

**Original Research Article****Analysis of Histopathological Spectrum of Kidney Lesions – An Institutional Autopsy Study of One Year**

Authors

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Abstract

Introduction: Autopsy provides an opportunity to uncover the changing patterns of disease in modern era. Chronic Renal Disease is a global health crisis, with an estimated worldwide prevalence of 8 -16%. So the current study is undertaken with the aims to analyze varied spectrum of renal lesions detected on autopsy and to study effect of associated co-morbidities for renal pathology.

Material and Methods: Present retrospective cross sectional study of both Medico-legal and clinical autopsy cases with total of 260 cases was carried out at Tertiary care center during July 2018 to June 2019. Microscopic histopathological examination was done and correlated with clinical details.

Results: We found 105 (40.38%) cases with renal pathologies, while 155 cases (59.61%) showed normal histology, with most commonly affecting 21-30 years of age. Male to female ratio was 1.7:1. Non-glomerular lesions were more common than glomerular.

Conclusion: Present study reveals many renal lesions which produce no functional derangement and are detected for the first time at autopsy.

Keywords: Autopsy, Kidney lesion, Histopathology, Spectrum, Diabetes, Hypertension.

Introduction

Autopsy study is of great diagnostic and educational value similar to the dictum “Mortui Vivos Docent”.¹ The Autopsy data is the best teaching aid to the Clinicians and Pathologists inspite of profound recent advances in diagnostic modalities. Autopsy studies uncover the changing patterns of disease in modern era. Gross and microscopic examination of both Clinical and

Medico-legal autopsy organs give insight into the possible cause of death. Thus, Pathologists play key role in determining the exact incidence, precise cause and mechanism of death through autopsy ensuring that in future appropriate preventive strategies are implemented.

Chronic Renal Disease (CKD) is a global health crisis, with an estimated worldwide prevalence of 8-16%. One in five men and one in four women

have CKD.² Kidneys are known to be “silent killers” and CKD is responsible for great deal of morbidity and mortality. Thus, CKD is now recognized as a major global public health issue and is an independent risk factor for cardiovascular disease.^{3,4} The increased prevalence of CKD is a consequence of enormous spike of risk factors like hypertension (HT), diabetes mellitus (DM), dyslipidemia and obesity.⁵

CKD is reported to be the 9th leading cause of death in the United States.⁶ In India prevalence of CKD is approximately 17% out of which 43% have HT and 18% have DM. Thus, globally most common causes of CKD are DM and HT.

Due to silent progressive nature of CKD affected largely by HT, DM, dyslipidemia, obesity, nephrolithiasis and drug interactions – the pathologic examination of renal tissue in autopsy would throw light on renal histologic changes of general population of that specific region. This valuable information would certainly prevent CKD which most of the times tend to be asymptomatic and undiagnosed till death. Accidentally acute renal injury in the form of Acute Tubular Necrosis (ATN) occurs in 22% of hospitalizations and is associated with fourfold increased mortality rate. Thus, high rate of acute and chronic renal diseases are expected at autopsy.⁷

The aim of the present study was 1) To analyze varied spectrum of renal lesions detected on autopsy and 2) to study effect of associated comorbidities like HT, DM on renal pathology.

Material and Methods

Present study was a retrospective cross sectional study of both Medico-legal and clinical autopsy cases with total of 260 cases carried out at Tertiary care center during July 2018 to June 2019. Detailed clinical history was retrieved from the clinical records. We received kidney specimen either in pieces or whole kidney. Weight and gross findings like cortical thickness, decortication, pelvi-calyceal system were analyzed. Specimens were fixed in 10% formalin. Representative

sections from cortex and medulla were taken and histopathological processing was done. Slides were stained with Haematoxyline and Eosin (H & E) and studied. Whenever required special stains like Periodic Acid Schiff (PAS), Reticulin and Congo red were used. Microscopic histopathological examination was done by Senior Pathologist and results were tabulated.

Results

In present study, 260 autopsy cases were studied for kidney lesions over a period of one year. We found 105(40.38%) cases with renal pathologies, while 155 cases (59.61%) showed normal histology.

The renal findings were categorized in to glomerular and non-glomerular lesions.

As shown in Table 1 there is male preponderance over females with male to female ratio being 1.76:1. Youngest was one day male with Autosomal recessive polycystic kidney (ARPKD) and oldest was 80 years with renal cell carcinoma -chromophobe type (RCC). Maximum age group affected was 21 to 30 years.

