

Fig. 1: Chronic pyelonephritis with hydronephrosis & renal calculi

Among 82 non-neoplastic diseases encountered 64(60.38%) were nonspecific pyelonephritis cases, 12(11.32%) were tuberculous pyelonephritis (AFB +VE) cases, 2 cases (1.89%) were xanthogranulomatous pyelonephritis, 2 (1.89%) were hypo plastic kidneys. 1(0.94%) case each was of traumatic kidney and hydatid cyst of kidney.

Fig. 2: Tuberculous pyelonephritis

Among total nephrectomies, 4(3.77%) benign neoplastic lesions were encountered, among which 2(1.84%) cases were oncocytoma, 1(0.94%) each were of multicystic nephroma & adult polycystic kidney disease. Among 20(18.87%) cases of malignant neoplastic lesions, 12(11.32%) were renal cell carcinoma, 5(4.72%) were Wilm's tumor, 1(0.94%) case each of clear cell sarcoma kidney, congenital mesoblastic nephroma & transitional cell carcinoma.

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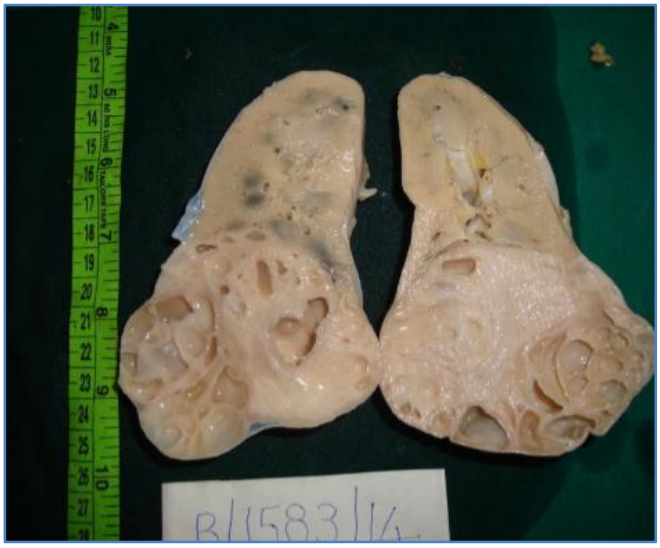

Fig. 3a: Multicystic Nephroma

Most common clinical presentation of patients who underwent nephrectomy was flank pain seen in 80 cases, which is followed by fever (55 cases), hematuria (30 cases) and least common symptom was epigastric pain (2 cases). Pediatric neoplastic cases presented with fullness & mass in the abdomen.

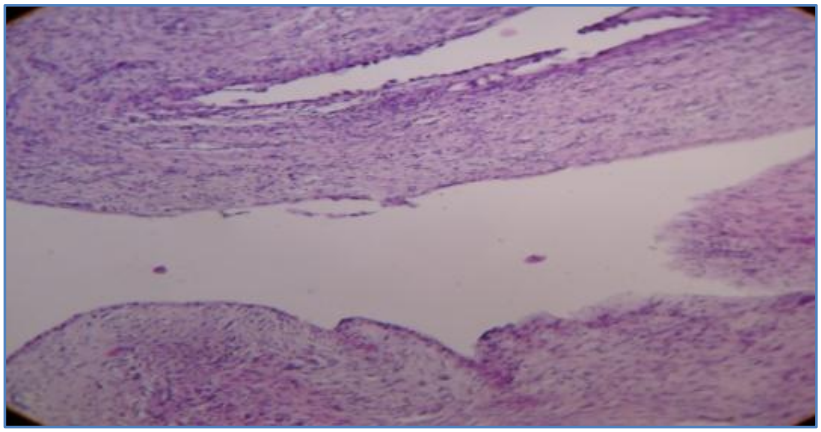

Fig. 3b: Multicystic Nephroma (x40)

Out of 106 nephrectomies 62 cases were left sided kidneys and 44 cases were right sided one. Out of 106 gross specimens of nephrectomies, 64 were nonspecific pyelonephritis cases, 48 were associated with calculus pyelonephritis which were showing hydronephrosis with dilated pelvis calycyeal system and thinned out cortex. Other inflammatory lesions encountered were tuberculous pyelonephritis 12(11.32%) cases and two cases of xanthogranulomatous pyelonephritis (1.89%), 1 case of hydatid cyst (0.94%).

