



Research Paper

ABSTRACT

Introduction

A renal cyst is a fluid-filled sac that develops in the kidneys. It is a common condition and is usually non-cancerous (benign). Renal cysts can vary in size and can occur in one or both kidneys. They can be simple or complex, with simple cysts being more common and typically not causing any symptoms or complications. While renal cysts are generally harmless, in some cases they can be associated with certain medical conditions, including hypertension (high blood pressure).

Most renal cysts are benign and do not pose a significant health risk. They are typically discovered incidentally during imaging tests, such as ultrasounds or CT scans, performed for other reasons. However, in some cases, renal cysts can cause symptoms or lead to complications, particularly if they become large or if there are multiple cysts present.

NEED OF THE STUDY

- The purpose of this study is to assess the prevalence of hypertension among individuals with renal cysts within the general population of India.
- Since there has been limited research on this topic, this study aims to enhance our understanding of the likelihood of hypertension in individuals with renal cysts.

AIM

- “To Analyze the probability of hypertension in patients with Renal Cyst by using MDCT”.

OBJECTIVES

- To see the hypertension in renal cyst patient based on bosniak classification.
- To see the frequency of renal cyst based on bosniak classification.

Method

The study is based on observational cross-sectional method to understand the probability of hypertension in patients with renal cyst by using Somatom emotion 16 slice Computed tomography. Analysis was conducted in 70 patients at HAHC, HIMSR Radiology Department, Hamdard Nagar New Delhi The gathered data were summarized using descriptive statistics, including frequency, percentage, mean, and standard deviation. To assess the relationship between variables, the likelihood ratio or Chi-square test was employed, with a p-value of < 0.05 considered significant. Data analysis was conducted using SPSS software (SPSS Inc; Chicago, IL), Version 26.0.

Result

Based on data that was collected from the HAHC, HIMSR, Radiology Department by using descriptive statistics. It was observed that renal cysts are more commonly found in males than in females.

Renal cyst based on Bosniak classification divided into 5 categories in which type-1 is more common and type three and four was not found. Hypertension probability found in diagnosis patients with the renal cyst was 32.9% (23). There was an association between unilateral, bilateral and multiple distribution of cyst and Bosniak classification also with age and size of the cyst.

Conclusion

The study concluded that the cause of renal cysts remains unidentified. However, it found a significant positive association between the presence of renal cysts, as classified by the Bosniak classification, and the incidence of hypertension. Characteristics such as unilateral or bilateral presence, multiple cysts, numbers of one, two, or more, sizes larger than 1 cm, and age groups were linked to hypertension according to the Bosniak classification.

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I. INTRODUCTION

Kidney Anatomy

The kidney is two reddish brown bean shaped organs found in vertebra. Kidney lies in the retroperitoneal space behind the abdomen^{2,8}. It weighs about 125 to 175grams in males and 115 to 155grams in females. Its length is 11 to 14 cm, width is 6cm, and thickness is about 4 cm. The kidney's parenchyma is made up of the outer renal cortex, the inner renal medulla, and the renal pyramids, which are the primary components of the medulla. The kidney is shielded by layers of fat, muscles, and the rib cage at the back.

Perineal fat safeguard the kidney from external injury or damage⁸. Each kidney contains approximately a million small structures known as nephrons, which serve as the functional units of the kidney. They filter blood, removing waste and excess water, which is then converted into urine³. Each kidney attaches to a ureter that carries excreted urine to the bladder².

Renal physiology is the study of kidney function². Most kidney diseases affect the nephrons, potentially impairing the kidney's ability to eliminate waste. Causes of this damage can include genetic disorders, injuries, or medications. Individuals with diabetes or high blood pressure, or those with a family history of kidney disease, are at greater risk, as these conditions can gradually damage the nephrons over time³. Disease include CkD, pyelonephritis, acute kidney injury, nephrotic syndromes, other kidney problems include cancer, renal cyst, stone, infection^{2,3}

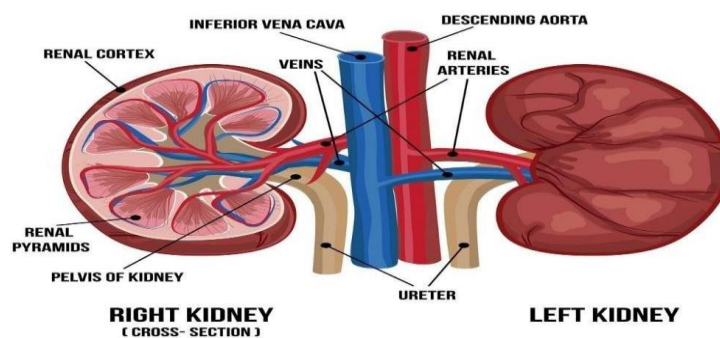


Figure: 1 Cross-sectional anatomy of kidney¹⁰

Renal cyst

A renal cyst is a fluid-filled pouch that develops in the kidneys. It is a common condition and is usually non-cancerous (benign). Renal cysts can vary in size and can occur in one or both kidneys. They can be simple or complex, with simple cysts being more common and typically not causing any symptoms or complications. While renal cysts are generally harmless, in some cases they can be associated with certain medical conditions, including hypertension (high blood pressure).

Renal cysts are a prevalent condition in patients and can be either benign or malignant, as well as focal, multifocal, unilateral, or bilateral. They may be congenital or acquired, with the acquired type being more common⁹. The renal cyst is also influenced by lifestyle features such as smoking and alcohol intake⁵.

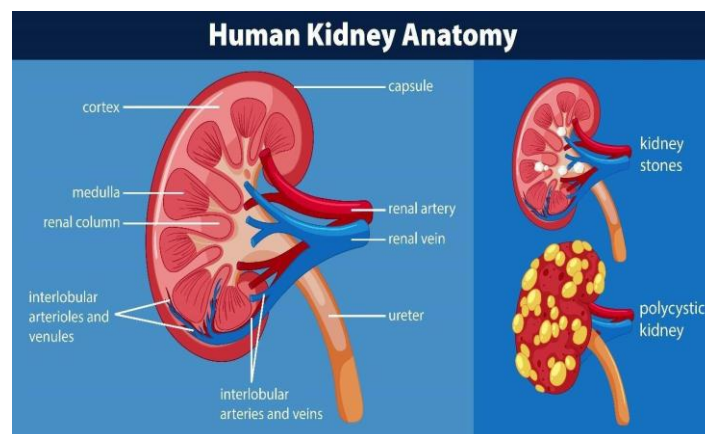


Fig .2. shows anatomical structure of kidney and occurrence of polycystic kidney⁴.

Causes: The exact cause of renal cysts is often unknown. However, they can develop due to the following factors:
Age: The threat of developing renal cyst rises with age, and they are more frequently observed in individuals over 50 years old.

1. **Genetic factors:** Certain genetic conditions, such as polycystic kidney disease (PKD), can cause the formation of multiple cysts in the kidneys.

2. **Acquired cystic kidney disease:** This condition can occur in individuals with chronic kidney disease, particularly in those who have undergone long-term dialysis.

Symptoms: Most renal cysts do not cause any symptoms and are often discovered incidentally during imaging tests for other conditions. However, larger cysts or those causing complications may lead to the following symptoms:

- Abdominal pain
- Hematuria
- Elevated blood pressure
- Recurrent urinary tract infections (UTIs)
- Changes in kidney function (rare)

Renal cyst classification by computed tomography

Computed tomography is commonly employed in the clinical assessment and classification of kidney cysts. Computed tomography was initially outlined by Bosniak in 1986 and is referred to as the Bosniak classification⁵. It allows the classification of renal cyst to ruled out infection, inflammatory, or vascular etiologies etc⁷. A simple renal cyst falls under the Bosniak Category I. Typically asymptomatic, it can occur in individuals of all age groups, though its prevalence rises with age, exceeding 5% in those over 40. And 36% in 80 and often diagnosed as an incidental finding¹. Simple renal cysts are most common now a days. Bosniak bracket has been extensively used by radiologists for reporting purpose to describe characteristics of renal tubercle. There are five bosniak order of renal tubercle as shown in the Table. 1

BOSNIAK reporting category of renal cyst⁵

Category	Criteria	Malignancy rate
Type 1	Simple cyst with either no septa or hairline thin septa, and no calcification.	1-5%
Type 2	Cyst with a few thin hairline septa, less than 3 cm in diameter; may show small areas of thickened calcification.	10-15%
Type 2-F	Cyst with multiple thin septa and a diameter exceeding 3 cm.	15-30%
Type 3	Cyst with thickened, irregular, or smooth walls or septa, and measurable enhancement.	50-60%
Type 4	Cyst with prominent enhancing soft tissue components, similar to Type 3 but with more pronounced features.	80-90%

Table 1: shows that bosniak classification of renal cyst.

High blood pressure, also referred to as hypertension, is a prevalent condition characterized by consistently elevated blood pressure in the arteries. Increased blood pressure is often referred to as the "silent killer" because it usually doesn't cause noticeable symptoms, but it can have serious health consequences if left untreated. Overtime, arterial blood pressure can harm blood vessels, resulting in complications such as heart disease, stroke, kidney problems, vision loss, dementia, and other organ damage^{1,7}.

There are two types of arterial blood pressure: primary and secondary. Primary hypertension, the most prevalent type, progresses slowly over time without a known cause. Secondary hypertension results from underlying conditions like kidney disease, hormonal disorders, or the use of certain medications⁷. Primary hypertension makes up 90-95% of cases and is often linked to non-specific lifestyle and genetic factors. Contributing lifestyle factors include high salt consumption, excess body weight, smoking, and alcohol consumption¹. The remaining 5-10% of cases are identified as secondary hypertension, resulting from specific causes such as kidney disease, narrowing of the kidney arteries, or endocrine disorders⁷.