As shown in Table 2 out of 105 cases 20(19%) deaths were due to primary renal cause and commonest reasons were diabetic nephropathy and Chronic Pyelonephritis (CPN). Rare causes were inherited renal disorders like ARPKD, Autosomal Dominant Polycystic Kidney Disease (ADPKD) and renal dysplasia. Also incidental findings included one case of chromophobe RCC and one case of Collecting duct carcinoma.

As shown in Table 3, 85 cases (71%) showed many associated renal pathologies when cause of death was from varied reasons. Most common among them were sudden cardiac death from Myocardial infarction (MI), coronary atherosclerosis and pneumonia. Young females with maternal deaths also showed ischemic Acute Tubular Necrosis (ATN). Cases of poisoning and snake bite showed toxic ATN.

As shown in Table 4, Renal arteriosclerosis in the form of benign and malignant nephrosclerosis associated with HT was the most common renal

pathology. Second common was ischemic and toxic ATN seen with sudden death from cardiac origin, poisoning and maternal mortality.

Table 1: Age and Sex Distribution (n = 105)

Age Range (years)	Male	Female	Total
1Day- 1	3	3	6
1 – 10	4	1	5
11 – 20	4	4	8
21 – 30	11	14	25
31 – 40	14	3	17
41 – 50	9	3	12
51 – 60	9	7	16
61 – 70	11	2	13
71 – 80	2	1	3
Total	67	38	105

Table 2: Deaths due to Primary Renal cause (n = 20)

Sr. No	Cause	Number	Percentage %
1	Diabetic Nephropathy	5	25
2	CPN with Pyonephrosis	4	20
3	Nephrolithiasis	3	15
4	Glomerulonephritis (FSGN)*	2	10
5	AR PCKD**	2	10
6	AD PCKD†	1	5
7	Renal Dysplasia	1	5
8	Renal Cell Carcinoma	1	5
9	Collecting Duct Carcinoma	1	5
	Total	20	100

Focal segmental Glomerulonephritis

**Autosomal recessive polycystic kidney

†Autosomal dominant polycystic kidney

Table 3: Secondary Renal changes associated with other causes of death (n= 85)

Sr. No	Primary Organ	Number	Percentage
1	Cardiovascular System (CAD*/MI)**	24	28.1
2	Respiratory System (Pneumonia/TB†/CVC)	15	18
3	Maternal Death	10	12
4	Poison	07	8.6
5	Fetal Death	06	7.4
6	Sickle Cell Disease	04	4.7
7	Unknown Cause	04	4.7
8	Hanging	03	3.5
9	Hepatobiliary System	02	2.2
10	Road Traffic Accident	02	2.2
11	Septecimia with Fever	02	2.2
12	Snake Bite	02	2.2
13	Gastrointestinal Tract	02	2.2
14	Sun Stroke	01	1
15	Drowning	01	1
	Total	85	100

*Coronary artery disease

**Myocardial Infarction

†Tuberculosis

|| Chronic venous congestion

Table 4: Histopathological Findings seen with Renal diseases (n=105)

Sr.No	Renal Changes	Number	Percentage
1	Renovascular changes (Arteriosclerosis)	40	38
2	Acute Tubular Necrosis	18	17
3	CPN with Pyonephrosis	10	9.5
4	End Stage Renal Disease	09	8.6
5	Diabetic nephropathy	05	4.7
6	Glomerulosclerosis	04	3.8
7	*SCD with Vasooclusive crisis	04	3.8
8	Nephrolithiasis	03	2.8
9	**TB(Miliary Kidney)	02	1.9
10	Dialysis Changes	02	1.9
11	†FSGN	02	1.9
12	AR PCKD	02	1.9
13	AD PCKD	01	0.9
14	Renal Dysplasia	01	0.9
15	Renal Cell Carcinoma	01	0.9
16	Collecting Duct Carcinoma	01	0.9
	Total	105	100

* Sickle cell disease

**Tuberculosis

†Focal Segmental Glomerulonephritis

Table 5: Male to female ratio in comparable other studies

Sr. No	Study	Male to Female ratio
1	SNS Yadav et al ¹⁰	1.8:1
2	P.S. Mulay et al ¹¹	2.1:1
3	AmandeepKaur et al ¹²	4:1
4	Present study	1.7:1

Table 6: Maximum affected age group comparable studies

Sr.No	Study	Age group
1	Amandeep Kaur et al ¹²	21-40
2	P.S. Mulay et al ¹¹	20-40
3	SNS Yadav et al ¹⁰	31-50
4	Present study	21-30

