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Histopathological spectrum of lesions of kidney: A morphological study

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Abstract

Introduction: The kidneys, as essential organs with diverse functions, are of paramount importance in the human body. Their primary role involves eliminating metabolic waste products and maintaining the balance of water, salt, calcium, phosphorus, anions, and cations to uphold the plasma's acid-base equilibrium. The objective of the current study is to investigate and understand the various morphological patterns exhibited by renal diseases, as well as assess their distribution across different age groups and genders.

Material and Methods: The present study was conducted at Department of Pathology, Mamata Medical College, Khammam. A total of 32 nephrectomy specimens were studied.

Results: The study shows, male to female ratio is 2.5:1 with male preponderance and among 32 nephrectomy specimens 20 were non-neoplastic and 12 were neoplastic. Neoplastic lesions constitute about 20 cases with chronic pyelonephritis being the most common cause (8 cases) leading to nephrectomy. Hydronephrosis (5 cases) majority of them showed enlarged kidneys with depressed scars and loss of corticomedullary differentiation. In the age group between 5th to 6th decades maximum number of non-neoplastic lesions was seen and least is observed in between 1st to 2nd decade.

Conclusion: To conclude, these findings provide valuable insights into the histopathological patterns and distribution of kidney diseases in the studied population, contributing to our understanding of the prevalence and characteristics of these conditions.

Keywords: Nephrectomy, kidney diseases, neoplastic, histopathology

Introduction

The kidneys, being vital organs with multifaceted functions, play a crucial role in the body. Their primary responsibility entails excreting metabolic waste products and regulating the concentration of water, salt, calcium, phosphorus, anions, and cations to maintain the acid-base balance of plasma [1]. Furthermore, the kidneys serve as endocrine organs, secreting hormones like erythropoietin, renin, and prostaglandins, while also overseeing vitamin D metabolism. In addition, they contribute to the regulation of blood pressure through the Renin-Angiotensin mechanism [2].

The histopathological spectrum of lesions of the kidney encompasses a wide array of pathological conditions that affect the structure and function of this vital organ. Histopathology refers to the microscopic examination of tissue samples obtained from the kidney, allowing for the identification and characterization of various lesions [3].

The kidneys play a crucial role in maintaining the body's homeostasis by filtering waste products and excess fluids from the blood, regulating electrolyte balance, and producing hormones involved in blood pressure regulation. However, the kidneys can be subject to a range of pathological changes resulting from diverse etiologies, including primary renal diseases, systemic conditions, infections, and genetic abnormalities [4].

Inflammatory and neoplastic conditions are the most frequently encountered kidney lesions. In severe cases, chronic renal disease can lead to the deterioration of the renal parenchyma in both kidneys, ultimately resulting in renal failure. Consequently, the removal of non-functioning kidneys through nephrectomy becomes necessary [5].

The extensive utilization of imaging techniques in recent years has resulted in an upsurge in the number of nephrectomies performed. However, in certain situations, distinguishing between renal tumors and tumor-like conditions based solely on imaging techniques proves to be a challenge.

Radiological methods have demonstrated limitations in accurately differentiating between benign and malignant lesions, leading to the consideration of all renal masses as potentially malignant unless proven otherwise through histopathological examination [6].

The purpose of the present study is to know the different morphological patterns of renal diseases and to assess their distribution among different age group and sex.

Materials and Methods

Type of Study: Descriptive study.

Duration of study: November 2020 to September 2022.

Place of study: Department of pathology, Mamata General Hospital, Khammam.

Sample Size: Total 32 specimens of nephrectomy were studied.

Inclusion criteria: All nephrectomy specimens.

Exclusion Criteria: Renal biopsies.

Method of collection of data

Detailed clinical data of the patient like age, sex, clinical diagnosis along with radiological details like USG and CT was taken.

All nephrectomy specimens were fixed in 10% formalin and then subjected to gross examination, noting the size, appearance, external surface and cut surface.

Sections were cut at 3-4 microns thickness, processed and stained with routine Haematoxylin and Eosin stain in the department of pathology, Mamata Medical College, Khammam. All sections were studied and Histopathological

evaluation of nephrectomy specimens were done. Tumours were further classified according to 2016 WHO classification.

