

# A HUMAN CADAVERIC STUDY ON INCIDENCE, PREVALENCE AND MORPHOLOGY OF CYSTIC KIDNEYS-WITH EMPHASIS ON ITS EMBRYOLOGICAL, PATHOLOGICAL AND CLINICAL SIGNIFICANCE

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## ABSTRACT

**Introduction:** Cystic diseases of kidney are heterogeneous, comprising of hereditary, developmental and acquired disorders. They account for 6-8% on dialysis. Knowledge of its occurrence, incidence, prevalence, morphology is clinically important for clinicians, radiologists, surgeons and pathologists for better pathological evaluation and understanding.

**Objective:** The aim of the present study is to observe the incidence, prevalence and morphology of cystic kidneys in cadavers and to review on its classification, embryology and clinical significance.

**Materials and Methods:** The present study was conducted on 30 adult formalin fixed human cadavers, 20 were male and 10 were female, used for routine dissection and teaching purposes for the first year medical students in the department of Anatomy, P.E.S Institute of Medical Sciences and Research.

**Results:** Cystic kidneys were seen in 7 cadavers out of the 30 cadavers. The other cadavers were normal. The incidence of cysts is 23.3%. The normal kidneys 76.6%. In female cadavers it was unilateral in right kidney. In male cadavers, one had unilateral cyst and the remaining 3 presented with bilateral cystic kidneys. One among the 4 showed multiple bilateral cysts- no ranging from 1-45.

**Conclusion:** Incidence of multiple cysts were more in males than in females. No of cysts were more in right than in the left kidneys. For a person to lead a normal life one fifth of the kidney is sufficient if it functions normally. (with reference to the 8<sup>th</sup> specimen). Autosomal dominant /adult poly cystic kidney usually manifest in later decades of life.

**KEY WORDS:** Cystic kidneys, multiple cysts, polycystic kidneys, bilateral cysts and unilateral cysts.

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## Access this Article online

### Quick Response code



DOI: 10.16965/ijar.2017.361

**Web site:** International Journal of Anatomy and Research  
ISSN 2321-4287  
[www.ijmhr.org/ijar.htm](http://www.ijmhr.org/ijar.htm)

Received: 21 Jul 2017  
Peer Review: 27 Jul 2017  
Revised: None

Accepted: 05 Sep 2017  
Published (O): 01 Oct 2017  
Published (P): 01 Oct 2017

## INTRODUCTION

Kidneys are a pair of excretory organs which elaborate urine and eliminate nitrogenous waste product of protein metabolism from blood and maintain electrolyte and water balance of the body. Each kidney is situated retroperitoneally

in the posterior abdominal wall by the side of the vertebral column. Extends from 12<sup>th</sup> thoracic to third lumbar vertebrae, are bean shaped with average measurements of 11cm x 6cm x 3cm [1]. Definitive human kidney is derived from two sources. Collecting part of the kidney is derived

from the ureteric bud which arises from the caudal part of the mesonephric duct and secretory part is derived from the metanephros-metanephric blastema [2].

Cystic disease of the kidney are heterogenous, comprising of hereditary, developmental and acquired disorders. As a group they are important for several reasons. They are reasonably common and often present diagnostic problems for clinicians, radiologists and pathologists. Adult polycystic kidney disease (ADPKD) is a major cause of chronic kidney disease. They can be occasionally confused with malignant tumours. Adult polycystic kidney disease is an autosomal dominant disease with high penetrance and occurs in 1 out of 400 to 1000 persons and accounts for 5% to 10% of chronic renal failure. It is caused by mutations in one of two genes, PKD1 and PKD 2. 85% of cases are due to mutation in PKD 1(chromosome 16p 13.3). PKD1 encodes polycystin 1, a large (460 KD) protein that localizes to tubular epithelial cells and has domains that are usually involved in cell-cell and cell-matrix interactions. PKD 2 encodes polycystin 2 a cation channel mutations of which disrupts the regulation of intracellular calcium. Polycystin 1 & 2 is both localized to the primary cilium. They form a complex that regulates intracellular calcium in response to fluid flow.