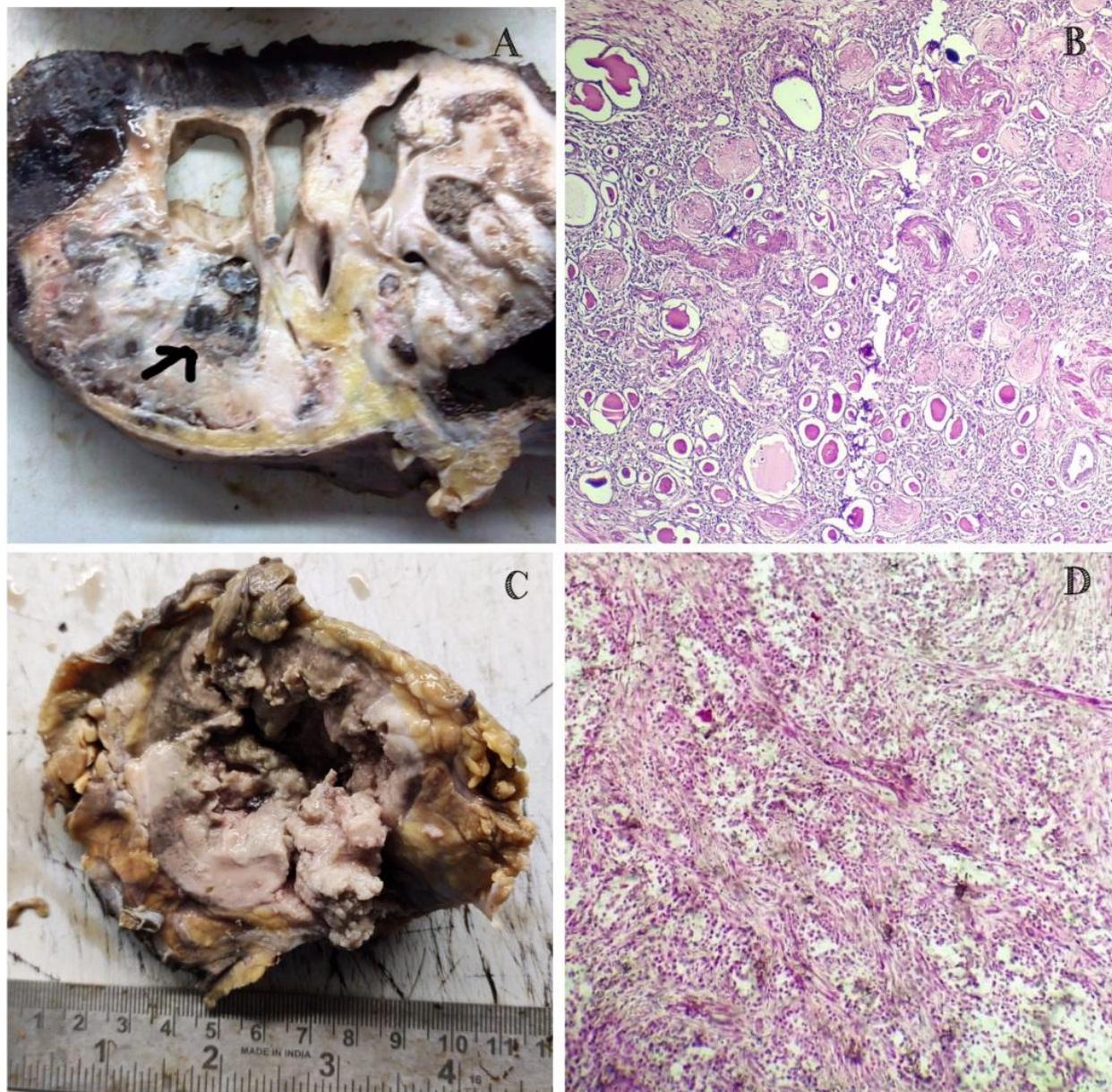
Table 7: Comparison of percentage of histologically normal kidneys in autopsy

Sr.No	Study	Year of Study	Cases
1	SNS Yadav et al ¹⁰	1980-87	422 out of 491 (85.95%)
2	Utsa et al ¹³	2014	23 out of 55 (41%)
3	Vaneetkaursandhu et al ¹⁴	2017	27 out of 120 (22%)
4	Amandeep Kaur et al ¹²	2018	25 out of 100 (25%)
5	Present study	2020	155 out of 260 (59.61%)