Ethical Committee Clearance and Consent: The study was approved by the College Ethics Committee a

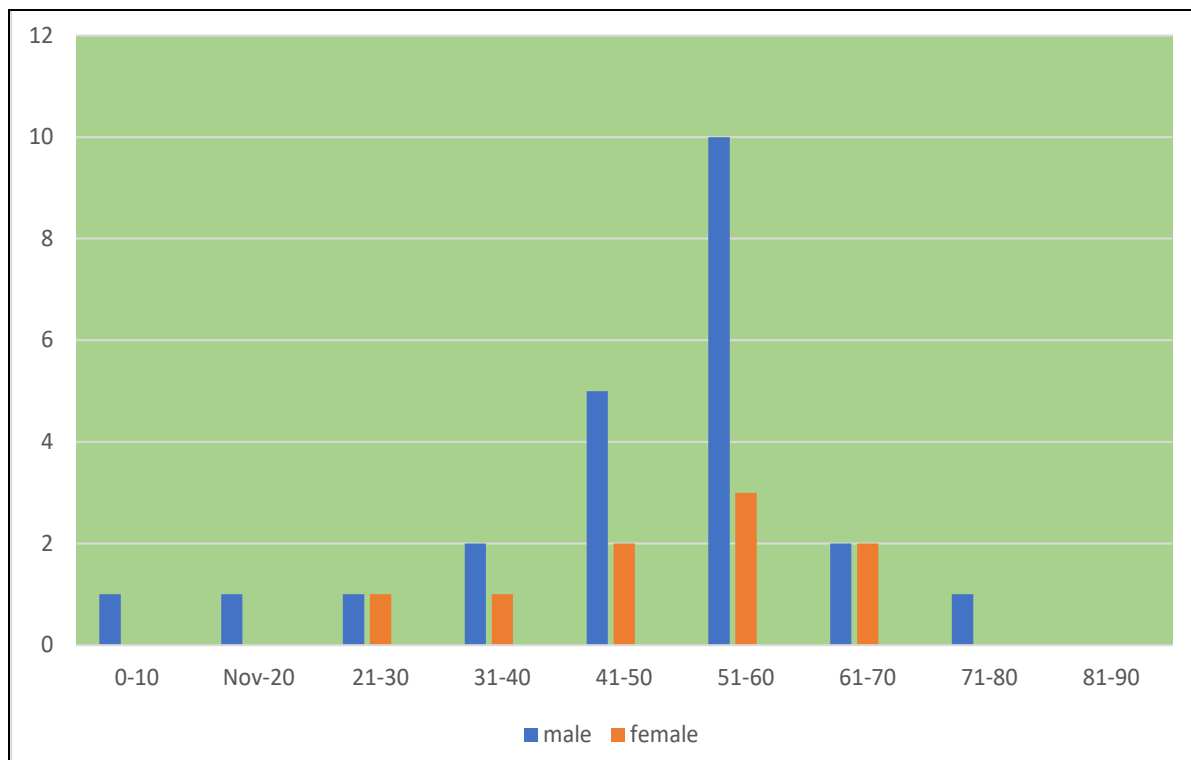
Results

The present study was conducted at Department of Pathology, Mamata Medical College, Khammam. A total of 32 nephrectomy specimens were studied.

Table 1: Age and sex distribution in Nephrectomy specimens (N=32)

Age group	Male	Female	Total Number of Cases.	Percentage
0-10	01	-	01	3.20%
11-20	01	-	01	3.20%
21-30	01	01	02	6.25%
31-40	02	01	03	9.37%
41-50	05	02	07	21.80%
51-60	10	03	13	40.60%
61-70	02	02	04	12.50%
71-80	01	-	01	3.20%
Total	23	09	32	100%

In the present study the youngest patient is 2 years male child while oldest patient is of 7th decade and most common age group affected is between 5th to 6th decades. Male to female ratio is 2.5:1 with male preponderance.



Graph 1: Frequency of age and sex distribution in nephrectomy specimens

Table 2: Distribution of Non-neoplastic and Neoplastic lesions in nephrectomy specimens (N=32)

Type of lesion	Number of cases	Percentage
Non-Neoplastic	20	62.50%
Neoplastic	12	37.50%
Total	32	100%

Among 32 nephrectomy specimens 20 were non-neoplastic and 12 were neoplastic.