The non-inflammatory, non-neoplastic indications or nephrectomy were 2(1.84%) cases of hypo plastic kidney, & 1(0.94%) case of traumatic rupture of kidney.

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Sl. No.	Lesions	<10 yrs.	11-20	21-30	31-40	41-50	51-60	>60 yrs.	Total
1	Chronic pyelonephritis	0	7	9	15	22	10	1	64
2	Tuberculous pyelonephritis	0	2	4	2	4	0	0	12
3	Xanthogranulomatous pyelonephritis	0	0	2	0	0	0	0	02
4	Hydatid cyst	0	1	0	0	0	0	0	01
5	Hypo plastic kidney	1	1	0	0	0	0	0	02
6	Traumatic rupture of kidney	0	0	1	0	0	0	0	01
7	Polycystic kidney disease(adult)	0	0	0	0	0	1	0	01
8	Multisystem nephroma	0	0	0	1	0	0	0	01
9	Oncocytoma	0	0	0	0	2	0	0	02
10	Renal cell carcinoma	0	0	0	1	1	4	6	12
11	Wilm's tumor	5	0	0	0	0	0	0	05
12	Congenital mesoblastic nephroma	1	0	0	0	0	0	0	01
13	Clear cell sarcoma	0	1	0	0	0	0	0	01
14	Transitional cell carcinoma	0	0	0	0	0	0	1	01
	Total	**7**	**12**	**16**	**19**	**29**	**15**	**8**	**106**

Table 2: Age-wise distribution of various lesions

Under neoplastic conditions we encountered, Renal cell carcinoma was the most common, comprising of 11.32% (12 cases) of all nephrectomies followed by Wilm's tumor – 5 cases(4.72%), & 1 case each(0.94%)of clear cell sarcoma, congenital meroblastic nephroma and transitional cell carcinoma.

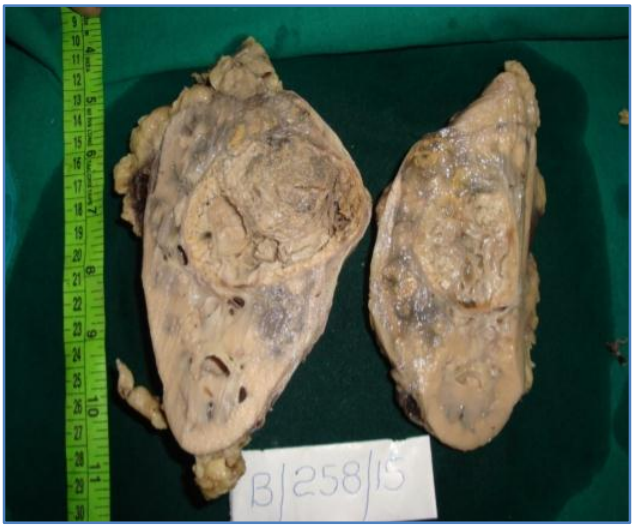

Fig. 4: Renal cell carcinoma (Papillary type)

The histological types of renal cell carcinomas were, 7 cases of (58.3%) clear.

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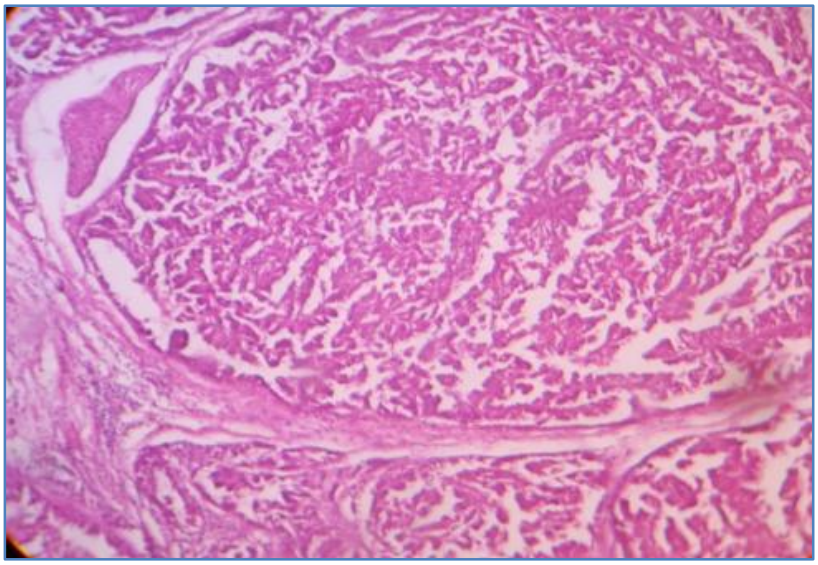

Fig. 5: Papillary variant of renal cell carcinoma (40X)

Cell type, 4 cases (33.33%) were papillary variants & 1 case (8.3%) was chromophobe variant. Fuhrman nuclear grading in all the cases of renal cell carcinomas shows grade 2 to 3 nuclear feature.

