



**SPECTRUM OF RENAL HISTOPATHOLOGY ON AUTOPSY FROM A TERTIARY CARE CENTER: STUDY OF 100 AUTOPSY CASES**

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**ABSTRACT**

**Background:** Kidney damage is a disease processes that remain unnoticeable in antemortem period. But ironically, kidneys are also one of the common organ that gets affected in many systemic pathological diseases. Prevalence of such systemic diseases are quite high in sedentary life style of present population and ultimately lead to irreversible end stage kidney disease. Thus histopathological examination of autopsy kidney tissue helps in identifying extent of renal damage at tissue level and its contribution towards cause of death. **Aim & objectives:** To find out finding out various pathological changes in kidney amongst various age group and assessing renal causes contributing to mortality. **Methods:** A prospective study conducted on 100 cases of kidney viscera received routinely after medicolegal autopsy followed by their gross and microscopic examination. **Results:** Histopathological examination of 100 cases on microscopy revealed 12% cases with normal histology. 03% cases with autolytic changes. Renal pathological findings were seen in 85% cases. The most common lesion observed in our study was non-specific edema and congestion in renal parenchyma (24%) followed by glomerular lesions and acute tubular necrosis (12 % each), tubular casts (9%) interstitial nephritis (8%). Other less common lesions observed were chronic pyelonephritis, cystic lesions, vascular lesion, neoplasm etc. **Conclusion:** Histopathological examination of kidney viscera from medicolegal autopsy cases can provide us great insight into the various medical diseases that resulted in end stage kidney disease which later contributes to cause of death.

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**INTRODUCTION**

Incidence and prevalence of kidney diseases have increased with global prevalence of chronic kidney disease (CKD) as 9.1% reported by National Kidney Foundation 2017 with an age standard global prevalence unchanged being higher in women (9.5%) than in men (7.3%) Chronic kidney disease contributes as 12<sup>th</sup> leading cause of deaths in 2017, an increase from 17<sup>th</sup> in 1990.<sup>1</sup> Autopsy plays an important role in identifying various diseases and by correlating their clinical findings with histopathological changes and thus helps in finding out the cause of death.<sup>2</sup> Medicolegal autopsies are performed most commonly in cases of unnatural, suspicious and sudden deaths to identify cause and nature of death.<sup>3</sup>

In India being a developing country, medicolegal autopsy are done on a larger scale from cases of unnatural, suspicious and sudden deaths to identify cause and nature of death. Hence large sample size can be obtained from such autopsy data, that provide a unique opportunity to study diseases and correlating with other parameters. There are lot of disease processes that remain undetectable in antemortem period. Sometimes, such disease processes don't cause any significant functional derangement during person's life and remain unnoticed due to

lack of signs or symptoms. Most of the times in road side accidents, poisoning and sudden injury, we don't get enough time to investigate properly and patient reaches to death. In such circumstances, thorough post-mortem examination plays a significant role in solving problems and mysterious cases. And subsequently, histopathological examination of viscera provide us detailed findings occurring at the tissue level and aid in finding out the cause of death.<sup>4</sup>

Kidney damage are among such disease processes that remain unnoticeable in antemortem period. But ironically, kidneys are also one of the common organ that get affected in many systemic pathological diseases like DM, HTN, Metabolic diseases, Chronic inflammatory diseases, toxic insults etc. Prevalence of such systemic diseases are quite high in sedentary life style of present population and ultimately lead to irreversible end stage kidney disease. Thus histopathological examination of autopsy kidney tissue helps in identifying extent of renal damage at tissue level.<sup>2</sup>

**Aim & Objectives-** The principle aim of our study is to analyze the spectrum of histopathological findings in kidney viscera received after medicolegal autopsy from a Tertiary Health care center in North India.

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## MATERIAL AND METHODS

This was a prospective study conducted on 100 cases of kidney viscera received routinely after medicolegal autopsy. In our pathology department, PGIMS Rohtak, we receive autopsy viscera from different district of Haryana, North India.