The primary cilium in tubular epithelial cells functions as a mechanosensor to monitor changes in fluid flow and shear stress. These sensors regulate ion flux in response to external forces. Mutated proteins affect second messengers and influence proliferation, apoptosis, ECM interactions, and secretory function, leading to formation of tubular cysts. Cysts arise anywhere along the nephron, they may be 3-4 cm in diameter, and may compress the adjacent parenchyma. In late disease interstitial inflammation and fibrosis. The other type of cystic diseases are Autosomal Recessive Polycystic Kidney disease, Medullary sponge kidney, Nephronophthisis and Adult-onset Medullary Cystic Disease, Acquired cystic disease associated with dialysis. Of the different types of renal cysts, the commonest are polycystic kidney disease, medullary sponge kidney and simple localized renal cysts. Simple cysts occur

in the cortex about 1-10cm in size. They have smooth walls and are filled with clear serous fluid [3]. Poly cystic kidney consists of progressive cystic dilatation of the renal tubules which results in nephromegaly and end in end stage renal disease [4].

This study was undertaken to identify cysts in the cadavers that were used for teaching purpose and an attempt was made to identify the types of cysts based on their morphology. To also discuss about the prevalence, incidence and the clinical significance of such cysts.

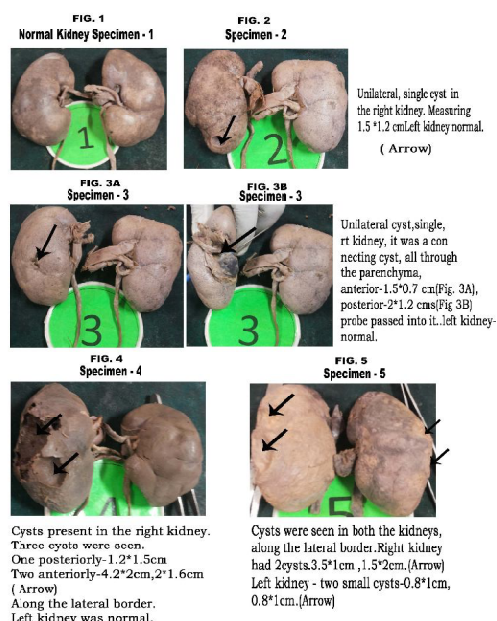
## MATERIALS AND METHODS

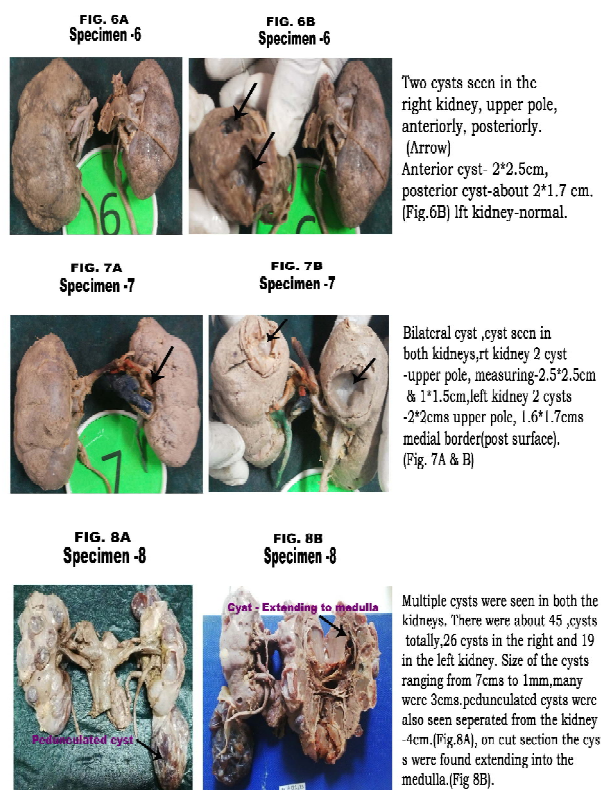
The dissection was as per the Cunningham manual of Practical Anatomy and the kidneys were identified and removed from their normal location. The kidneys were examined and presence of cysts were noted. Photographs of the kidneys with cysts were taken and observations noted down.

## OBSERVATIONS

The following observations were made:

Out of 30 cadavers, cystic kidneys were seen in 7 cadavers out of which 4 were male and 3 were female cadavers. 3 female cadaveric kidneys had unilateral cyst in the right kidney. Fig-2,3,6. Of the four male cadavers one cadaver had unilateral cyst and 3 presented with bilateral cystic kidneys. Fig-4,5,7,8. One of the 4 male cadaveric kidneys presented with enormous multiple cysts. fig-8. (specimen 8)





## DISCUSSION

In a study by Jaswinder Kaur[5] out of 30 cadavers cysts were reported to be seen in 4 cadavers more in incidence in males, compared to females. Even in the present study male cadavers had cysts more than the female cadavers.