Fig. 6: Renal cell carcinomac(Clear cell varient)

The present study included 5 cases of Wilm's tumor in the age group of 2 to 6 years. Microscopically 3 cases had triphasic (blastemal, epithelial &mesenchymal) lineage, and 2 cases had biphasic lineage. None of them had unfavorable histology. All the malignant lesions were of stage 1.

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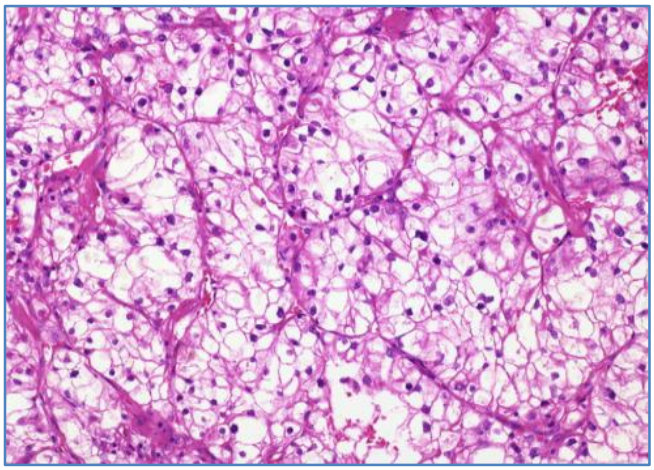

Fig. 7: Clear cell variant of RCC (40X)

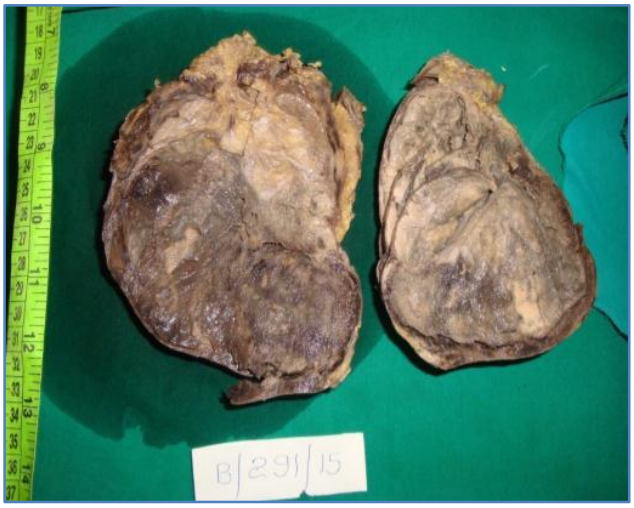

Fig. 8: Renal cell carcinoma (Chromophobe variant)

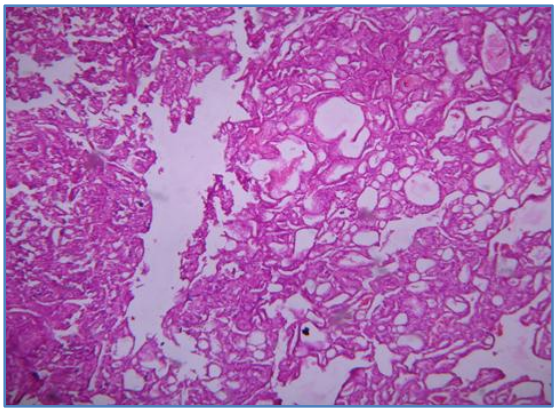

Fig. 9: Chromophobe variant of RCC (40x)

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One (0.94%) case of clear cell sarcoma kidney in a 12 year old female child is included in our study. Gross examination revealed, right nephrectomy specimen measuring 8.5x5x4cm, with circumscribed tumor mass measuring 7x4cm, with grey white solid cut surface with areas of necrosis & hemorrhage. (Figure.11). Tumor was invading the renal capsule... Microscopic picture showed highly cellular tumor consisting of proliferating monotonous unidentified malignant cells with moderately clear to faint eosinophilic cytoplasm, nucleus was anisokaryotic with inconspicuous nucleoli. &2-3 mitosis/hpf.