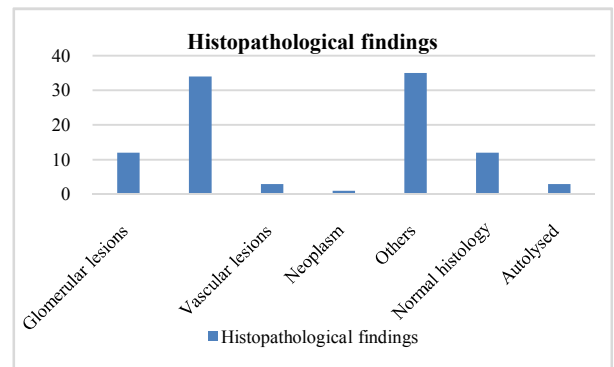
Formalin fixed autopsy viscera was received in properly sealed container along with post mortem papers. Data pertaining to diseased age, gender, native place, provisional cause of time and death, clinical findings, indication of autopsy were recorded from the post mortem papers. Without any delay, viscera was examined grossly & following points were recorded whether partially resected specimen or completely excised renal specimen, weight, measurement, color, texture, external, cortical surface & capsule & any abnormal finding. Large specimens were bisected & cortex, medulla, pelvis, calyces were examined. Further serial sectioning was done at 1cm distance. Representative tissue sections were taken & minimum 2 paraffin blocks were prepared from each specimen. Sections were cut at thickness of 3-5 microns & stained with routine Hematoxylin & Eosin stain. Special stains including PAS, MT, Silver methanamine were applied in cases wherever required. The microsections were examined under microscope & detailed histopathological findings were noted.

## RESULTS

The present prospective observational study included 100 cases based on aforementioned inclusion criteria. Of all 73 were males and 27 were females. Cases were divided into five age groups. Maximum number of cases were among 41-60 year with 61-80 being the next common group. We tabulated provisional cause of death noted from post-mortem documents into 9 categories. Maximum death 29% were from some chronic sickness/illness that include Diabetes Mellitus (DM), Chronic Hypertension (HTN), Asthma, chronic lung disease followed by cardiovascular diseases 20% i.e heart attack. One case of Renal cell Carcinoma also identified incidentally.

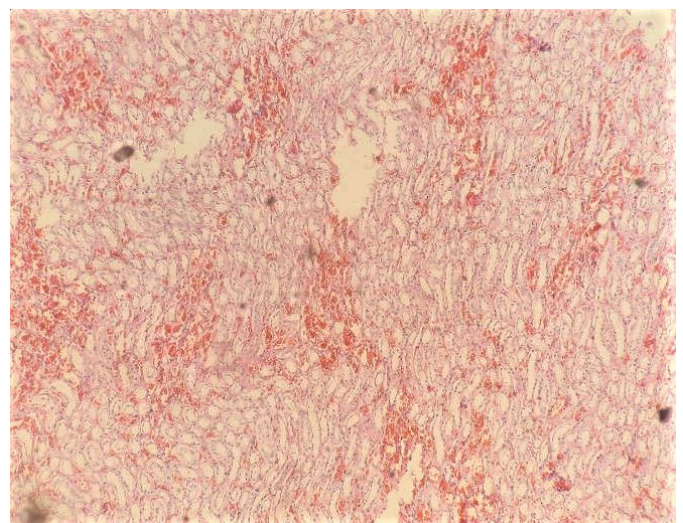
**Table 1** Distribution of cases based on different histopathological lesions.

Total cases (100)	% cases	M (73)	F (27)
<b>Normal Histology</b>	<b>12</b>	09	03
Autolysis	03	02	01
<b>Glomerular Lesions</b>	<b>12</b>	09	03
-Glomerulosclerosis			
FGS	06	04	02
FSGS	03	02	01
-Glomerulonephritis			
FSGN	02	02	-
MPGN	01	01	-
<b>Tubular interstitium</b>	<b>34</b>	25	09
ATN	12	09	03
Pyelonephritis	05	04	01
Tubular cast	09	06	03
Interstitial Nephritis	08	06	02
<b>Vascular lesions</b>	<b>03</b>	02	01
Hyaline	03	02	01
Arteriosclerosis			
<b>Neoplasm</b>	<b>01</b>	01	-
Renal cell carcinoma	01	01	-
<b>Others</b>	<b>35</b>	25	10
Cystic lesions	05	03	02
Ca oxalate crystals	02	02	-
Edema/Congestion	<b>24 (most common)</b>	17	07
Tuberculosis		01	01
Calculi		02	-
(Nephrolithiasis)		02	-
<b>Non-specific</b>		02	-

