



## Original Research Article

# HISTOPATHOLOGICAL SPECTRUM OF INCIDENTAL RENAL LESIONS IN AUTOPSY: A RETROSPECTIVE STUDY AT A TERTIARY CARE CENTRE IN SOUTHERN INDIA

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### ABSTRACT

**Background:** Chronic kidney disease (CKD) is a major health problem particularly in developing countries where early-stage disease often remains undiagnosed due to its subclinical progression. Autopsy studies provide a unique opportunity to uncover silent renal pathologies. Meticulously done histopathological examination of autopsy specimens helps in better understanding of the true prevalence and histopathological spectrum of CKD.

**Materials and Methods:** This retrospective descriptive study was conducted at a tertiary care hospital in South India. In this study renal tissues from 60 medico-legal autopsies performed between January 2022 and December 2024 were analysed. Individuals aged new born to 73 years with no documented renal disease were included in this study on the basis of a predefined inclusion and exclusion criteria. Tissue sections from kidneys (cortical and medullary regions) were analysed histologically using H&E and special stains when required. Findings were categorized into glomerular, tubular, interstitial, vascular, and neoplastic lesions. SPSS v25.0 was used for statistical analysis.

**Results:** Of the 60 cases, 49 (82%) were males and 11 females (18%), with a mean age of  $37.1 \pm 15.9$  years. The most common age group was 31–50 years (45%). Normal renal histology was seen in 20 cases (33.3%) and incidental lesions were seen in the remaining 40 (66.7%) cases. Common findings included renal congestion (25%), tubular lesions (18.3%) and glomerular lesions (8.3%). Renal cell carcinoma was seen in 3 cases (5%), while simple renal cysts, end stage renal disease, nephrolithiasis and vascular lesions were infrequent findings.

**Conclusion:** A significant proportion of autopsy cases were found to have unrecognized renal pathologies. These findings underscores the importance of including detailed and systematic renal examinations in autopsy protocols.

**Keywords:** Autopsy, Kidney Diseases, Histopathology, Incidental Findings, South India.

## INTRODUCTION

Chronic kidney disease (CKD) is an important public health issue that affects millions of individuals globally. CKD contributes substantially to morbidity, mortality and healthcare costs.<sup>[1]</sup> The prevalence of chronic kidney disease is high in developing countries where majority of CKD cases remain undiagnosed due to limited access to diagnostic and preventative services. Traditional risk factors such as

diabetes mellitus, hypertension and aging underlie the majority of CKD cases. The silent nature of early renal injury means many pathologies progress unchecked until advanced stages, when therapeutic options are limited and outcome becomes poor. Because of this reason it becomes important to analyse subclinical renal lesions.

Autopsy studies offer a unique opportunity to analyse histopathological spectrum of renal disease. Various studies have consistently revealed that a substantial

proportion of cadavers harbour previously unrecognized renal pathology.<sup>[2,3]</sup> Various types of nephropathies including glomerulosclerosis, interstitial nephritis, and vascular changes are commonly identified in autopsies done for various reasons. Most of these pathologies remain overlooked during life. Incidental findings such as renal cysts, neoplasms, and inflammatory lesions have also been commonly found during forensic autopsies.<sup>[4]</sup>

There has been extensive research work undertaken by various researchers on the topic of incidental renal pathologies uncovered during medicolegal autopsies. Despite these valuable contributions, there remains a notable geographic gap in the literature regarding the histopathological spectrum of incidental renal lesions in autopsies undertaken for various medicolegal reasons.<sup>[5]</sup> Most existing data of incidental renal pathologies found during autopsies come from Western and Eastern Indian centres, leaving the demographic, environmental, and healthcare differences of southern India comparatively unexamined. Bridging this knowledge gap would enhance diagnostic accuracy and guide resource allocation tailored to regional needs.<sup>[6]</sup>

To address these deficiencies, the present retrospective study was undertaken at a tertiary care centre in Southern India with the primary objective of finding out the histopathological spectrum of incidental renal lesions identified during autopsy examinations. By systematically analyzing renal tissue retrieved from medicolegal and hospital autopsies this study aimed to quantify the prevalence of various non-neoplastic and neoplastic renal pathologies. This study will expand the existing body of knowledge on subclinical renal disease in southern region of India.