According to the World Health Organization, approximately 1.28 billion adults aged 30 to 79 are affected by hypertension. The global prevalence of hypertension has surged significantly, rising from approximately six hundred million cases in 1975 to six million in 1980, 1 thousand million in 2008, and 10^{^9} in 2020. Out of the seventeen million annual deaths from cardiovascular diseases, an estimated 10 million are attributed to hypertension^{1,7}.

MULTI-DETECTOR COMPUTED TOMOGRAPHY

CT scan is a cross sectional study of the body often known as computed axial tomography. In this imagine technique the radiographer takes a image in axial section and reconstructed in coronal or sagittal section. It is a medical imaging procedure that produces precise side image of the body.

NEED FOR THE STUDY

- The purpose of this study is to assess the prevalence of hypertension among patients with renal cysts within the general population of India.
- There has been limited research on this topic, making this study valuable for enhancing our understanding of the likelihood of elevated blood pressure in patients with renal cysts..

AIM AND OBJECTIVES

AIM

- “To Analyze the probability of hypertension in patients with Renal Cyst by using MDCT”.

OBJECTIVES

- To see the prevalence of renal cyst in hypertension patient.
- To see the frequency of renal cyst based on bosniak classification .

OPERATIONAL DEFINITION

ANALYSIS: A detailed examination of anything to determine its essential features.

PROBABILITY: It is a mathematical tool used to study randomness and provide predictions about how likely something to happen.

RENAL: It is a paired bean shaped organs that are present on the posterior side of the abdominal wall and it also known as Kidney.

CYST: A cyst is a small pocket of tissue filled with air, fluid, or other substance.

HYPERTENSION: It's a condition where the pressure of the blood against the barrier of the blood vessels is excessively high.

ASSUMPTIONS

The study assumed that:

- Renal cyst probability high in males compare to females.
- Renal epithelial cyst are more frequently observed in individuals compared to complex cysts.
- Patients with multiple cysts have a higher likelihood of developing hypertension.
- The renal cyst is more common in people who are above 40-45 years.

DELIMITATIONS OF THE STUDY

The study was delimited by:

- Sample size is so small.
- Only one hospital in Delhi/NCR was included in the study.

II. Review of literature

Su-Mi Kim, Sung-Gul Kwon, Myoung-Soon Oh, Sung-Jin Bae, et al Conduct a prospective study to examine the link between simple renal cysts identified through abdominal ultrasonography and hypertension in a cohort of 13,482 peoples at Ulsan University Hospital in 2002.

They included 3,249 patients, consisting of 217 females and 3,032 males, and considered factors such as age,

BMI, diabetes, dyslipidemia, as well as social history details like alcohol consumption, smoking, and exercise. In 2010, they analyzed data from 505 patients with newly diagnosed simple renal cysts and 2,744 patients without renal cysts. Individuals with renal cysts, , diabetes, liver cirrhosis, kidney disease, thyroid disease, or cancer in 2002 were excluded from the study..

The result of the study showed that 3249 patients, of which 505 patients had renal cyst with hypertension and 2744 patients had renal cyst without hypertension. Incidentally hypertension with renal cyst found higher in males than females.

The study concludes that patient with simple renal cysts had a higher incident of elevated blood pressure. Hypertension was observed in those patients in which two or more cysts were present in both kidneys. The size of renal cyst measures larger than 1cm in diameter.

Burga Keseroglu, Berat Cem Ozgur, Sedat Tastemur, et al conduct a retrospective cross-sectional study to assess the factors associated with cystic renal lesions for predicting renal tumors, in the Urology Department at Ankara Yuksek, Ihtisas, and Samsun Research and Training Hospitals in Turkey, from January 2013 to 2017.

They included 785 patients for the study. They include BMI and details of physical activity like smoking, the patients who had sign and symptom of renal cyst.

The results indicate that 191 patients had renal cystic lesions, categorized as follows: 35 were classified as Bosniak type I, 38 as Bosniak type II, 22 as Bosniak type IIF, 38 as Bosniak type III, and 58 as Bosniak type IV. This study shows type I patients had benign, whereas type II, type II-F, type III and type IV malignant. In which in type II - 3 patient had malignancy out of 38, in type II-F -7 patient had malignancy out of 22, in type III- 30 patient had malignancy out of 38, in type IV- 40 patients had malignancy out of 58.

The study concluded that renal cysts had a higher likelihood of malignancy in patients with a “history of smoking” or a high BMI. Additionally, no significant difference was found between male and female concerning renal cysts.

Jie Mu, Yiran Mao, Fangxuan Li, Sheng Zhang, et al conduct a prospective study to assess the sensitivity, specificity, and accuracy of conventional ultrasound combined with Superb Microvascular Imaging (SMI) in diagnosing malignant cystic renal masses according to the Bosniak classification, utilizing an ultrasound machine equipped with SMI, a novel ultrasound technique. This study was conducted at the “Tianjin Medical University Cancer Institute and Hospital”.

The study included 55 patients diagnosed with solitary renal cystic masses between January 2015 and February 2017. These patients underwent conventional ultrasound, color Doppler imaging, and Superb Microvascular Imaging (SMI).

The study results indicated that 44 patients underwent surgical resection of their renal cystic masses and received final pathological reports, while 11 patients did not have surgery. Among the latter, 6 patients with renal cystic masses were confirmed as simple cysts after 27 months of follow-up, and 5 patients were identified as having complex renal cystic lesions according to Bosniak categories 2f and 4. Of these, CEUS performed on 4 patients showed 3 cases as simple cysts and 2 cases as multilocular cysts, with final confirmation achieved after 1 year of follow-up. The result shows that out of 55 patients 38 patients had malignancy and 17 patients had benign renal cystic mass.

The study conclude that Bosniak Classification aided by SMI may be an accurate non-invasive ultrasonic examination to distinguish between benign and malignant renal cystic masses.

Vincent Schwarze, Johannes Rubenthaler, Thomas Geyer, Michael Staehler, et al conduct a retrospective study to assess the diagnostic effectiveness of contrast-enhanced ultrasound (CEUS) in evaluating Bosniak III complex renal cystic lesions, with histopathological validation. The study involved 49 patients classified with Bosniak III renal cystic lesions. They included patients who had been examined using native “B-mode imaging, color Doppler ultrasound, and contrast-enhanced ultrasound (CEUS)”.

This study shows that out of 49 patients, 26 patients’ renal lesion had located on left side and 23 patients’ renal lesion had located on right side. Bosniak III were found higher in male than female, ratio is 1:2. The average age of patients at the time of the CEUS examination was 64 years, and the mean size of the renal lesions was 3.4 cm. Histopathological evaluation revealed renal cell carcinoma (RCC) in 29 patients: 12 had clear-cell RCC, 3 had papillary RCC, 2 had mixed RCC, 1 had multilocular cystic RCC, and 1 had chromophobe RCC. Benign conditions included 4 patients with benign epithelial cysts, 3 with oncocytoma, and 1 with papillary renal adenoma.

The concludes that Contrast-Enhanced Ultrasound (CEUS) has high diagnostic accuracy in distinguishing between malignant and benign renal cystic lesions according to the Bosniak classification. It was found that CEUS offers diagnostic validity comparable to that of Computed Tomography and Magnetic Resonance Imaging.

Zerem, Enver, Imamovic, Goran, Omerovic, et al conduct a cross-sectional study to determine whether the removal of simple renal cysts lowers blood pressure (BP) and how simple renal cysts relate to arterial hypertension.

This study includes 184 patients of renal cysts who were hypertensive and non-hypertensive using a cross-sectional approach. The results encompassed the number, diameter, and location of cysts. In 62 hypertensive patients who underwent percutaneous cyst evacuation, we initially evaluated the changes in absolute values of systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean blood pressure (BP) using a crossover design. The reduction in BP was analyzed as a categorical variable across all study cases.

The result of the study shows that Patients with hypertension had a big renal cyst prevalence of 55% compared to 24% in non-hypertensive patients ($P = 0.0001$). In both hypertensive and non-hypertensive patients, the prevalence rates of multiple and peripheral cysts were similar to those of perihilar and solitary cysts, respectively. Significant differences in systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean blood pressure (BP) were observed between pretreatment measurements and 3 days, 1 month, 3 months, and 6 months after cyst evacuation ($P < 0.001$). All hypertensive patients exhibited substantial changes ($P < 0.001$). Three days after treatment, there were fewer hypertension patients than there were previously ($P 0.0001$).

This study concluded that Simple renal cyst size appeared to be related to hypertension, and aspiration of cysts led to a drop in blood pressure. The quantity and location of cysts showed no correlation with blood pressure.

Neringa Bielskiene, Vytautas Augustinavicius, Dileta Valanciene, et al conducted a cross-sectional reviewed study to assess the features of malignancy in computed tomography inside category III lesions at Vilnius University Hospital because it is still difficult to determine the malignancy in these lesions.

In this study 73 patients was included Bosniak type III lesions, data was based on genetic abnormalities and cancer history. Bosniak category III lesions were analyzed for their largest diameter, location, shape, extent of calcification, and contrast enhancement.

This study found that 43 cysts were surgically removed and histologically analyzed from 73 patients with Bosniak category III lesions. Malignant lesions had a significantly smaller average tumor size compared to benign ones. The mean enhancement during the arterial and portovenous phases, as well as the change in enhancement between the portovenous and native phases, showed significant differences between benign and malignant lesions. The contrast enhancement patterns also differed notably: septa and capsular enhancement were observed in 28.6% ($n = 12$) of malignant lesions, compared to only 4.8% ($n = 2$) in benign lesions. While no significant changes were noted, some characteristics were more frequently associated with malignant tumors.

This study conclude that we are unable to accurately distinguish between benign and malignant Bosniak grade III cystic tumors based on the gathered data and chosen features. Although some of the criteria indicated certain trends, more research is needed to prove the validity of these conclusions.

JF Pedersen, SA Emamian, MB Nielsen et al a study was conducted to investigate the relationship between simple kidney cysts and EBP (Elevated Blood Pressure).