Non Neoplastic Lesions

The non-neoplastic lesions constitute about 20 cases with chronic pyelonephritis being the most common cause (8

cases) leading to nephrectomy. 75 % of the cases showed shrunken kidney with renal scarring. The pelvicalyceal system was dilated and distorted. Microscopy showed varying degrees of glomerular sclerosis, periglomerular fibrosis, tubular atrophy and thyroidization along with interstitial inflammation, fibrosis and thickened blood vessels.

Hydronephrosis (5 cases) majority of them showed enlarged kidneys with depressed scars and loss of corticomedullary differentiation. The microscopy showed periglomerular fibrosis atrophied tubules few with thyroidization, fibrosis and interstitial inflammation.

Xanthogranulomatous Pyelonephritis (3 cases) grossly showed yellow nodules and microscopic examination showed sheets of macrophages and interstitial inflammation. The other lesions include tuberculous pyelonephritis ^[1], APKD (1), Multicystic Renal Dysplasia ^[1].

Table 3: Distribution of various Non-neoplastic Lesions in nephrectomy specimens. (N=20)

Type of lesion	No of cases	Percentage
Chronic pyelonephritis	08	40.00%
Hydronephrosis	05	25.00%
Xanthogranulomatous pyelonephritis	03	15.00%
Tuberculous nephritis	02	10.00%
Polycystic kidney disease	01	5.00%
Multicystic Renal Dysplasia	01	5.00%
Total	20	100%

In the present study most common non neoplastic lesion is chronic pyelonephritis followed by Hydronephrosis and

Xanthogranulomatous pyelonephritis.

Table 4: Distribution of sex in Non –neoplastic lesions (N=20)

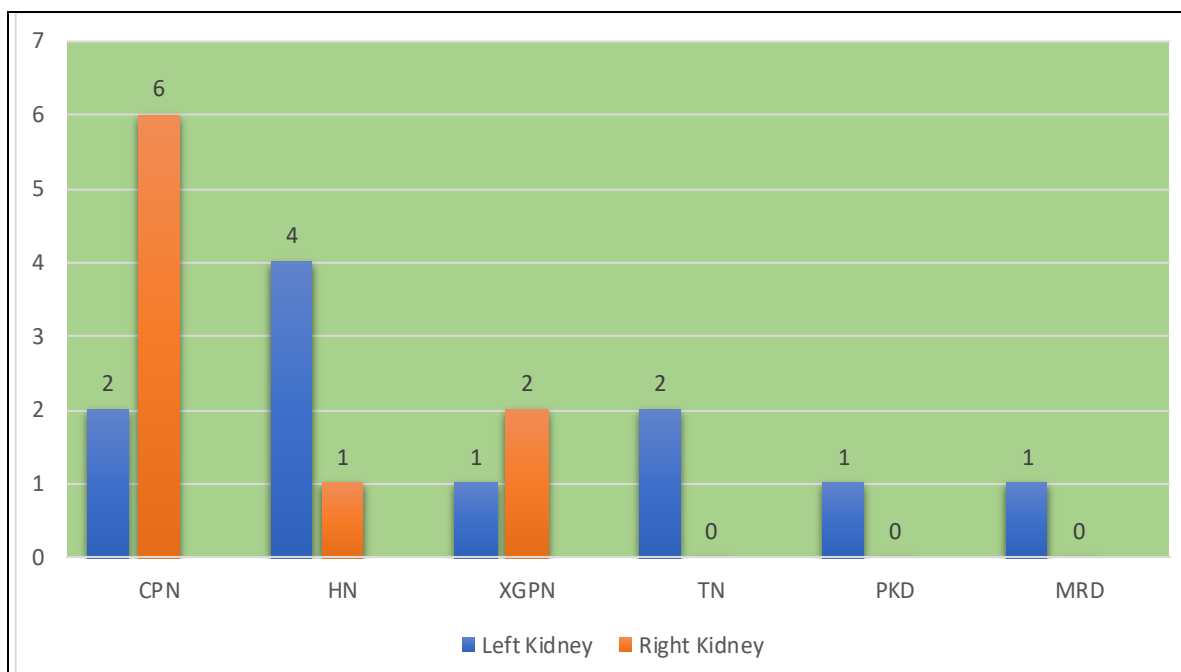
Non neoplastic lesion	Male	Female	Male: Female Ratio
Chronic pyelonephritis	03	05	1:1.6
Hydronephrosis	04	01	4:1
Xanthogranulomatous Pyelonephritis	02	01	2:1
Tuberculous pyelonephritis	02	00	-
Polycystic kidney	01	00	-
Multicystic Renal dysplasia	01	00	-
Total	13	07	1.8:1

The male female ratio in non-neoplastic lesions is 1.8:1 with male preponderance except in chronic pyelonephritis.