## MATERIALS AND METHODS

This was a retrospective study conducted in the Department of Pathology of a tertiary care Medical institute located in South India. The study included renal tissues specimens collected during 60 medicolegal autopsies. The duration of study was 3 years extending from January 2022 to December 2024. Since the study involved cadaveric tissue informed consent from relatives was not applicable, however Institutional protocol for research on autopsy samples was strictly followed. Sample size was determined on the basis of pilot studies done aiming for a confidence level of 95% ( $\alpha = 0.05$ ) and a precision of 10% while accounting for the expected availability of intact renal tissues with adequate histological preservation throughout the study period. All kidneys obtained during autopsies were first examined grossly and tissue samples were collected from non-autolyzed specimens. From each kidney two sections were taken, one from the cortical region and one from the medullary region. In case of grossly visible abnormality, it was ensured that the section included gross abnormality.

The tissue samples were fixed in 10% neutral-buffered formalin for at least 48 hours after which routine histopathological processing was performed. Paraffin-embedded blocks were sectioned at approximately 4–5  $\mu\text{m}$  thickness and were then stained with haematoxylin and eosin (H&E). In cases where further characterization was necessary special stains such as Periodic Acid-Schiff (PAS), Masson's trichrome and Congo red were used. All slides were independently reviewed by two senior pathologists and in cases of discrepancies in interpretation the disagreement was resolved by mutual consensus. The study aimed to identify and classify incidental renal histopathological lesions including glomerular, tubular, interstitial and vascular pathologies. Diagnoses were made on the basis of established morphological criteria. Where applicable lesions were categorized based on diagnostic standards for common renal pathologies such as diabetic nephropathy, hypertensive nephrosclerosis and glomerulonephritis. Normal renal histology included intact glomeruli with no sclerosis, unremarkable tubules, minimal interstitial fibrosis, and patent arteries without intimal thickening. Descriptive statistics were used to summarize the findings. Frequencies and percentages were used for categorical variables, and mean with standard deviation for continuous variables. Data analysis was done using Microsoft Excel and SPSS version 25.0.

### Inclusion Criteria:

- Availability of intact, non-autolyzed renal tissues
- Cases where autopsy was conducted for medicolegal reasons.

### Exclusion Criteria:

- Cases with significantly autolyzed renal tissues unsuitable for histopathological examination
- Known pre-existing renal pathology documented in medical history
- Inadequate tissue fixation or processing artifacts preventing diagnosis.

## RESULTS

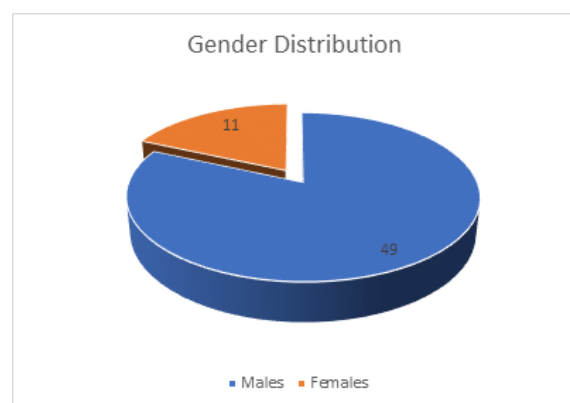


Figure 1: Gender Distribution of autopsy cases.

The analysis of the gender distribution of the studied cases showed that males constituted the majority with 49 cases (81.6%), while females accounted for 11

cases (18.3%). There was a significant male predominance in studied cases with a M:F ratio of 1:0.22 [Figure 1].

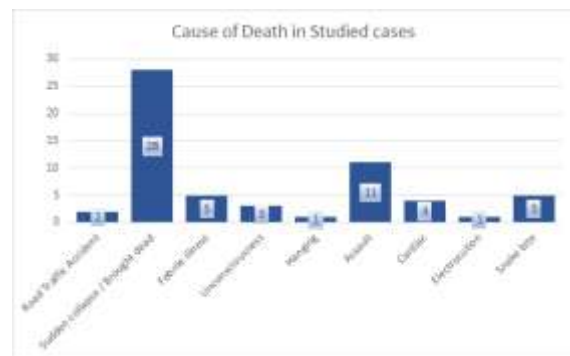
The analysis of the age distribution of the studied cases showed that the majority of incidental renal lesions were observed in the 31–50 years (45.0%) followed by individuals aged below 30 years (36.7%). A smaller proportion of cases were noted in the 51–70 years age group (13.3%) and the least number of cases were found in those above 70 years (5.0%). The mean age of the studied population was 37.1 years with a standard deviation of  $\pm 15.88$  years [Table 1].