This study involved the analysis of “115 patients (mean-age 67.7 years, range 31-91) in whom renal cyst(s) were discovered incidentally via ultrasonography, alongside 115 age- and sex-matched control patients”. The notes were reviewed without knowledge of the treatment source or details.

Patients with cysts had notably higher systolic and diastolic blood pressure compared to those without cysts ($P = 0.031$ and $P = 0.0034$; with mean differences of 6.9 mmHg and 5.0 mmHg, respectively). For individuals aged 30 to 70, the probability of having a diastolic blood pressure of 95 mmHg or higher increased from 7 out of 58 to 17 out of 58 when simple renal cysts were present ($P = 0.038$).

This study concluded that kidney cysts and greater elevated pressure are frequently linked, most likely due to the same underlying renal illness. The increase in BP can occasionally be induced by renal ischemia brought on by cyst growth and its associated increased renin release. If true, techniques for locating these cysts should be developed.

N Terada, Y Arai, N Kinukawa, K Yoshimura et al conducted a study to evaluate “the risk factors for renal cysts in a large population-based health survey”. “A multiphase health-screening program was conducted at our institution in 2000”.

This study included 17,914 patients, with renal cysts identified through ultrasonography. Factors such as gender, age, kidney function test, elevated blood pressure, hypercholesterolemia, type-2 diabetes, smoking, and other risk factors for renal cysts were analyzed using logistic regression. Hypertension was defined as a systolic blood

pressure above 140 mmHg, a diastolic blood pressure above 90 mmHg, or the current use of antihypertensive medication. For 45 patients with renal cysts, sequential changes in cyst size and systolic blood pressure were tracked over an average period of 6 years (ranging from 4 to 7 years) and compared to age.

“The result of the study found that 9.9% of subjects had kidney cysts, with prevalence increasing from 3.8% in their thirties to 18.5% in their sixties. Cysts were present in 5.8% of women and 13.0% of men ($P < 0.001$). The average systolic blood pressure was 123 mmHg for those with cysts and 118 mmHg for those without ($P < 0.001$). Additionally, the mean serum creatinine level was 83 mg/L in individuals with cysts compared to 76 mg/L in those without. Multivariate logistic regression analysis showed that age, sex, hypertension, and serum creatinine significantly affected the likelihood of developing renal cysts ($P < 0.001$, $P = 0.0022$, and $P = 0.021$, respectively). However, no correlation was found between cyst growth and an increase in blood pressure”.

This study concluded that age, gender, kidney failure, and arterial blood pressure are key factors in the development of kidney cysts, with hypertension potentially leading to renal impairment.

Bora Ozveren, Efe Onganer, Levent N Turkeri et al conducted a study to determine the prevalence of simple renal cysts among adults undergoing health screenings, and to evaluate their clinical characteristics, risk factors, and progression over time.

This study included 1000 individuals with simple kidney cysts who had identified by ultrasonography in a check-up programme between April and November 2008, and each patient file was examined for demographic and clinical details as well as cyst characteristics. An electronic patient record system was used for follow-up. To assess the relationship between outcomes and parameters, correlation analysis and univariate and multivariate analyses were conducted.

The result of the study found that 7.7% of individuals were affected. Among 77 patients with an average follow-up of 3.5 years, there were 123 cysts. Those with cysts were generally older ($P < 0.01$). Prevalence rates for individuals under 40 and between 40 and 60 years old were 2.7% and 23.9%, respectively. Cysts were predominantly observed in males (94.8%), with most being solitary (63.6%). Although no link was found between Body Mass Index and total cholesterol levels, individuals with cysts had notably higher serum creatinine levels ($P < 0.01$). Hypertension and microscopic hematuria were similarly diagnosed in patients with renal cysts, but diabetes and hyperglycemia were more common, and older age was associated with a higher number of cysts (all $P < 0.05$). Among those who were monitored, 86.5% had either an increase in the number of cysts or maintained the same number.

This study concluded that ultrasonography revealed a 7.7% frequency of simple renal cysts in a group of persons having a health check. Males and older people were more likely to develop renal cysts, and these cysts were linked to higher serum creatinine and diabetes levels.

Jae Duck Choi et al conducted a study to evaluate the “characteristics of simple renal cysts and the potential causes of their development in healthy Korean adults”.

“The study involved 10,261 individuals who participated in a polyphase health check-up at our institution in 2002, and their medical records were reviewed. Factors such as gender, age, BMI, serum creatinine, estimated GFR, proteinuria, blood in urine, elevated blood pressure, hypercholesterolemia, and type 2 diabetes were analyzed using logistic regression to identify potential risk factors for renal cyst development. Additionally, sequential changes in size and associated risk factors for cyst growth were monitored in 65 patients with 79 simple renal cysts through annual follow-ups over a 10-year period”.

“The result of the study shows that simple renal cysts were prevalent, occurring in 5.43% of cases. These cysts were more common among older individuals ($p < 0.001$), those with higher body mass index ($p < 0.001$), those with proteinuria ($p = 0.011$), those with microscopic hematuria ($p < 0.001$), those with reduced estimated GFR ($p < 0.001$), and those with hypertension ($p < 0.001$). On average, simple renal cysts increased by 1.43 mm (6.5%) per year during the 10-year follow-up period. In the multivariate analysis, age 50 years ($\beta = 2.37$; 95% CI 0.52, 4.22; $p = 0.013$) was the only factor significantly associated with the rate of cyst growth”.

This study concluded that the incidence of simple renal cysts is linked to factors such as age, BMI, renal failure, proteinuria, blood in urine, and elevated blood pressure. Younger individuals under 50 years be inclined to see more rapid growth in the size of simple renal cysts, though these cysts generally do not progress into more severe conditions.

Naoki Terada, Kazutoshi Okubo Yosuke Matsuta, , Kentaro Ichioka et al conducted a to assess how often renal cysts occur and how their size and number change over time, aiming to understand their cytology.

The study involved 14,314 individuals who participated in a multiphase health screening program at our institute in 1999, utilizing ultrasonography. Between January 1993 and December 1999, 45 patients with renal cysts were followed for an average of 6 years.

“The study result shows that men were twice as likely as women to have renal cysts, and the prevalence of these cysts increased over seven times with age, rising from 5.1% in the fourth decade of life to 36.1% in the eighth decade. Our longitudinal analysis revealed that cysts grew in both size and number over time, with an average size increase of 2.82 mm and a yearly growth rate of 6.3%”.

“The study discovered that the prevalence of renal cysts rises with age, and there is a notable difference in their occurrence between sexes. Moreover, renal cysts become larger and more numerous over time, with younger people showing faster growth. Further research is required since the patterns of development and progression for multiloculated cysts might differ from those of simple cysts”.

Jafar Al-Said, W Charles O’Neill et al conduct a study to assess the decrease in kidney size in individuals with renal cysts.

“The study involved 2,526 patients with conditions such as genetic cystic disorders, complex cysts, pyonephrosis, peripelvic cysts, end-stage renal disease, and kidney transplants, of whom 385 had one or more cysts. All outpatient and inpatient ultrasounds performed by the Renal Division since 1995 were examined, with duplicate studies excluded”. Serum creatinine levels were used to assess renal function, while the maximum renal length was measured to evaluate kidney size.

The result of the study shows that patients with cysts had significantly shorter kidney lengths in both the right and left kidneys, regardless of which kidney had the cyst(s) ($P < 0.0001$). There was no significant difference in kidney lengths between those with bilateral or unilateral cysts. However, individuals with multiple cysts had shorter kidney lengths compared to those with a single cyst. Cysts were found to be twice as common in single kidneys as in both kidneys ($P = 0.01$). Although outpatients with cysts had higher serum creatinine levels, this difference was not statistically significant ($P = 0.06$). The patients were matched for age and gender. A multivariate analysis revealed that age, gender, and kidney length were independent factors that collectively accounted for one-third of the variability in cyst occurrence.

This study concludes that Simple kidney cysts seen in kidney ultrasound result in smaller kidneys in patients, and cysts may also be linked to impaired renal function. According to this, patients with renal problems may have solitary cysts as a sign of nephron loss.

Jian She Liu, Isao Ishikawa et al conducted a study to determine whether patients with mild chronic renal insufficiency also develop acquired renal cysts.

This study included 720 cases of renal biopsy samples and was done retrospectively. A tubule dilated by further than 200 μ m was a renal tubercle.

“The result of the study shows that 21 out of 720 renal biopsy samples, renal cysts were discovered. When compared to 699 patients without cysts, the serum creatinine of 21 patients with renal cysts was considerably higher (2.59 2.64 vs. 1.09 0.79 mg/dl) ($p < 0.0001$). On biopsy specimens, cyst development is more evident in patients with poor renal function (serum creatinine > 1.6 mg/dl) than in patients with adequate renal function (serum creatinine 1.5 mg/dl). Cysts were found in 10 of 113 (8.8%) individuals over 51 years old and 11 of 607 (1.8%) patients who were under 50 years old. 11 patients under the age of 50 underwent a thorough examination to rule out simple cysts, which are frequently seen in older subjects. The range for mean serum creatinine was 0.7–10.4 mg/dl, or 2.98–3.06 mg/dl. The creatinine clearance for these 11 patients was only 47.5 25.6 ml/min (5–71 ml/min). Seven patients had creatinine clearances of 52–71 ml/min (serum creatinine, 0.7–2.0 mg/dl)”. Immunohistochemistry on lectin was used to evaluate one of the 11 biopsy specimens with cysts. “Tetragonolobus lectin was present in this instance, but peanut lectin was not, indicating that, unlike in simple cysts, the epithelial cells lining this tubercle were deduced from proximal tubules”.

“This study concluded that these findings suggest that a decrease in normal renal function, such as creatinine clearances of 52–71 mL/min, is enough to trigger the development of acquired cysts in various renal diseases”.