Table 5: Distribution of age in Non -Neoplastic nephrectomy lesions (N=20)

Age	CPN	HN	XGPN	TN	PCKD	MRD
0-10						1
11-20		1				
21-30	1		1			
31-40	-	1	1			
41-50	3	1	1	1		
51-60	3	2		1	1	
61-70	1					
Total	8	5	3	2	1	1

In the age group between 5th to 6th decades maximum number of non-neoplastic lesions was seen and least is observed in between 1st to 2nd decade.



Graph 2: Frequency of laterality in non-neoplastic lesions

In most of the lesions left kidney is involved except in chronic pyelonephritis and Xanthogranulomatous pyelonephritis.

Discussion

Millions of people are being affected annually by nonfatal kidney diseases and twenty percent of females suffer from infection of the urinary tract at some time in their lives ^[7]. In chronic kidney disease, all the components of the kidney are

damaged leading to end stage renal disease. But due to the large functional reserve capacity of the kidney, early signs of kidney disease are often missed, and much renal damage may occur before the renal dysfunction becomes clinically apparent ^[5]. The indications of nephrectomy ranges from inflammatory lesions causing extensive parenchymal damage to benign and malignant neoplasms. Few diseases of kidney are misdiagnosed clinically and radiologically ^[2]. Therefore, it is mandatory that every nephrectomy specimen

must be studied histopathologically for clinicomorphological correlation to ensure proper management. Hence histopathology helps as a useful learning tool for the pathologist to study histomorphological spectrum of diseases^[8]. In the present study analysis of 32 Nephrectomy specimens was done which included 20 non neoplastic (65%) and 12 neoplastic lesions (35%). Similar findings were observed in studies done by Vikram and Beisland and co-workers^[9, 10]. Most common non neoplastic lesion observed in the present study was chronic pyelonephritis and in neoplastic lesions it was renal cell carcinoma. In the present study majority of lesions were presented by males (71.80%) and remaining were females (28.20%) showing male preponderance, similar finding was observed in study done by Vinay and co-workers. Similar to the present study males were affected more in other studies also which are done by Vinay and co-workers, Vikram and Malik and co workers

In the present study more number of renal lesions is seen between 5th to 6th decades, similar finding was observed in the study done by KathirveluS and co-workers^[11]. Other studies showed different ranges of age distribution which ranged between 20 to 60 years age group. In the present study the most common clinical feature was loin pain followed by urinary tract infections, fever, nausea, vomiting and maximum number of patients who came with complaint of haematuria were diagnosed with malignant lesions. These similar observations were found in the study done by Malik and co-workers^[12].

In the current study most of the nephrectomise involved left kidney (56.25%) than right kidney (43.75%) this similar finding was observed in the studies done by Badmus and co-workers^[13]. In the present study most common non neoplastic lesion seen was chronic pyelonephritis. Adequate examination of non-neoplastic lesions renal parenchyma plays an important role in recognizing at risk patients for progressive renal disease after nephrectomy and this could be an essential step in providing early preventive measures and better medical care for patients who are undergoing nephrectomy for neoplastic processes. Suvvari and co-workers^[14] analysed 34 cases of nephrectomy specimens in which it was observed that 47.05% of them were non neoplastic lesions, and most common affected age group was between 41-50 years with male to female ratio as 1:1.4 showing female preponderance. In the present study male preponderance was observed (M: F ratio - 1.8:1). Similar to suvvari and co-workers study it was observed that most of the cases were non neoplastic lesions (62.50%) and majority of the affected cases were seen between 51-60 years age group.

To conclude, these findings provide valuable insights into the histopathological patterns and distribution of kidney diseases in the studied population, contributing to our understanding of the prevalence and characteristics of these conditions. Further research and larger studies are warranted to validate and expand upon these findings, potentially leading to improved diagnostic and treatment strategies for kidney diseases.

Conflict of Interest

Not available

Financial Support

Not available

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