**Table 1: Age Distribution of autopsy cases.**

Age Group	Number of Cases	Percentage
<30 years	22	36.7%
31–50 years	27	45.0%
51–70 years	8	13.3%
>70 years	3	5.0%
Total	60	100%
Mean $\pm$ SD = 37.1 $\pm$ 15.88 years		

**Table 2: Distribution of renal lesions in autopsy (N=60)**

Renal Lesion	Number of Cases	Percentage
Normal	20	33.3%
Congestion	15	25.0%
Glomerular lesions	5	8.3%
Tubular lesions	11	18.3%
Cyst	2	3.3%
Nephrolithiasis	1	1.7%
End-Stage Renal Disease (ESRD)	2	3.3%
Vascular lesion	1	1.7%
Renal Cell Carcinoma	3	5.0%
Total	60	100%



**Figure 2: Preliminary Cause of Death in studied cases.**

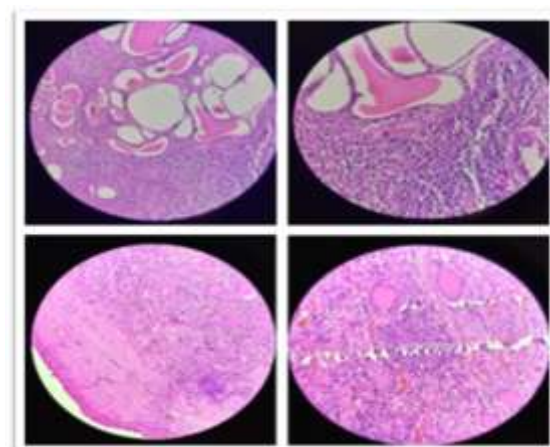


**Figure 3:- Gross Renal Specimens: Dilated Pelvicalyceal System with Thinned Cortex (Left); Renal Mass with Yellowish Areas Suggestive of RCC (centre); Large Necrotic Renal Tumor with Hemorrhagic Areas (Right)"**

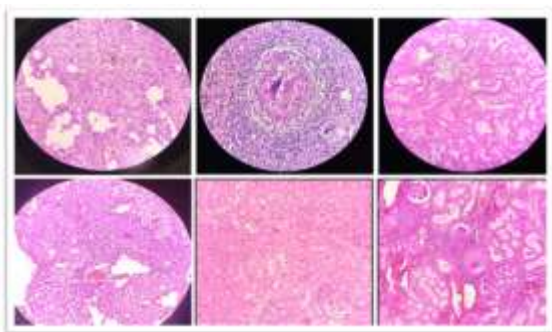
The analysis of the histopathological spectrum of incidental renal lesions revealed that normal renal morphology was observed in 20 cases (33.3%). This was followed by renal congestion seen in 15 cases

The analysis of the cause of death in the studied cases showed that the most common cause was sudden collapse or patients being brought dead (46.7%). This was followed by assault, which was responsible for 11 cases (18.3%). Febrile illness and snake bite were each noted in 5 cases (8.3%), while cardiac causes contributed to 4 cases (6.7%). Preceding unconsciousness was reported in 3 cases (5.0%) and road traffic accidents in 2 cases (3.3%). Less frequent causes included hanging and electrocution each with 1 case (1.7%) [Figure 2].

(25.0%) and tubular lesions noted in 11 cases (18.3%). Glomerular lesions were identified in 5 cases (8.3%) while renal cell carcinoma was detected in 3 cases (5.0%). Less frequently observed findings included cysts and end-stage renal disease, each present in 2 cases (3.3%), and vascular lesions and nephrolithiasis each found in 1 case (1.7%) [Table 2, Figure 3-5].



**Figure 4:- Histopathological Features of Renal Involvement: (Clockwise from Top Left) – Cystically Dilated Tubules, Tubular Casts with Inflammation, Lymphoid Follicle Formation, and Glomerular-Interstitial Sclerosis"**



**Figure 5: Histopathological Spectrum of Renal Lesions: Xanthogranulomatous Pyelonephritis, Granulomatous Pyelonephritis, Tubular Necrosis (Top Row, Left to Right); Papillary Renal Cell Carcinoma, Clear Cell Renal Cell carcinoma with clear cytoplasm, and Diabetic Nephropathy with Kimmelstiel-Wilson Lesion (Bottom Row, Left to Right)"**