Jared J Grantham, Sumanth Mulamalla, Connor J Grantham, et al conducted a retrospective study to determine the total number and range of cyst sizes in adults with maintained GFR.

“The study involved 8 adult patients with autosomal dominant polycystic kidney disease, who were assessed through a morphometric analysis of renal cyst number and size using magnetic resonance imaging both at baseline and 6.9 years later”. Additionally, the quantity and size of cysts were measured in microscopic sections of nephrectomy specimens from five different individuals.

“The study results indicate that the average total number of cysts increased from 682 to 1,002 over 6.9 years, with sizes of the 1,010 cysts ranging from 0.9 to 77.1 mm on baseline T2 magnetic resonance scans”. However, only cysts larger than the detection threshold were identified using MRI. In nephrectomy samples, 70% of the 405 cysts measured were smaller than 0.9 mm. Cyst counts by MRI showed approximately 62 times more cysts below the detection limit than those above it, when compared with histological findings in eight patients.

This study concludes that the statistical result shows that kidney cysts only form in a small proportion of kidney tubules. Cysts that were undetectable at baseline but during time grew to a detectable diameter are the main cause of increased numbers discovered by magnetic resonance imaging. The creation process that occurs continually throughout life may be the most plausible explanation for the wide range of diameters and the high concentration of microscopic cysts.

Aahraf A Mosharafa et al conducted to assess the characteristics of renal tubercles and the risk factors for their development, aiming to determine the prevalence of renal tubercles in a large Middle Eastern population participating in a health check-up program.

The method of this study shows that renal cysts have been associated with several variables, and ultrasonography (US) has been used to diagnose them in the general population with a reported prevalence of 5.0-20.8. Retrospective analysis was conducted on the computerized records of 8,551 patients who participated in a "check-up" program at the author's institution in 2005. These patients came from eight different countries, primarily Egypt and Yemen. The analysis focused on identifying the presence and characteristics of renal cysts and any associated renal conditions through abdominal ultrasound. Risk factors for renal cyst formation, including age, gender, hypertension, diabetes mellitus, serum creatinine levels, hyperlipidemia, and a history of bilharziasis, were also examined.

The result of the study indicate that 4.2% of cases had renal excrescencies, with the prevalence increasing from 0.6% in patients in their third decade to one-third in those over 80. Cysts were found in 4.8% of males and 2.8% of females ($P = 0.001$). The average serum creatinine level was 1.02 mg/dL in patients with cysts, compared to 0.88 mg/dL in those without ($P = 0.001$). However, the multivariate model did not fully account for the significant impact of hypertension, diabetes, and hyperlipidemia on the occurrence of renal cysts. Among the 361 individuals with renal cysts, the mean size was 26 mm (ranging from 4 to 104 mm), with 58 (16.1%) having bilateral cysts and 26 (7.2%) having multiple unilateral cysts. Most cysts were classified as Bosniak I, with seven categorized as Bosniak II and one as Bosniak IV. 39 patients had concurrent renal diseases such as renal stones, nine had hydronephrosis, 18 had enhanced parenchymal echogenicity, three had tiny, atrophic kidneys, six had haematuria, and one had a renal tumour.

This study concludes that in a Middle Eastern population that underwent health screening, the US found 4.2% of cases of kidney cysts. Ageing, being a man, and having a higher blood creatinine level all acted as separate, substantial risk factors for cyst development. Associated renal diseases, such as increased parenchymal echogenicity and stones, were also rather common.

I Ishikawa, M Asaka, Y Saito, N Tomosugi et al conducted a study to evaluate a follow-up renal cystic disease. Since 1979, 96 patients with chronic renal failure brought on by chronic glomerulonephritis have had their damaged kidneys monitored to look at the emergence of acquired cysts and tumours.

This study examines the kidneys of 96 individuals with chronic renal failure due to chronic glomerulonephritis, focusing on the development of acquired cysts and tumors since 1979. The document provides findings from a 20-year follow-up.

The study results reveal that male kidney volumes, initially 57.8 (1.51) ml, increased to 185.3 (2.03) ml over 20 years, while female kidney volumes rose from 57.3 (1.64) ml to 99.7 (2.36) ml. The increase in male kidney volumes was 3.2 (2.06) times greater compared to a 1.7 (2.57) fold increase in females. This kidney enlargement was attributed to acquired cysts. Over the 20-year period, male kidney volumes showed a more significant increase compared to the 15-year follow-up, whereas female kidney volumes remained unchanged from the 15-year follow-up.

This study concludes that at the 20-timefollow-up, the male transcendence of acquired excrescencies was still present. Young guys sounded to have a advanced rate of increase in acquired renal cystic complaint. Despite the high circumstance of renal cell cancer, nothing ever passed down from it.

Wiener Klinische Wochenschrift et al study was conducted to investigate the association between simple renal

cysts and hypertension.

The study involved 91 patients (58 females and 33 males, with a mean age of 50.5 ± 16.9 years) who had normal renal function (serum creatinine level of 100 micromol/L). Patients were evaluated using a real time ultrasound scanner equipped with a 2-4 MHz convex transducer. Assessments included kidney size, the presence and characteristics of cysts (number and diameter), and the presence of hypertension. Hypertension was determined based on the use of antihypertensive medications, systolic blood pressure exceeding 140 mmHg, and/or diastolic blood pressure exceeding 90 mmHg.

The result of the study shows that 19 (20.88%) patients had simple renal cysts. 11 (12.09%) patients had just cortical cysts, and 4 (4.39%) patients were only parapelvic cysts. Parapelvic and cortical excrescencies were seen four cases (4.39%). Five (5.49%) individualities had cortical excrescencies in both kidneys; three (3.29%) cases had parapelvic excrescencies in both kidneys. Ten (10.99%) cases had bilateral renal excrescencies, and six (60%) of them had hypertension. According to gender, the presence of straightforward renal excrescencies did not differ in our study. Thirty patients (32.97%) had hypertension, which was found. Patients had simple renal cysts had significantly greater rates of hypertension than patients without cysts ($P = 0.041$). Age was also mainly associated with simple renal excrescencies ($P = 0.01$). We discovered a significant connection with age alone ($P = 0.0001$) using multiple regression analysis, but not with hypertension ($P = 0.394$).

This study concludes that simple renal tubercle are generally found, and they come more common as people age. We discovered a link between minor order excrescencies and high blood pressure. However, only a correlation between simple kidney cysts and age could be found using multiple regression analysis.

Davut Sakiz, Muhammed Erkram Sencar, Murat Calapkulu, et al a retrospective study was conducted to evaluate the prevalence and risk factors associated with renal cysts in patients with primary hyperparathyroidism (PHPT).

The study involved 147 control individuals and 235 PHPT patients who had undergone surgical treatment. The analysis included laboratory test results, ultrasound findings of the neck and urinary system, as well as physical and clinical examination data. Additionally, measurements of the volume and weight of the postoperative parathyroid adenoma were recorded.

The study results indicate that simple renal cysts were present in 15 control patients (10.1%) and 53 patients with primary hyperparathyroidism (PHPT) (22.6%) ($p = 0.002$). Among these, only seven control cases (4.8%) and 33 PHPT cases (14%) had renal stones independently ($p = 0.004$). Both PHPT and high PTH levels were associated with the development of simple renal cysts. Simple renal cysts emerged as independent predictors of kidney stones in PHPT patients, with advanced age also identified as a risk factor. However, no correlation was found between the volume and weight of the parathyroid adenoma and the presence of simple renal cysts.

This study concludes that simple renal cysts in patients with primary hyperparathyroidism (PHPT) are likely to develop independently when there is a PHPT diagnosis, elevated PTH levels, advanced age, and the presence of kidney stones. These individuals should have routine evaluations for nephrolithiasis and renal cyst consequences.

V. METHODOLOGY

Research Approach – The study is grounded on the experimental cross-sectional system. To collect the data, the number of cases is approached, and their data will be recorded.

Research Design – This study is based on observational cross-sectional method to understand the probability of hypertension in patient with renal cyst by using multi-detector computed tomography in general population of India.

Instrumentation – Computed tomography machine is used Somatom emotion 16 slice.

Research setting – This study is conducted in the Department of Radiodiagnosis and Imaging Jamia Hamdard.

Population - Patients who have undergone for abdominal imaging and urography in MDCT.

Sample size – 70 subjects.

Sample Technique – Convention sample technique. **Sampling Criteria** – Inclusion and Conclusion criteria

Inclusion criteria

- Patient who are undergone abdominal imaging and KUB CT.
- Subject age between 18-80 years.
- Included both gender (male and female).

Exclusion criteria

- Patient who had undergone surgery and have contrast media allergy.
- Pregnant women.

Study procedure: -

- Approval will be acquired from the institutional Ethical Committee Jamia Hamdard University.
- This is observational cross-sectional study which will be conducted on subjects who will be conducted on subjects who will be referred for CT WHOLE ABDOMEN AND UROGRAPHY in Hamdard Imaging Center, Jamia Hamdard.
- Permission will be taken from the Hamdard Imaging Center, after taking permission data will be collected.
- Age group 18-80 years will be selected, subject with CT WHOLE ABDOMEN and UROGRAPHY.
- CT WHOLE ABDOMEN and UROGRAPHY will be performed by using SIEMENS SOMATOM 16-SLICE MDCT.

VI. DATA ANALYSIS

Descriptive statistics were performed to describe demographics of patients. The mean was calculated and recorded based on gender and different age groups of hypertensions in unilateral, bilateral, and multiple cysts. Based on the mean score the percentage of hypertension patients falling under different categories were recorded. Data were calculated by using n, mean, standard deviation and likelihood ratio test, which was used to characterize the sample. This study was done by undertaken to analyze the probability of hypertension in patients with Renal cyst by using MDCT.

The data were organized in a Microsoft Excel spreadsheet, and the analysis was performed using the Chi-Square test to examine associations between variables. A p-value of < 0.05 was considered statistically significant.