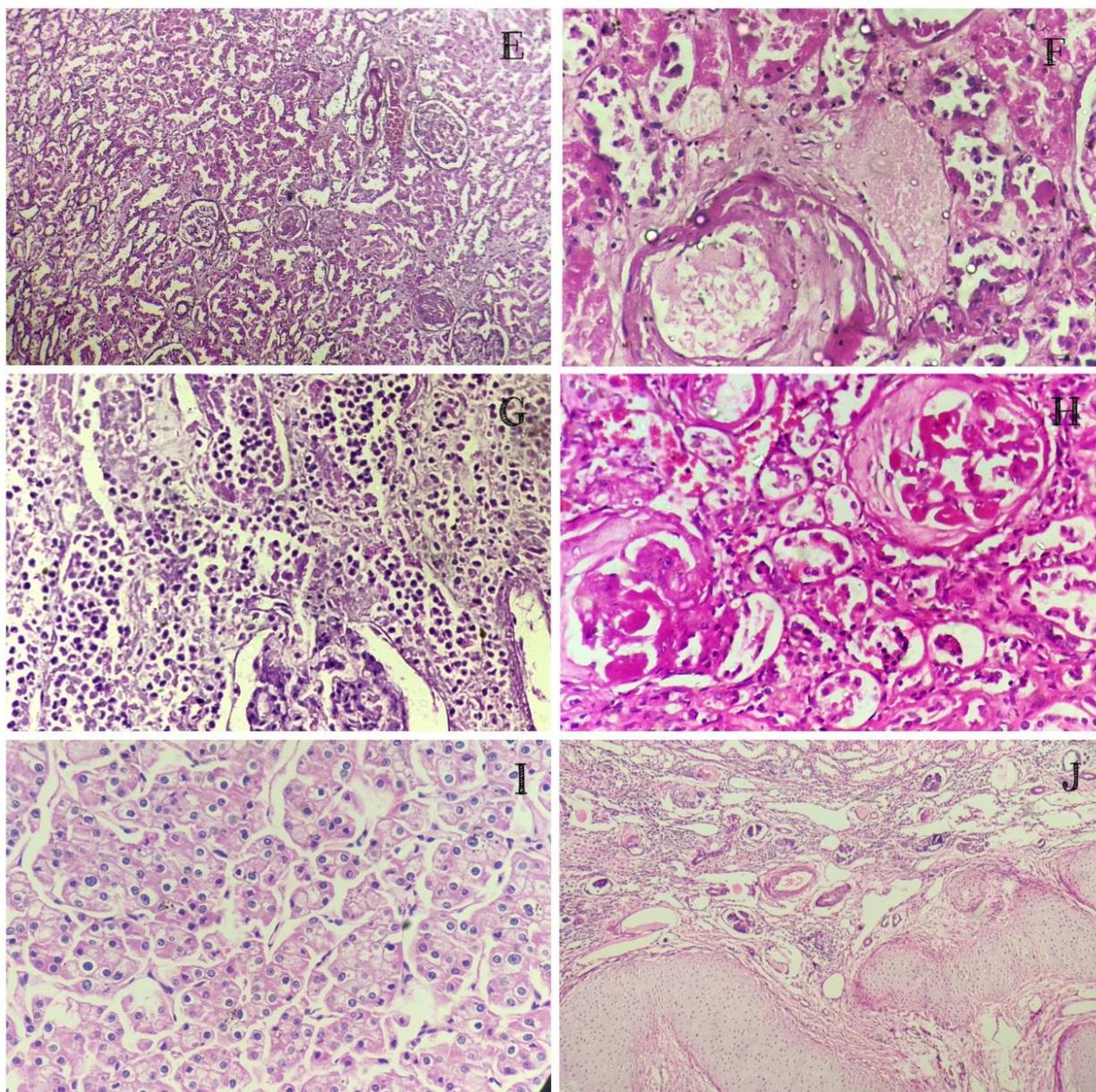
Table 8: Comparison of percentage of glomerular lesions involved with other studies

Sr.No	Study	cases
1	AmandeepKaur et al ¹² (2018)	17 out of 100 (17%)
2	Hailেমariam S et al ¹⁵ (2001)	28 out of 273 (11.81%)
3	P.S. Mulay et al ¹¹ (2020)	78 out of 550 (14.17%)
4	Present study (2020)	11 out of 105 (10.47%)

Figure 1: Gross and Microscopy of Renal Lesions



- A: Gross Photo of Nephrolithiasis with Pyelonephrosis
- B: Microphotograph of chronic pyelonephritis, (HE, 200X)
- C: Gross photo of Collecting Duct Carcinoma of Renal Pelvis
- D: Microphotograph of Collecting Duct Carcinoma of Renal Pelvis (HE, 400X)