## DISCUSSION

In our study incidental renal pathology was observed in two-thirds of cases (66.7%), with a marked male predominance (82%) and a mean age of  $37.1 \pm 15.9$  years. These findings are consistent with prior literature emphasizing the silent burden of renal disease in autopsy populations. Khare et al in their study examined 417 renal specimens and found renal abnormalities in 38% of cases.<sup>[7]</sup> Male predominance was seen in this study and most common affected age group was between 21 and 50 years. Similarly, a Nigerian study by Omenai S A et al analyzed non-neoplastic renal disease in autopsy samples.<sup>[8]</sup> The study found a male predominance of 65.7% and a mean age of 57.7 years. The authors reported that occult renal lesions were present in over 90% of cases. Our slightly younger mean age and higher proportion of sudden and trauma-related deaths likely was the reason behind differences in mean age and types of renal pathology observed in this study. These observations across diverse geographical locations suggest that incidental renal pathologies are common and may remain clinically undetected. This is more so in younger populations where overt renal dysfunction may not be suspected by physicians.

A substantial number of our cases exhibited non-neoplastic parenchymal lesions. Renal congestion was found to be the most common finding (25.0%) followed by tubular lesions (18.3%). Glomerular changes were relatively infrequent (8.3%). Subrat Kumar Sahoo et al conducted a retrospective study to analyse the histopathological spectrum of kidney lesions identified during autopsy in a teaching hospital.<sup>[9]</sup> The study involved gross and microscopic examination of kidney specimens to identify various pathological changes. The study found that grossly, 55 cases (68.75%) showed normal soft to firm kidney consistency. Cystic lesions and swollen enlarged kidneys were observed in 5 cases (6.25%) each. Microscopically, the most common change was congestion seen in 20 cases (25%). No renal pathology was detected in 18 cases (22.5%). Similar

renal pathologies were also reported by the authors such as Ohashi R et al,<sup>[10]</sup> and Santoriello D et al.<sup>[11]</sup> Incidental neoplastic and cystic findings in our cohort included renal cell carcinoma (RCC) in 5.0% and simple renal cysts in 3.3% of cases. The detection of RCC in autopsy studies has historically been variable. For instance, Jonsson A et al in an autopsy review found occult RCC in approximately 0.7%–0.9% of cases across multiple decades suggesting a relatively stable background rate.<sup>[12]</sup> Our higher rate may be due to meticulous histological sampling or reflect a regional increase in RCC prevalence. Similarly, Al mahroon MS et al in their review study reported that incidental small renal masses, including RCC, are increasingly detected both in imaging and at autopsy. These masses often measures less than 4 cm and remain clinically silent.<sup>[13]</sup> The presence of simple renal cysts is frequently age-related and considered benign, their detection in our relatively young cohort was limited likely due to the under representation of older individuals where cystic degeneration is more common.

Our study found end-stage renal disease (ESRD) in 3.3% of autopsies and noted vascular pathology in 1.66 % cases. Vascular lesions such as arterial wall thickening and chronic ischemic changes are known to be indicators of hypertensive or diabetic nephropathy. While our study had relatively few such findings, likely due to the exclusion of cases with known renal disease and the younger age of the population, these lesions remain clinically significant. Sainath K Andola et al conducted a prospective study to study the histomorphological spectrum of renal lesions in autopsies and attempt to establish the cause of death.<sup>[14]</sup> Out of 210 cases, 103 cases (49.1%) showed tubulo-interstitial and vascular lesions, 92 cases (43.81%) exhibited near-normal histology, and 15 cases (7.1%) showed glomerular lesions. On the basis of these findings the authors concluded that tubulo-interstitial lesions were more common than glomerular lesions in medicolegal autopsies. Similar histopathological findings were also reported by the authors such as Sainath K et al.<sup>[14]</sup> Our findings reaffirm the diagnostic value of systematic autopsy-based renal examination and underscore the importance of including renal pathology in postmortem analyses since many of these pathologies remain undetected in asymptomatic individuals. Perrone ME et al reported that in adult autopsies majority of significant renal lesions were initially unrecognized.<sup>[15]</sup> This under recognition has significant public health implications, including missed opportunities for familial counselling, regional surveillance, and the design of screening protocols.

## CONCLUSION

The study illustrates the spectrum of renal lesions identified in kidney tissues obtained during autopsy. Histopathological evaluation of these autopsy

specimens provides critical insights in to undiagnosed renal pathologies. Furthermore, it offers valuable information for identifying risk factors associated with various renal diseases and contributes to monitoring disease patterns and trends over time.

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