Statistical - Analysis

The data were summarized using descriptive statistics, including frequency, percentage, mean, and standard deviation. The Likelihood ratio or Chi-square test was employed to determine associations between variables, with a p-value of < 0.05 deemed significant. Data analysis was conducted using SPSS software (SPSS Inc.; Chicago, IL) Version 26.0.

VII. RESULT

TABLE 2: NO. OF PATIENTS

(n = 70)	Range	Mean	S.D.
Age	19 to 78	53.8	14.1

TABLE 3: DEMOGRAPHICS

Variables		Frequency	%
Age groups	< 30	6	8.6
	30-39	8	11.4
	40-49	11	15.7
	50-59	15	21.4
	60-69	21	30
	70-79	9	12.9
Gender	Men	40	57.1
	Female	30	42.9
Region of the cyst	Upper	21	30
	Middle	15	21.4
	Lower	19	27.1

	Upper and middle	3	4.3
	Upper and lower	2	2.9
	Middle and lower	5	7.1
	Upper, middle and Lower	5	7.1
Bosniak classification of cyst	Type I	56	80
	Type II	3	2.86
	Type II-F	1	1.43
	Type III	0	0
	Type IV	0	0
	Type I & II	11	15.7
Hypertension	Yes	23	32.9
	No	47	67.1
Unilateral cyst	Yes	45	64.3
	No	25	35.7
Bilateral cyst	Yes	25	35.7
	No	45	64.3
Multiple cyst	Yes	30	42.9
	No	40	57.1

Table 2 &3:: shows basic information about the total number of patients and their range mean and standard deviation. Also including patient information like gender, age group, region of the cyst, bosniak classification of cyst type, hypertension, unilateral, bilateral, multiple cysts. A total number of patients data were collected out of them 57.1% (n=40) were males and 42.9% were females. There were more males than females.

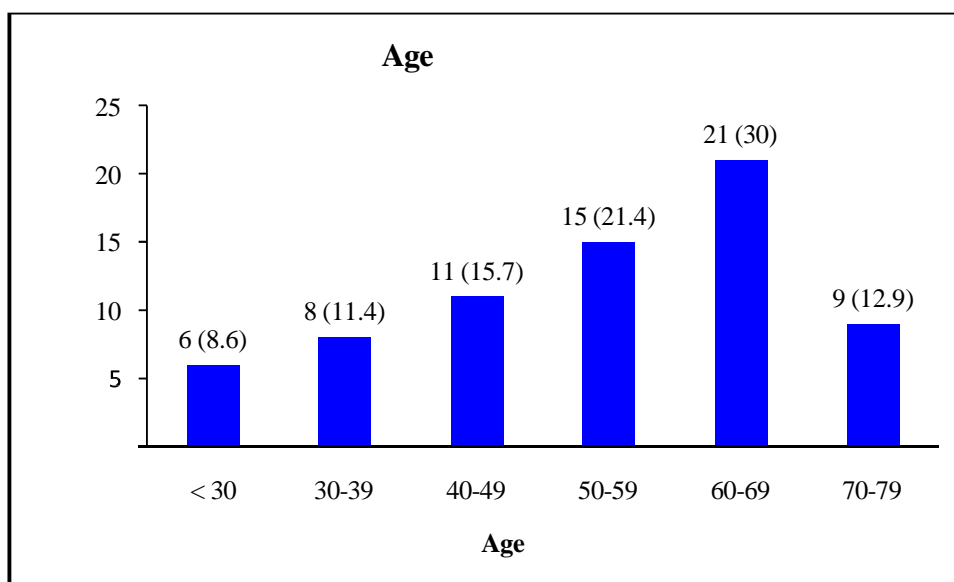
STATISTICS

AGE-WISE DISTRIBUTION OF RENAL CYST PATIENT

Out of the 70 patients, 8.6% were under the age of 30, 11.4% were between 30 and 39, 15.7% were in the 40-49 age-group, 21.4% were in the 50-59 age-group, 30% were in the 60-69 age- group, and 40% were in the 70-79 age-group. The frequency of renal tubercles increased after the age of 40.

(n = 70)		Frequency	%
Age groups	< 30	6	8.6
	30-39	8	11.4
	40-49	11	15.7
	50-59	15	21.4
	60-69	21	30
	70-79	9	12.9

Table 4: Age wise distribution of patients



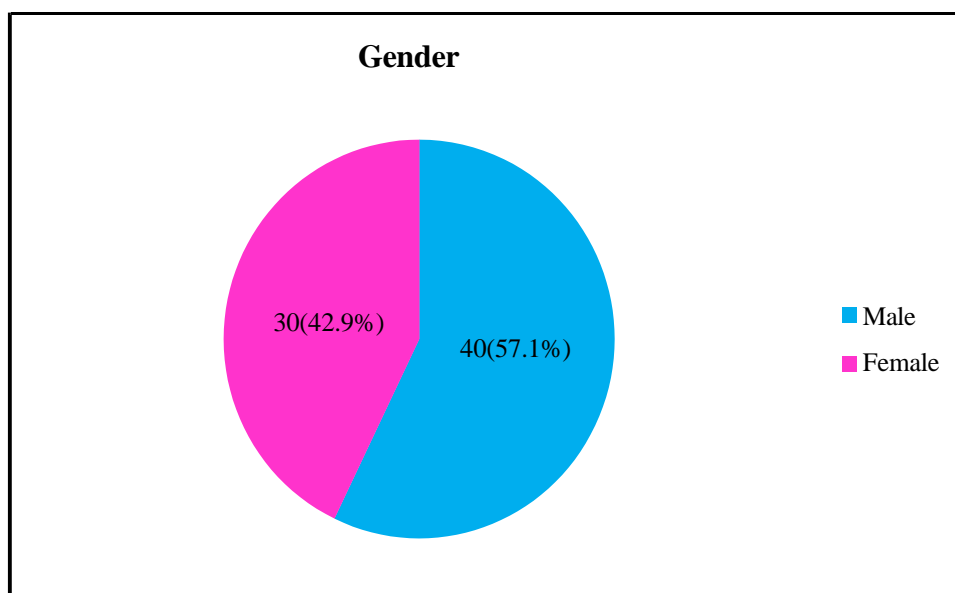
Graph 1: Age wise distribution of patients

GENDER-WISE DISTRIBUTION OF RENAL CYST PATIENTS

A total number of 70 cases who were renal cyst, out of which 40 patients (57.1%) were men and 30 (42.9%) were women. More men cases who were renal cyst than female out of 70 cases who were renal cyst in which 30 patients were male.

GENDER	NUMBER OF PATIENTS	PERCENTAG E OF PATIENTS
MEN	40	57.1%
WOMEN	30	42.9%

Table 5: Gender wise distribution of patients



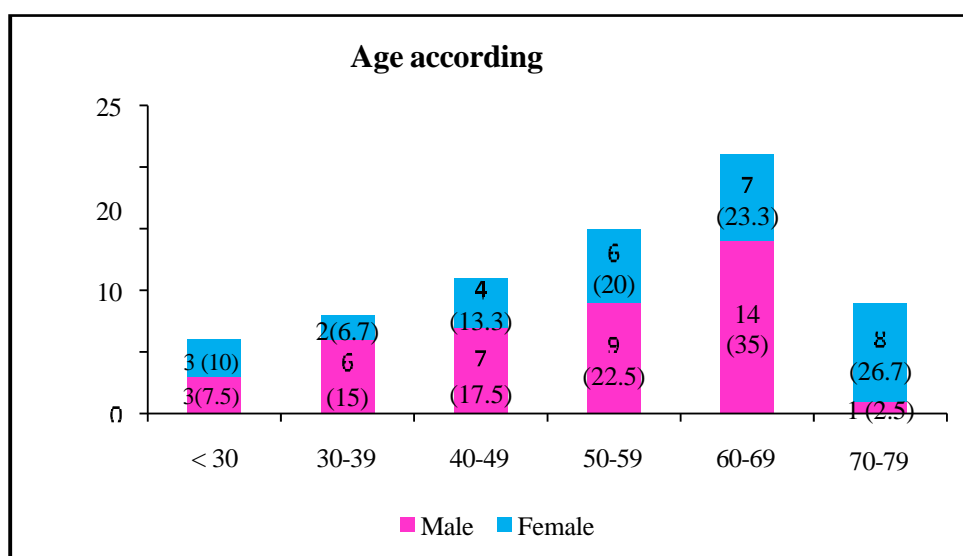
Graph 2: Distribution of renal cyst patients by gender wise

AGE-GENDER WISE DISTRIBUTION OF RENAL CYST PATIENTS

Out of the 70 cases, 7.5% of men and 10% of women were under the age of 30. In the 30-39 age group, 15% were men and 6.7% were women. For the 40-49 age-group, 17.5% were male and 13.3% were female. In the 50-59 age-group, 22.5% were men and 20% were women. Among those aged 60-69, 14% were men and 23.3% were women. For the 70-79 age-group, 2.5% were men and 26.7% were women. The frequency of renal cysts increased after the age of 40 for both men and women, with a higher probability observed in men patients.