Kaur Manpreet et al [6] observed and reported that multiple cysts were present only on the left side. They concluded that unilateral polycystic kidney is seen not so frequently. They cited Levin et al that unilateral renal cystic disease had at least three aspects from ADPKD, unilateral localization, negative family history and no progression to chronic renal failure. They have no cysts in other abdominal organs. In the present study unilateral cystic kidney was seen in one male cadaver.

Sathialakshmi V et al [7] studied cystic diseases in various organs. They reported bilateral polycystic kidney in a male cadaver, similar to the present study.

Dr.Shroff Gautam A et al [8] studied ultrasonography of patients between 25-29 weeks gestation for kidney development. They found unilateral multi cystic dysplastic left kidney, right hypoplastic kidney with left lobulated kidney, right kidney agenesis & left kidney enlarged

with cystic mass. They opined that failure of the ureteric bud to integrate and branch appropriately into the metanephros during development of kidney resulted in multicystic disease of kidney. The present study was in adult cadavers with probably cysts present since birth and it had not affected the individual organ systems as there were no observable changes seen.

Vinnakota Sunitha [9] studied still born foetuses at various stages of development from 10 weeks to 40 weeks. They found that lobulation is seen at 12 weeks and is not present at 16 weeks. They also observed juxta glomerular apparatus at 14 weeks of gestation. Difference in staining pattern of tubules at 16 weeks of gestation. They concluded that major development of kidney takes place at 20-22 weeks. Vinnakota Sunitha also reported a case of bilateral polycystic kidneys with hepatic fibrosis and hypoplastic lungs in a 32 weeks still born male foetus. The present study did not compare foetal kidneys.

Eswari A.K, et al [10] discussed and concluded that time of formation of cysts is not known but tubular and glomerular microcysts are seen as early as 12 weeks of gestation. According to the present study one male cadaver which was aged 85 years had large cysts on both sides. The personal history of the individual is known as it was a donated cadaver. The history revealed treatment of hypertension, no history of renal disease till the end. This suggests formation of cysts but a normal excretory function not affecting the individual's life. The cysts were probably simple cysts and this had to be confirmed by histological studies.

Adrian S.Woolf et al[11] have described three types of diseases associated with glomerular cysts. One of them is urinary obstruction. The author cited studies which described that normal glomeruli can become cystic after birth. The Bowman's space becomes enlarged after collapse of glomerular tufts secondary to glomerulosclerosis or mesangiolysis or haemolytic uremic syndrome. When cysts form in the kidney they are filled with fluid. Cysts can enlarge in the kidneys while replacing much of the normal structure, resulting in reduced kidney function leading to kidney failure. Granthem et al [12].

It was reported that polycystic kidney disease/ cystic kidneys were slightly more severe and



common in males than in females by Torra [13]. It is similar finding in the present study too.

Incidence of polycystic kidneys increase in frequency to 25-33% of patients older than 50 years & account for cysts which occupy 65-70% of renal parenchyma.<sup>[14]</sup> This we observe in the present study that one among the cystic kidneys presented with enormous multiple cysts which almost occupied nearly 60-70% of the renal parenchyma belonged to the cadaver aged 85 years.

## CONCLUSION

The study observed cysts in cadaveric kidneys of various age groups and in both sexes. The cysts were present in male cadavers more than in female cadavers. The size and number of cysts was also variable and though the cause of death of the individual cadavers was not known in this study, the chance finding of cysts in adult kidneys indicate that an autosomal dominant disease manifests itself late in life and does not interfere with the functioning of the individuals organs. Most probably the cysts were formed due to obstruction in the glomeruli and did not go as far as renal failure for manifestation clinically.

**Conflicts of Interests: None**

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### How to cite this article:

Sujatha. K, Shakuntala Rao. A HUMAN CADAVERIC STUDY ON INCIDENCE, PREVALENCE AND MORPHOLOGY OF CYSTIC KIDNEYS-WITH EMPHASIS ON ITS EMBRYOLOGICAL, PATHOLOGICAL AND CLINICAL SIGNIFICANCE. Int J Anat Res 2017;5(4.1):4437-4440. DOI: 10.16965/ijar.2017.361