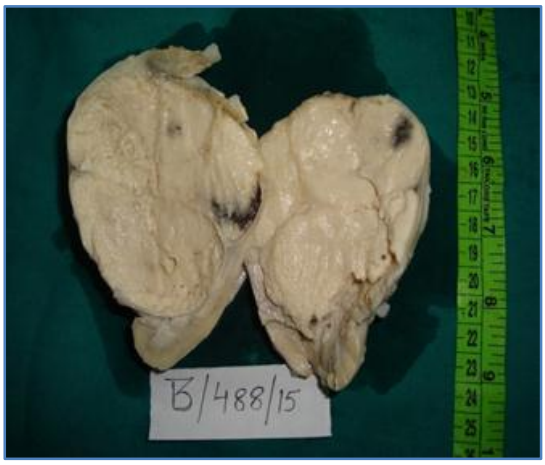

Fig. 10: Wilms tumor

And intervening delicate vascular stroma. (Figure12.).Immunohistochemistry revealed focal vimentine positive. & cytokeratin, NSE negative.

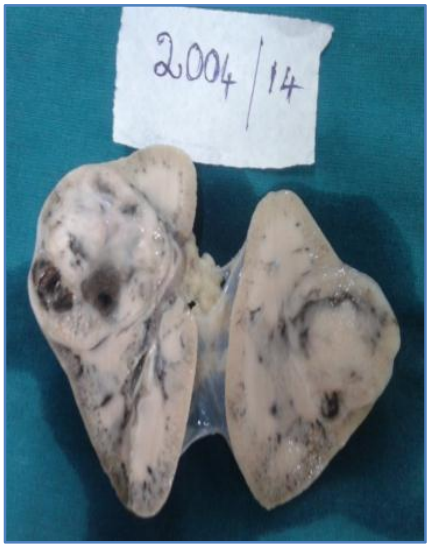

Fig. 11: Clear cell sarcoma kidney

Another rare case in our study was congenital mesoblastic nephroma operated in 11day old infant, with history of maternal hydramnios, premature birth, abdominal mass. The nephrectomy specimen revealed a grey brown circumscribed fleshy mass with hemorrhage &cystic degeneration. (Figure14A.)Microscopically, cellular varient with sheet like proliferation of plump atypical spindle cells with moderate cytoplasm & vesicular nucleus, 5-6 mitosis/hpf (Figure, 14B)

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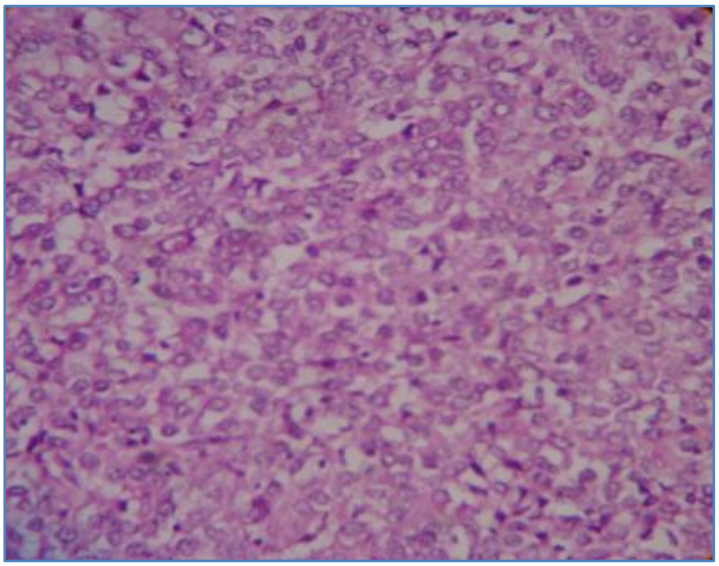

Fig. 12: Clear cell sarcoma (40x)

The present study included a case of high grade transitional cell carcinoma of renal pelvis in a72 year old male patient. (Fig-13)