Age groups	Gender			
	Male		Female	
	N	%	n	%
< 30	3	7.5	3	10.0
30-39	6	15	2	6.7
40-49	7	17.5	4	13.3
50-59	9	22.5	6	20.0
60-69	14	35	7	23.3
70-79	1	2.5	8	26.7

Table 6: Age-gender wise distribution of renal cyst patients



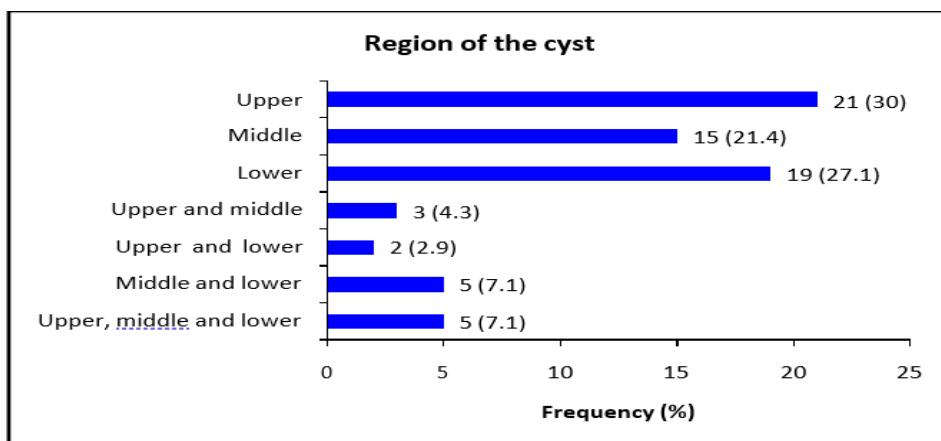
Graph 3: Age-gender wise distribution of renal cyst patients

REGION WISE DISTRIBUTION OF RENAL CYST

Out of 70 patients, 21(30%) patients were upper region cyst. 15(21.4%) patients were middle region cyst. 19(27.1%) patients were lower region cysts. 3 (4.3%) patients were upper and middle region cysts. 2(2.9%) patients were middle and lower region cysts. 5(7.1%) patients were upper, middle, and lower region cysts.

Region of the cyst	Frequency	%
Upper	21	30
Middle	15	21.4
Lower	19	27.1
Upper and middle	3	4.3
Upper and lower	2	2.9
Middle and lower	5	7.1
Upper, middle and lower	5	7.1

Table 7: Region wise distribution of renal cyst patient

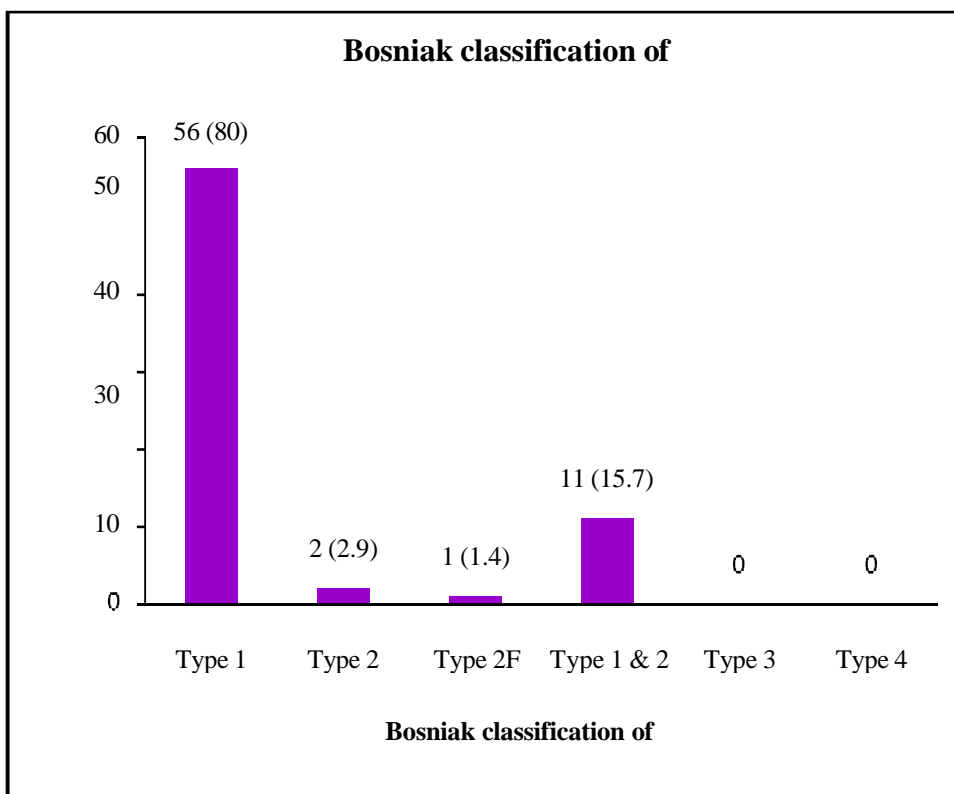


Graph 4: Region wise distribution of renal cyst patients

FREQUENCY BASED ON BOSNIAK CLASSIFICATION OF CYST

Bosniak classification of cyst	Frequency	%
Type 1	56	80
Type II	2	2.9
Type IIF	1	1.4
Type I & II	11	15.7
Type III	0	0
Type IV	0	0

Table 8: Bosniak classification of renal cyst



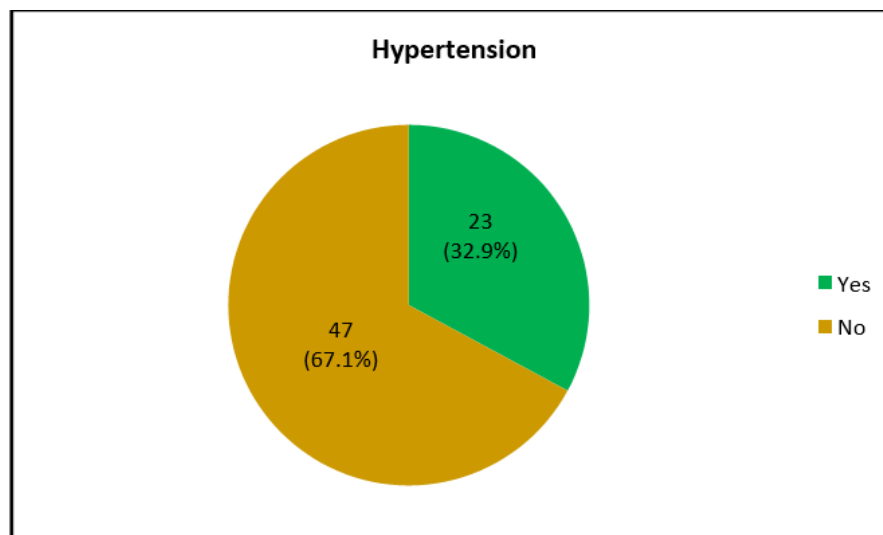
Graph 5: Bosniak classification of renal cyst.

PROBABILITY OF HYPERTESION WITH RENAL CYST PATIENTS

Out of 70 cases 23(32.9%) cases were hypertension with renal tubercle cases and 47(67.1%) cases were non-hypertension cases with renal tubercle case. Probability of hypertension is very 23(32.9%) out Of 70 case.

		Frequency	%
Hypertension	Yes	23	32.9
	No	47	67.1

Table 9: Probability of hypertension with renal cyst patient



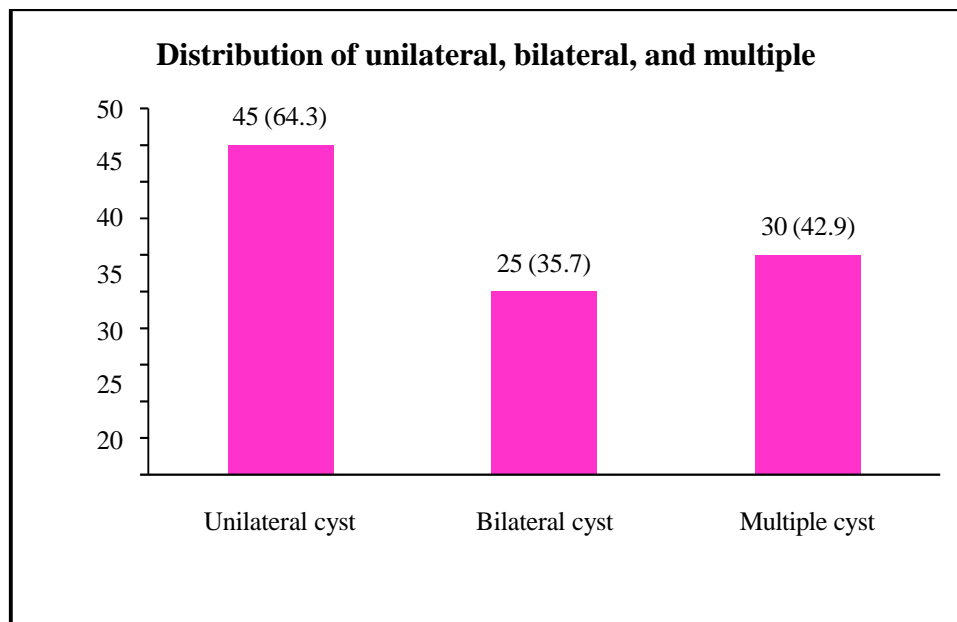
Graph 6: Probability of hypertension with renal cyst patient

DISTRIBUTION OF UNILATERAL, BILATERAL AND MULTILE CYSTS

Among the 70 cases, 45 (64.3%) had unilateral cysts, while 25 (35.7%) had bilateral cysts. 30(42.9%) s had multilateral cyst. Distribution of unilateral cyst is higher than bilateral and multiple cysts.