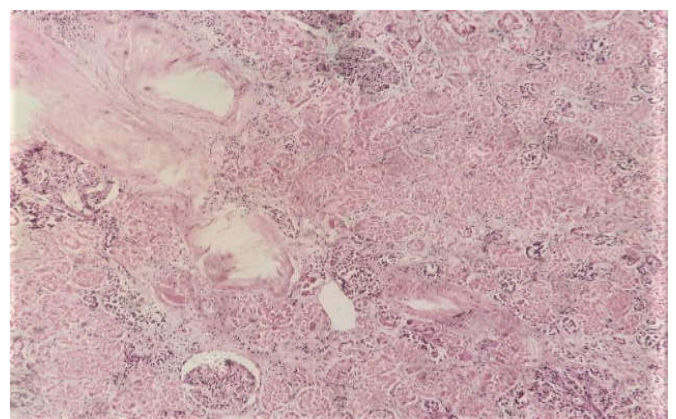


**Figure 1** Categories of Histopathological findings on renal autopsy

**Gross examination:** Most of the kidney specimens received in our department were in pieces therefore as a whole comment on kidney measurement and weight could not be done. On gross examination, external surface and capsule was normal and could be stripped off in 80% of cases. Majority of the cases were unremarkable on external examination with congestion in 20 cases. In 6 cases external surface showed granular appearance. On Cut surface 80% specimens were unremarkable with 3 cases revealed dilated pelvicalyceal system. 10 cases revealed congestion and hemorrhage. One specimen of kidney was enlarged in size, with external surface nodular and with a solitary mass at upper pole which was grey white solid cystic necrotic on cut surface.

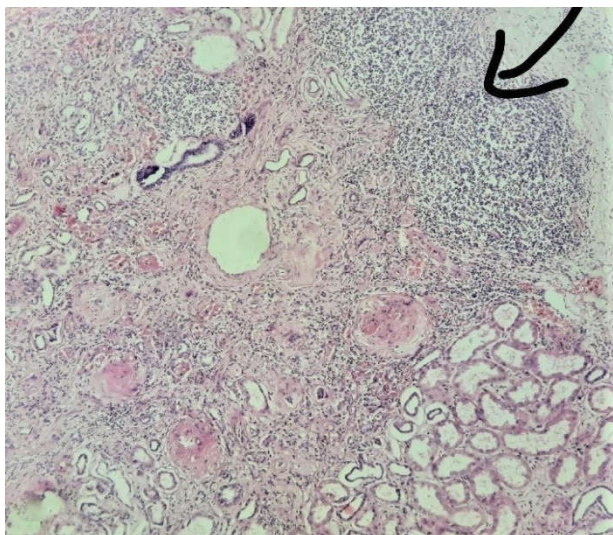


**Figure 2** 10x, H&E stained section revealing non-specific edema and congestion.

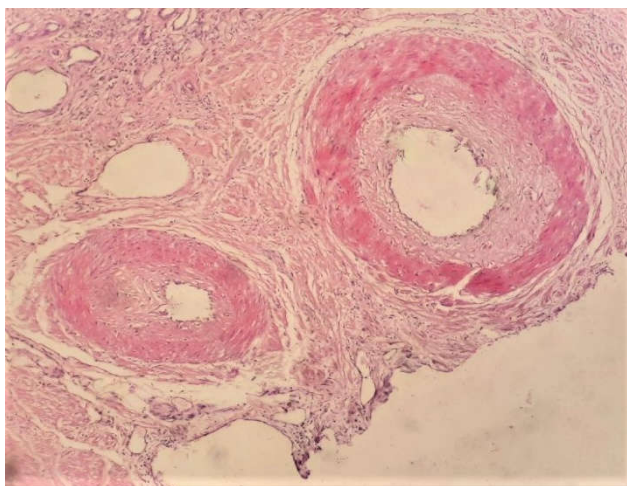


**Figure 3** 40x, H&E stained section revealing Acute tubular necrosis.

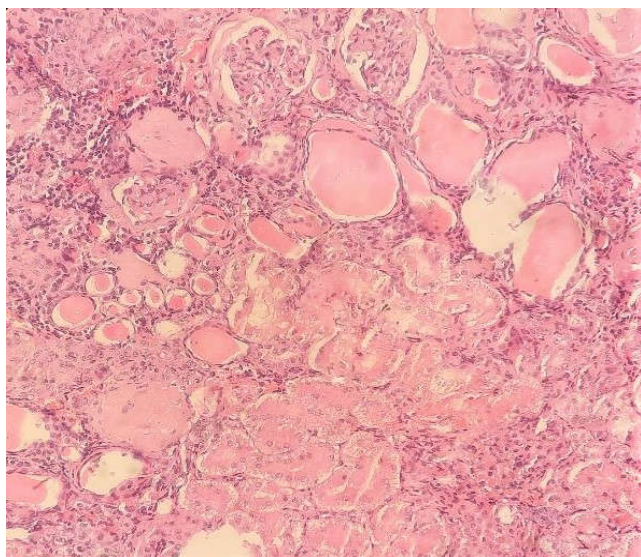




**Figure 4** 40x, H&E stained section revealing changes of chronic pyelonephritis with thyroidization of tubules.



**Figure 5** 10x, H&E stained section revealing interstitial nephritis with sclerosis of glomeruli.



**Figure 6** 10x, H&E stained section showing thickened arteries suggestive of hyaline arteriosclerosis.

**Microscopic examination:** This was followed by histopathological examination which on detailed Microscopy revealed 12% cases with features near to normal histology. 03% cases showed advanced autolytic changes, in which histomorphological details were not indistinct. Renal