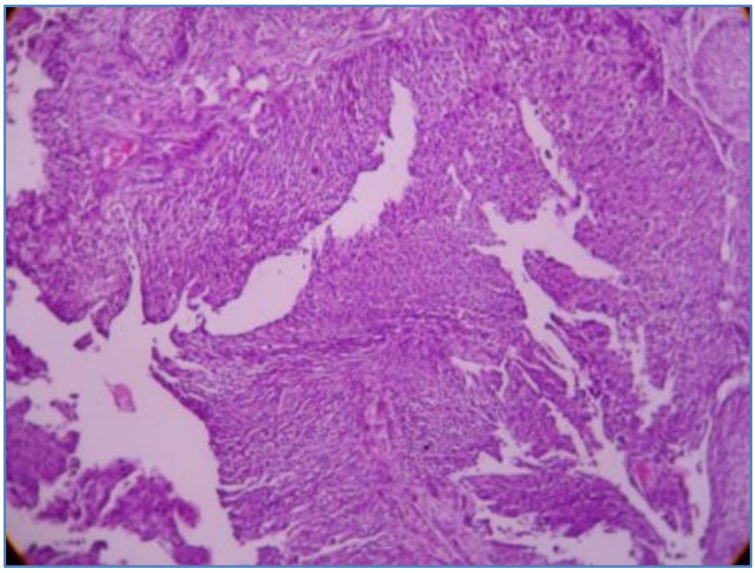

Fig. 13: Transitional cell carcinoma of renal pelvis

Among the benign neoplastic lesions, multicystic nephroma is unusual one. A 33 year old woman, presented with mild persistent left flank pain. Ultrasound scanning revealed a multicystic mass having multiple thick septae. The nephrectomy specimen showed a lobulated outer surface. While the cut surface revealed numerous cysts in the lower half portion of kidney. Cysts were filled with serous fluid. (Figure-3a) Microscopic examination showed multiple cysts lined by flattened to low cuboidal epithelium. (Figure-4b.)

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Fig. 14: Mesoblastic nephroma, (A) Gross, (B) Microscopy (40x).

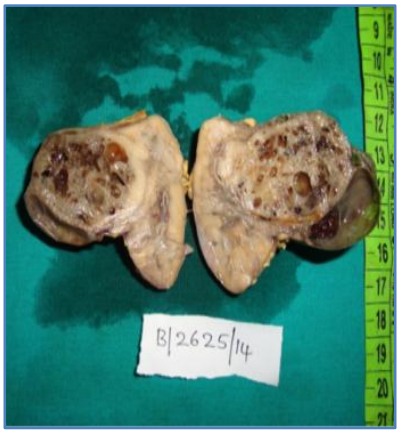

Fig. 14 A

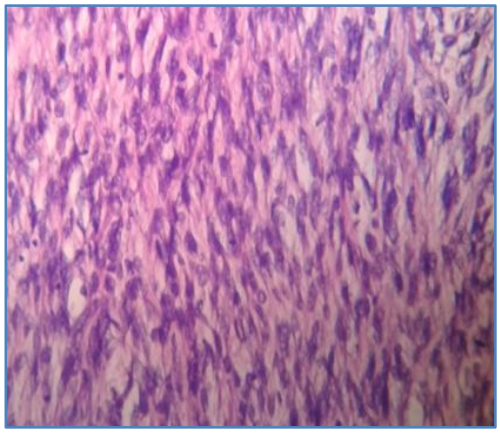

Fig. 14 B

DISCUSSION: In our study 106 nephrectomy cases were analyzed. There were 86 cases (81.13%) were benign lesions, 20 cases (18.87%) were malignant lesions. There was a vast majority of benign lesion in our study. Similar study was observed by Aifa Aiman et al.,[7] & others.[8,9] (Table 3)

Study	Benign %	Malignant%
Chalayini et al[8] (2002)	70.44	29.56
Rafique [9](2007)	76.60	23.40
Aiffa Aiman et.al[7] (2010)	77.20	22.80
Present study (2015)	81.13	18.87

Table 3: Studies comparing benign & malignant lesions

Out of 106 nephrectomies 82(77.66%) were non neoplastic and 24(22.64%) were neoplastic lesions. This observation is similar to study of Divyasree B.N. et al.[10] where non-neoplastic were 72.41% & neoplastic were 27.59% cases.