		Frequency	%
Unilateral cyst	Yes	45	64.3
	No	25	35.7
Bilateral cyst	Yes	25	35.7
	No	45	64.3
Multilateral cyst	Yes	30	42.9
	No	40	57.1

Table 10: Distribution of unilateral, bilateral, and multiple cyst

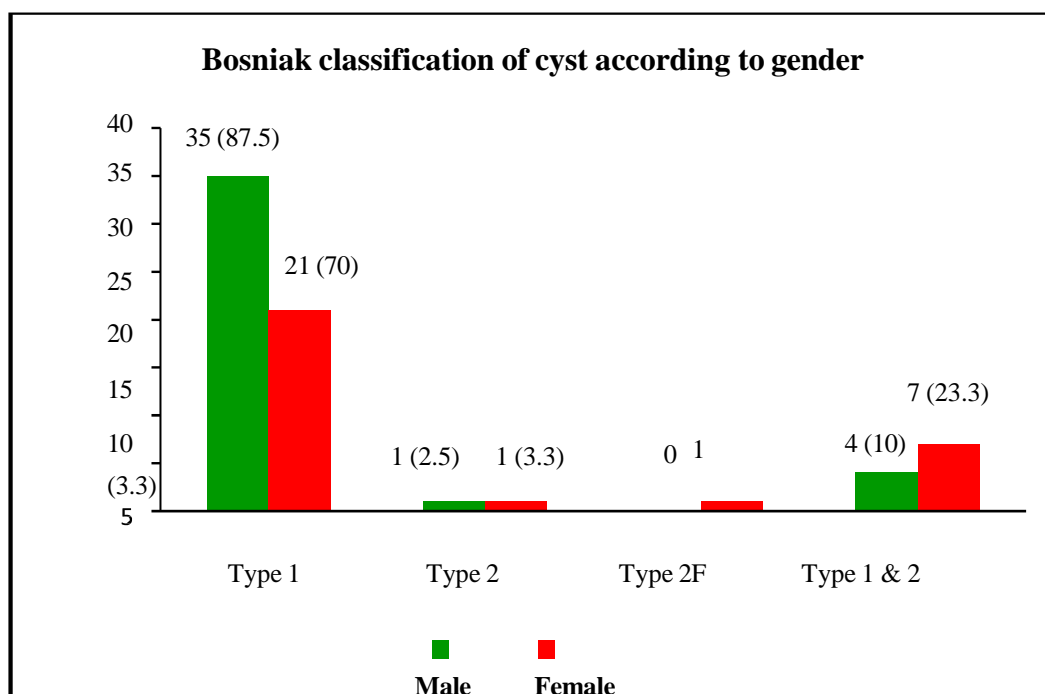


Graph 7: Distribution of unilateral, bilateral and multiple cyst

Table 11: Association between Bosniak classification of cyst and gender

Bosniak classification of cyst	Gender				Likelihood ratio	p value
	Male		Female			
	N	%	N	%		
Type 1	35	87.5	21	70.0	6.08	0.414
Type 2	1	2.5	1	3.3		
Type 2F	0	0	1	3.3		
Type 1 & 2	4	10	7	23.3		

The Likelihood ratio test was used to examine the relationship between the Bosniak classification of cysts and gender. There was no association ($p > 0.05$) between Bosniak classification of cyst and gender.

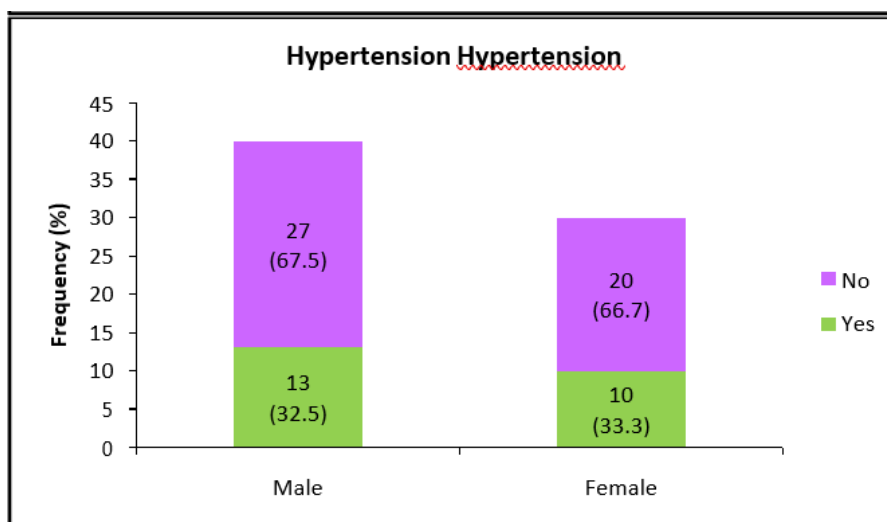


Graph 8: Distribution of renal cyst based on bosniak classification according to gender.

Table 12: Association between hypertension and gender

		Gender				Chi square	p value
		Male		Female			
		n	%	n	%		
Hypertension	Yes	13	32.5	10	33.3	0.01	0.941
	No	27	67.5	20	66.7		

The Chi-square test was used to explore the relationship between hypertension and gender. There was no association ($p > 0.05$) between hypertension and gender.



Graph 9: Probability of hypertension in male and female

Table 13: Association between types of cyst and age groups

Distribution of cyst		Age groups												Likelihood ratio	p value
		< 30		30-39		40-49		50-59		60-69		70-79			
		N	%	n	%	N	%	n	%	n	%	N	%		
Unilateral cyst	Yes	4	66.7	7	87.5	1	90.9	1	60.7	1	52.4	3	33.3	11.26	0.046*
	No	2	33.3	1	12.5	1	9.1	5	33.3	1	47.6	6	66.7		
Bilateral cyst	Yes	2	33.3	1	12.5	1	9.1	5	33.3	1	47.6	6	66.7	11.26	0.046*
	No	4	66.7	7	87.5	1	90.9	1	60.7	1	52.4	3	33.3		
Multiple cysts	Yes	3	50	4	50	5	45.5	8	53.8	8	38.1	2	22.2	2.87	0.720
	No	3	50	4	50	6	54.5	7	47.7	1	61.9	7	77.8		

(* Significant)

The Likelihood ratio test was used to examine the relationship between cyst distribution and age. There was an association ($p < 0.05$) between distribution of cysts (Unilateral and bilateral) and age.

Table 14: Association between distribution of cyst and Bosniak classification of cyst

		Bosniak classification of cyst								Likelihood ratio	p value
		Type 1		Type 2		Type 2F		Type 1 & 2			
		n	%	N	%	N	%	N	%		
Unilateral cyst	Yes	41	73.2	1	50	1	100	2	18.2	12.96	0.005*
	No	15	26.8	1	50	0	0	9	81.8		
Bilateral cyst	Yes	15	26.8	1	50	0	0	9	81.8	12.96	0.005*
	No	41	73.2	1	50	1	100	2	18.2		
Multiple cyst	Yes	19	33.9	1	50	1	100	9	81.8	10.66	0.014*
	No	37	66.1	1	50	0	0	2	18.2		

(* Significant)

The Likelihood ratio test was used to investigate the relationship between cyst distribution and the Bosniak classification of cysts. There was an association ($p < 0.05$) between distribution of cyst and Bosniak classification of cyst.

Table 15: Association between hypertension and age group

Age groups	Hypertension				Likelihood ratio	p value
	Yes		No			
	N	%	N	%		
< 30	1	4.3	5	10.6	9.82	0.081
30-39	0	0.0	8	17.0		
40-49	3	13.0	8	17.0		
50-59	5	21.7	10	21.3		
60-69	10	43.5	11	23.4		
70-79	4	17.4	5	10.6		

The Likelihood ratio test was used to examine the relationship between hypertension and age. There was no association ($p > 0.05$) between hypertension and age.

Table 16: Association between Bosniak classification of cyst and hypertension

Bosniak classification of cyst	Hypertension				Likelihood ratio	p value
	Yes		No			
	N	%	N	%		
Type 1	11	47.8	45	95.7	30.38	< 0.001*
Type 2	1	4.3	1	2.1		
Type 2F	0	0	1	2.1		
Type 1 & 2	11	47.8	0	0		

(* Significant)

The Likelihood ratio test was employed to explore the relationship between the Bosniak classification of cysts and hypertension. There was an association ($p < 0.05$) between Bosniak classification of tubercle and hypertension

Table 17: Association between distribution of cyst and hypertension

		Hypertension				Likelihood ratio	p value
		Yes		No			
		N	%	N	%		
Unilateral cyst	Yes	2	8.7	43	91.5	46.11	< 0.001*
	No	21	91.3	4	8.5		
Bilateral cyst	Yes	21	91.3	4	8.5	46.11	< 0.001*
	No	2	8.7	43	91.5		
Multiple cyst	Yes	16	69.6	14	29.8	9.98	0.002*
	No	7	30.4	33	70.2		

(* Significant)

The Likelihood ratio test is used to examine the relationship between cyst distribution and hypertension. There is an association ($p < 0.05$) between distribution of cyst and hypertension.

Table 18: Association between hypertension and kidney cyst size (Right)

Hypertension	Kidney cyst size (Right)						Chi square	p value
	< 1 Mm		> 1 Mm		No cyst			
	n	%	n	%	n	%		
Yes	11	47.8	10	43.5	2	8.3	10.06	0.007*
No	12	52.2	13	56.5	22	91.7		

(*Significant)

The Chi-square test is used to investigate the relationship between hypertension and the size of kidney cysts (right). There is an association ($p < 0.05$) between hypertension and kidney cyst size (Right).

Table 19: Association between distribution of cyst and kidney cyst size (Right)

		Kidney cyst size (Right)						Chi square	p value
		< 1 Mm		> 1 Mm		No cyst			
		n	%	n	%	N	%		
Unilateral cyst	Yes	9	39.1	12	52.2	24	100.0	21.14	< 0.001*
	No	14	60.9	11	47.8	0	0.0		
Bilateral cyst	Yes	14	60.9	11	47.8	0	0.0	21.14	< 0.001*
	No	9	39.1	12	52.2	24	100.0		
Multiple cyst	Yes	14	60.9	9	39.1	7	29.2	5.01	0.081
	No	9	39.1	14	60.9	17	70.8		

The Chi-square test is used to analyze the relationship between the distribution of cysts and the size of kidney cysts (right). There is an association ($p < 0.05$) between distribution of cyst (Both unilateral and bilateral cyst) and kidney cyst size (Right).