pathological findings were seen in 85% cases, which were further divided into 5 major categories which are summarized in Table no. 1 Figure 1.

1. Glomerular lesions- 12% 2. Tubular/interstitium- 34% 3. Vascular- 03% 4. Neoplasm – 01% 5. others – 35%

The most common lesion observed in our study was non-specific edema and congestion in renal parenchyma (24%) followed by glomerular lesions and acute tubular necrosis (12% each), tubular casts (9%) interstitial nephritis (8%).

Percentage of Non-glomerulopathies was higher 73% as compared to glomerulopathies 12%. Glomerular Lesions were further divided into: Glomerulosclerosis (9 cases) which contributed to majority of the cases & Glomerulonephritis (3 cases). Crystallography was done and 2 cases of calcium oxalate crystals were identified on polarizing microscopy. One case of Renal Cell Carcinoma was also identified incidentally. Other lesions observed were pyelonephritis and cystic lesions each contributing to 5% cases followed by Hyaline arteriosclerosis, Renal Calculi and Renal Tuberculosis with one case of Renal cell carcinoma as an incidental finding.

## DISCUSSION

In the present study peak incidence of renal lesions was observed in age group of 41-60 which was comparable to studies done by Neha S *et al*<sup>3</sup> with most common affected group being 41-50 and SNS Yadav *et al*<sup>5</sup> as 31-50 years. Whereas, in studies by S Patel *et al* and A Kaur *et al*<sup>6,7</sup> most common affected age group was 21-40 years. In our study males comprised 73% of total cases and females as 27%, a similar finding observed by Neha S *et al*<sup>3</sup> and SS Thakur *et al*<sup>4</sup> with both the studies revealing predominant population of males.

Most common probable cause of death in the present study observed was chronic illness diabetes mellitus and chronic hypertension which may have contributed as the cause of glomerular lesions as well. Vascular and glomeruli components are mostly compromised with these types of chronic illness and tubules are mainly affected in cases where road side accident, hemorrhage and shock were mode of injury.

In the present study, All the cases with histopathological findings were divided into Glomerular lesions and non-glomerular lesions which included Tubular lesions, vascular lesions, Neoplasm and others. We systematically examined all the four compartments of renal parenchyma i.e. glomeruli, tubules, interstitium, vessels.

Normal histology was observed in 12% of cases which was relatively lower to observed by PS Mulay *et al*<sup>8</sup> VK Sandhu *et al*<sup>9</sup> and Neha S *et al*<sup>3</sup> with percentage of normal histology as 22%, 25% and 22.9% respectively. Whereas a higher percentage of normal histology (80%) compared to renal lesions (20%) was seen by Kakadiya J *et al*<sup>2</sup>.

Most common histopathological finding seen in our study was non-specific edema and congestion (24%) shown in Figure 2. Passive collection of blood within renal tissue and accumulation of extracellular fluid within interstitial space could be termed as congested and edematous kidneys. These changes occur due to increase in back pressure to the kidneys either from other organ failure or some systemic inflammatory processes. Congestion and edema per se are not any disease

entity but reflect as a significant part of some pathological processes going on in the body. A study done by Kakadiya J *et al*<sup>2</sup> in which commonest lesion observed was chronic pyelonephritis followed by Glomerulosclerosis as the next common finding. A study done by Neha S *et al*<sup>3</sup> and K KJhaji *et al*<sup>10</sup> observed most common histopathological renal finding encountered as Acute tubular necrosis.

**Glomerular Lesions v/s non-glomerular lesions:** Percentage of non-glomerulopathies (88%) was higher as compared to glomerular lesions (12%) which was comparable to studies done by PS Mulay *et al*<sup>8</sup>, VK Sandhu *et al*<sup>9</sup>, Usta *et al*<sup>11</sup> and Neha S *et al*<sup>3</sup> which showed higher presence of non-glomerular lesions; 85.61%; PS Mulay *et al*<sup>8</sup> and 82.3 %; Neha S *et al*<sup>3</sup> respectively.