Figure 2: Microscopic Findings of Renal Lesions

E: Benign Nephrosclerosis showing hyaline arteriosclerosis (HE, 200X)

F: Malignant Nephrosclerosis showing onion skin lesion and fibrinoid necrosis (HE, 400X)

G: Acute Tubular Necrosis (ATN) – Toxic type showing desquamation of tubular epithelium (HE, 200X)

H: Diabetic Nephropathy showing KW lesions (HE, 400X)

I: Chromophobe RCC showing perinuclearhof (HE, 400X)

J: Multicystic Renal Dysplasia showing primitive cartilage (HE, 200X)

Discussion

Distribution of renal lesions vary with geographic area, age, gender, environmental, nutritional and genetic factors.^{8,9}

In the present study, among 260 autopsies studied during one year, 105(40.38%) cases showed kidney lesions and 155(59.61%) cases showed normal histology.

It was observed in all studies that there is male predominance. Male to female ratio in present study was 1.76:1, that goes parallel with studies mentioned in table 5.

In our study commonest age group affected was 21 to 30 years, which was comparable to studies mentioned in table 6.

Kidneys unaffected and kidneys involved with pathologies detected in autopsies varies from region to region as shown in table 7.

In our present study analysis, glomerular lesions were less compared to non-glomerular lesions. Other studies which support our findings are as in table 8.

Most common histological finding was reno-vascular lesions (38%) in the form of benign nephrosclerosis with hyaline change (Fig 2E) and malignant nephrosclerosis showing onion skin lesions with fibrinoid necrosis (Fig 2F) comparable with study by Sandhu et al¹⁴ and Marie E Perrone et al¹⁶

Second common finding was acute tubular necrosis ATN (17%) (Fig 2G). ATN is most common and important cause of acute renal failure (ARF) characterized by sudden cessation of renal function. It has two morphological forms ischemic and toxic¹⁷. It was comparable with study by Amandeep kaur et al¹² and Sandhu et al¹⁴ Third common finding was CPN associated with nephrolithiasis (9.5%) (Fig 1A, 1B). Urinary calculi are worldwide in distribution affecting 2% of population in second and third decade of life¹⁷. These findings are similar to study by Sandhu et al.¹⁴

A very important finding was renal changes associated with Diabetic nephropathy. CKD with Renal failure accounts for more than 10% of all diabetic deaths. Renal complications are more severe and develop early in Type I diabetes – 40% as compared to 20% seen in Type II diabetes. Variety of lesions are seen in the form of diffuse glomerulosclerosis, capsular drop, fibrin cap, Kimmelstiel Wilson (KW) lesions (Fig 2H), papillary necrosis and Armann iEbstein lesions.¹⁷ We reported 4.7% deaths due to Diabetic nephropathy while Marie E Perrone et al¹⁶ found 20 % of diabetic nephropathies.

Rare lesion was cystic renal diseases. Cystic Renal lesions may be congenital or acquired, neoplastic or non-neoplastic. They occur at any age from newborn to old age and are classified in to Potter type I, II, III. We reported three such rare

cases of which one is Multicystic Renal Dysplasia (Potter II) (Fig 2J). Second is ARPKD (Potter I) and third case is of ADPKD (Potter III).

RCC comprise 70 to 80% of all renal cancers affecting elderly males.¹⁷ We reported two rare lesions of Chromophobe RCC (Fig 2I) and Collecting duct carcinoma of renal pelvis. (Fig 2C, 2D). These findings are comparable with study by Sandhu et al¹⁴ and Mulay et al.¹¹

Sickle cell disease is a very common haemolytic anaemia in Vidarbha region of Maharashtra. We reported four cases of Sickle cell nephropathy while Marie E Perrone et al¹⁶ reported only one case.

Our study also included two cases of Miliary Renal Tuberculosis.

Conclusion

Autopsy is an indispensable part of Medicine. Autopsy study reveals many rare and undiagnosed histologic lesions which are not clinically detected. Many renal lesions produce no functional derangement and are detected for the first time at autopsy.

Present study showed that non-glomerular lesions are more common than glomerular lesions. HT and DM are the main impending risk factors. Our study provides satisfactory data with respect to morphological spectrum of renal lesions at autopsy. However, it may not reflect the actual renal lesions of the entire population.

In this modern era also, autopsy study throws immense light on pathogenesis of disease, reveals hazardous effects of drug therapies and associated comorbidities like HT, DM, dyslipidemia and obesity, which are preventable.

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