Among the nephrectomy cases 61 (57.55%) were female patients & 45 (42.45%) were male patients. This finding is again similar to study of Divyasree B.N.et al [10].who observed 51.5% of female & 48.5% of males. However it is at variable with E. Malik et al.[11] reported 61% nephrectomies in males & 39% in females.

Majority of nephrectomies were in 5th decade (26.41%), followed by 4th decade (18.86%), this observation is varies with study of Mohammed. et. al.,[12] who observed in 3rd decade (30%) followed by 4th decade (20%).

In the present study the most common clinical presentation was flank pain (80 patients), followed by fever (30 patients). This observation is more or less comparable with study conducted by Aiffa Aimann et al.[7]

In our study the most common lesion (64 cases) observed was chronic nonspecific pyelonephritis comprising 60.38% of total nephrectomies, which is followed by renal cell carcinoma (11.32%) and tuberculous pyelonephritis (11.32%). These findings are again correlating with the study of Aiffa Aimann et al[7], Popat et al.[13]

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In the present study, 2 cases (1.88%) of xanthogranulomatous pyelonephritis were seen, both of them were associated with renal calculi & found in female gender. This observation is matching with the studies of Siddappa et al,[14] Ghalayani IF et al.[8]

Among 20 malignant neoplastic lesions of kidney in our study, the most common neoplasm encountered was renal cell carcinoma i.e. 12 cases (63.16%), which is followed by Wilm's tumor i.e: 5 cases (26.36%). This was similar to findings of Aiffa Aiman et al [7] & Mohammed Rafique et al.[9] Other rare neoplastic lesions were transitional cell carcinoma in adults & clear cell sarcoma kidney & congenital mesoblastic nephroma in childhood i.e: 1 case each. Among the renal cell carcinomas all the cases are seen in 5th – 7th decades of life. This observation is similar to the observation by Mahesh Kumar et al.[15]

	Mahesh kumar et al[15] (7cases)	Aiffa aimann et al[7] (25cases)	Present study(12cases)
Clear cell type	57.19%(4)	80%(20)	58.3%(7)
Papillary type	14.2%(1)	12%(3)	33.33%(4)
Granular type	14.2%(1)	8%(2)	8.3%(1)
Sarcomatoid type	14.2%(1)	0	0

Table 4: Histological types of renal cell carcinoma in different studies

In our study histological types of renal cell carcinomas were 7 (58.3%) cases of clear cell type, 4 cases (33.33%) were papillary variants & 1 case (8.3%) was chemophobe variant. This observation is similar to the observation noted by Mahesh Kumar et al [15] & Aiffa Aimann et al.[7] (table 4)

Fuhrman nuclear grading in all the cases of renal cell carcinomas shows grade 2 to 3 nuclear feature. This observation again was similar to the study of Aiffa Aimann et al,[7] & Popat et al.[13]

The present study included 5 cases of Wilm's tumor in the age group of 2 to 6 years which is correlating with the study of Argani P. et al.[16] Microscopically 3 cases had triphasic (Blastemal, epithelial & mesenchymal) lineage, and 2 cases had biphasic lineage.

In our study we observed one case of congenital mesoblastic nephroma, operated in a 11 days old infant, with history of maternal hydramnios, premature birth, abdominal mass. This observation is similar to the study of Daskas N et al.[17]

Other rare renal neoplasms we came across were; a case of clear cell sarcoma of kidney in a 12 year old female child was similar to observation of Aiffa Aimann et al[7] & Popat et al;[13] comprising approximately 14% of pediatric renal tumors(7 cases).This observation slightly differs from the study of Bo.Xie et. Al,[18] who observed 4% clear cell sarcoma kidney among childhood renal tumor. & Argani P. et al.[16] who's study has a peak incidence during 3-5 years, with a male: female ratio of 2:1

Other rare renal neoplasms we came across was 1 case of transitional cell carcinoma of renal pelvis in a 72 years old male patient comprising of 5% of renal neoplasms.

CONCLUSION: The present study provides a fair insight into the morphological patterns of lesions in nephrectomy specimens in our institution. There is a vast majority of non-functioning kidney due to inflammatory lesion is the indication for nephrectomy; whereas malignant neoplasms, (Most common being renal cell carcinoma) is the second common indication. A wide histopathological spectrum of lesions comprising both neoplastic and non-neoplastic lesions were encountered in nephrectomy specimens. Hence it is mandatory to study each specimen in detail along with clinical and radiological findings.

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