Among the Glomerular lesions most common finding seen was Glomerulosclerosis seen in 9% cases followed by glomerulonephritis seen only in 3% cases, a similar finding observed by Kakadiya J *et al*<sup>2</sup> who also observed glomerulosclerosis as the most common glomerular lesion followed by Glomerulonephritis. Majority of the cases of glomerulosclerosis were in age group of 41-60 and 61-80. Most of our glomerular lesions were secondary in nature i.e. associated with systemic chronic illness, Diabetes Mellitus & Chronic hypertension.

In our study Diabetic nephropathy was seen in 3 cases in form of focal segmental glomerulosclerosis. One of the case showed advanced phase of Diabetic nephropathy characterized by increase in mesangial matrix forming nodules known as kimmelstien Wilson nodules along with evident hyaline deposition in efferent and afferent arteriole. These features were well highlighted using special stains.

**Tubules/Interstitium:** Most common finding among tubular lesions was tubular necrosis; 12 cases Figure 3. Etiologically, tubular necrosis may be due to toxic or ischemic insult to the tubules. In our study, ATN (focal or diffuse) was the consistent findings in all autopsy cases where poisoning was the suspected cause of death (11 cases). Pyelonephritis was seen in 05 cases, two of them had history of diabetes. Grossly there were random pale streaks extending from medulla to cortex. One of the case showed collections of frank pus at the papillary region making a diagnosis of acute on chronic pyelonephritis. Diabetes mellitus, long term use of painkillers are well known risk factors for papillary necrosis. Microscopically characteristic findings showed infiltration by polymorphonuclear leukocytes. Within the tubular lamina as well as in tubular epithelium & interstitium Figure 4. Interstitial nephritis was seen in 08 cases with mixed infiltrate of lymphocytes, plasma cells, eosinophils within the interstitium along with tubular thyroidization also with colloid like hyaline cast; Figure 5.

Vascular lesions (3 cases) showed deposition of hyaline within the vascular wall and constricting the lumen as shown in Figure 6. One of the case showed advanced changes of hypertension in form of thickened vascular wall and onion skin appearance at places.

Renal mass was detected in one case which on histopathological examination came out to be renal cell carcinoma and showed IHC positivity for keratin, vimentin, and CD10 in tumor cells. Cystic lesions were seen in 05 cases, one of them was associated with nephrolithiasis. Grossly these

cysts were varying in diameter from 1 to 4 cm. Microscopically all cases showed simple cyst lined by cuboidal cell. 02 cases showed calcium oxalate crystals within renal parenchyma well highlighted on polarizing microscopy as needle like structures.

In spite of high prevalence of tuberculosis (TB) in India. We found only 02 cases where kidneys were involved with TB. Both these cases also had tuberculosis of other organs like lungs, liver & spleen etc. So, kidneys are secondarily involved in these cases as a part of military tuberculosis. Renal TB usually seen in immunocompromised individuals like HIV, drug, transplants. Grossly, renal tuberculosis is difficult to distinguish from Xanthogranulomatous pyelonephritis. But microscopically, both cases showed epithelioid cell granulomas with caseous necrosis, interstitial fibrosis and tubular atrophy. The mycobacterium organism was well identified with Ziehl Nelson Staining using 20% H<sub>2</sub>SO<sub>4</sub>. In two cases, we found calculi within the renal parenchyma. One case was associated with chronic pyelonephritis and other cases had a staghorn calculi in pelvicalyceal system.

Autolysis was evident in 03 cases which were inconclusive for pathological reporting. Partial autolytic changes in kidney autopsy viscera causes diagnostic confusion for tubular necrosis. Autolysis consists of degeneration, pyknosis of tubular epithelial nuclei & retraction from basement membrane. These microscopy findings somewhat overlap with those of acute tubular necrosis. There would be uniform degenerative changes in cases of autolysis. So, careful examination of other components of renal parenchyma is required.

A detailed comparative analysis was done to compare histopathological findings in renal autopsies by various studies shown in table 2. Hence above literature states that detailed gross as well as microscopic examination of renal autopsies can provide a spectrum of diseases that can help in establishing the cause of death especially in medicolegal cases.

## CONCLUSION

Histopathological examination of kidney viscera from autopsy cases provide us great insight into the various medical diseases that resulted in end stage kidney disease. Chronic illness are the major cause of morbidity burden that affect kidneys. Also, we notify here autopsy data from kidney specimens provide us rich educational resource to study renal pathology conditions. In India, being a developing country, these practices should be emphasized in residency training of a pathologist.

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