Table 20: Association between hypertension and kidney cyst size (Left)

Hypertension	Kidney cyst size (Left)						Chi square	p value
	< 1 Mm		> 1 Mm		No cyst			
	n	%	n	%	n	%		
Yes	10	43.5	13	48.1	0	0	13.83	0.001*

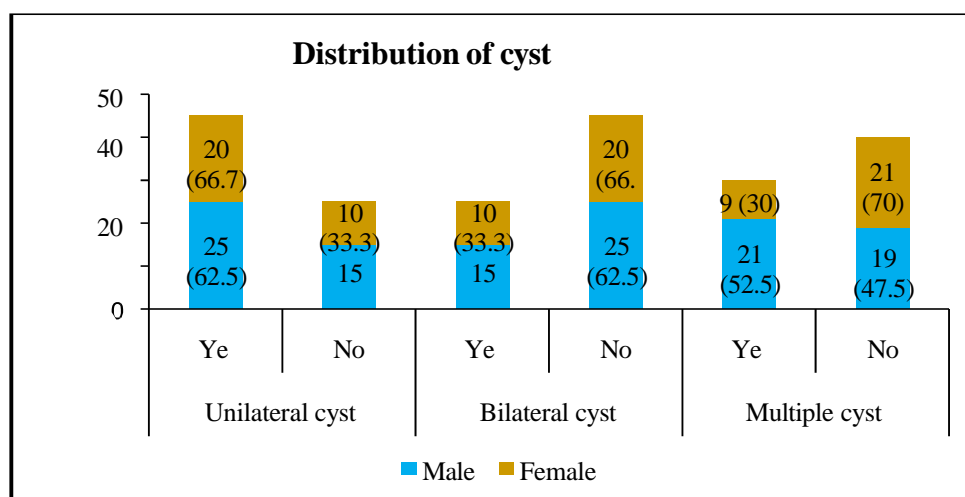
No	13	56.5	14	51.9	20	100		
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The Chi-square test is used to determine the relationship between hypertension and the size of kidney cysts (left). There is an association ($p < 0.05$) between hypertension and kidney cyst size (Left).

Table 21: Association between types of cyst and kidney cyst size (Left)

		Kidney cyst size (Left)						Chi square	p value
		< 1 Mm		> 1 Mm		No cyst			
		n	%	N	%	n	%		
Unilateral cyst	Yes	10	43.5	15	55.6	20	100	16.35	< 0.001*
	No	13	56.5	12	44.4	0	0		
Bilateral cyst	Yes	13	56.5	12	44.4	0	0	16.35	< 0.001*
	No	10	43.5	15	55.6	20	100		
Multiple cyst	Yes	7	30.4	15	55.6	8	40	3.29	0.193
	No	16	69.6	12	44.4	12	60		

The Chi-square test is used to investigate the relationship between the types of cysts and the size of kidney cysts (left). There is an association ($p < 0.05$) between distribution of cysts (Both unilateral and bilateral cyst) and kidney cyst size (Left).

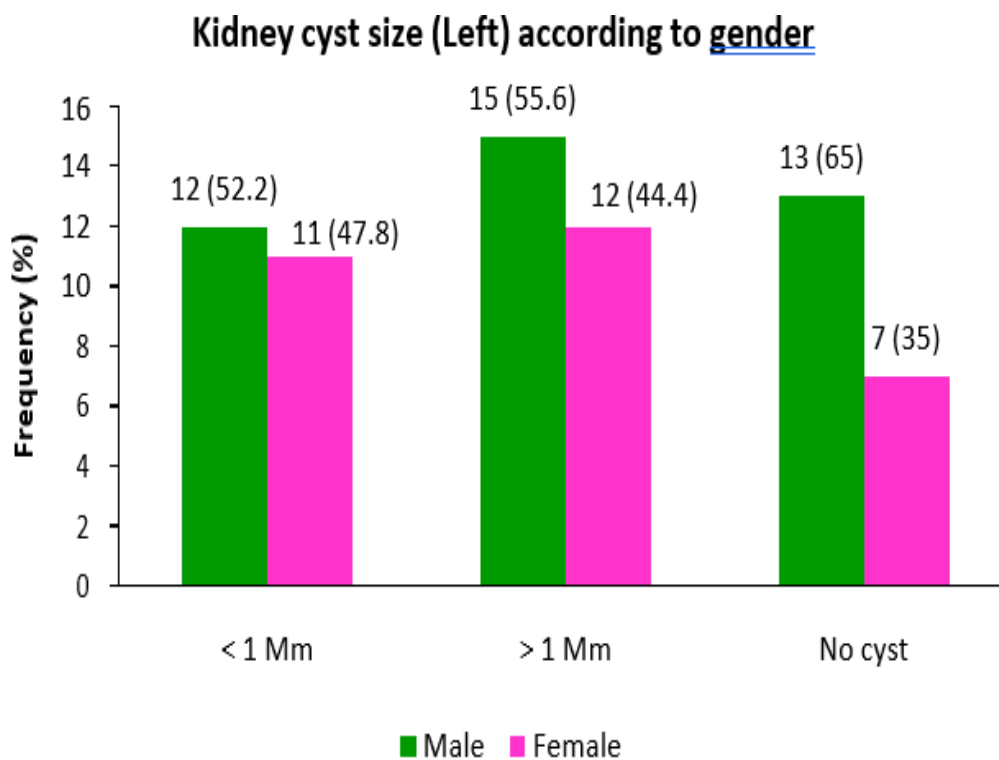


Graph10: Distribution of cyst according to size

Table 22: Association between gender and kidney cyst size (Left)

Gender	Kidney cyst size (Left)						Chi square	p value
	< 1 Mm		> 1 Mm		No cyst			
	N	%	n	%	n	%		
Male	12	52.2	15	55.6	13	65	0.76	0.683
Female	11	47.8	12	44.4	7	35		

The Chi-square test is applied to examine the relationship between gender and the size of kidney cysts (left). There is no association ($p > 0.05$) between gender and kidney cyst size (Left).



Graph11: frequency of gender and cyst size

Table 23: Association between hypertension and kidney cyst size (Left)

Hypertension	Kidney cyst size (Left)						Chi square	p value
	< 1 Mm		> 1 Mm		No cyst			
	N	%	n	%	n	%		
Yes	10	43.5	13	48.1	0	0	13.83	0.001*
No	13	56.5	14	51.9	20	100		

This test is used to explore the relationship between hypertension and the size of kidney cysts (left). There is an association ($p < 0.05$) between hypertension and kidney cyst size (Left).

Table 24: Association between distribution of cyst and kidney cyst size (Left)

		Kidney cyst size (Left)						Chi square	p value
		< 1 Mm		> 1 Mm		No cyst			
		n	%	N	%	n	%		
Unilateral cyst	Yes	10	43.5	15	55.6	20	100	16.35	< 0.001*
	No	13	56.5	12	44.4	0	0		
Bilateral cyst	Yes	13	56.5	12	44.4	0	0	16.35	< 0.001*
	No	10	43.5	15	55.6	20	100		
Multiple cyst	Yes	7	30.4	15	55.6	8	40	3.29	0.193
	No	16	69.6	12	44.4	12	60		

The Chi-square test is employed to determine the relationship between the distribution of cysts and the size of kidney cysts (left). There is an association ($p < 0.05$) between distribution of cyst (Both unilateral and bilateral cyst) and kidney cyst size (Left).

VIII. DISCUSSION

This study identified an association between the risk of elevated blood pressure and kidney cyst classified by the Bosniak system, particularly when the cysts were unilateral, bilateral, or multilateral, had more than two cysts, or were larger than 1 cm. However, the exact relationship between simple renal cysts and hypertension remains unclear.

Increased threat of elevated blood pressure was well known when kidney cyst grounded on bosniak classification was unilateral, bilateral, or multilateral, and with more than 2 or more cyst with largest size of more than 1 cm. This study shows the size of renal tubercle based on unilateral, bilateral and multiple cysts, there was an association ($p < 0.05$) between unilateral, bilateral cyst and kidney cyst size.

This study shows the size of renal cysts according to the Bosniak classification was associated with the likelihood of hypertension. However, no significant risk of elevated blood pressure was observed when comparing age groups with cysts larger than 1 cm to those with cysts smaller than 1 cm.

Further studies are needed with the largest sample size. Probability of hypertension was found with renal cyst patients based on bosniak classification, in unilateral, bilateral, or multiple cysts. Prevalence of hypertension increases with age group over 30 years, in 30- 39 and 40-49 age group hypertension was found in 17% patients respectively. In 50-59 age group patient hypertension was found in 21.3% patients in 60-69nage group hypertension was found in 24.4% patients, and 70-79% was found in10.6% patients.

The probability of hypertension was found in this study was 32.9 % higher than previous report from the KHANES in 2007 ⁽¹⁾. Sexual difference of renal cyst may be controversial and have reported that probability of kidney cyst greater in men than women. This study frequency of kidney cyst in men was 30(57.1%) and in women was (42.9%).

The probability of renal cyst based on bosniak classification out of 70, 80% patients was Type - 1, 2.9% patients were type- 2, 1.4% patients were type-2F, 15.7% patients were both type-1 and type- 2 renal cyst, 0% patients were type-III and type-IV renal cyst. Type-3 and type-4 type renal cysts were very rare. Type -I was more common than other type of renal cyst based on the bosniak classification.

Prevalence of hypertension based on bosniak classification, 47.8% patients were type -1, 4.3% patients were type- 2, 47.8 % cases were type-I and type-II. There was a link between the Bosniak classification of kidney cyst and elevated blood pressure ($p < 0.05$).

Prevalence of hypertension in unilateral, bilateral and multiple cysts was shown out of 70 8.7% were unilateral cyst and 91.3 % patients were bilateral cyst, and 69.6% patients were multiple cysts. There was an association in unilateral, bilateral and multiple cyst and hypertension ($p < 0.05$).

If the connection between kidney cyst and elevated blood pressure is make clear using the proposed methods, the heightened risk of hypertension could then be explored in observational studies.

Probability of kidney cyst is high than other type of renal cyst based on bosniak classification with distribution of unilateral, bilateral and multiple cyst or size of cyst larger than 1cm or less than 1cm.

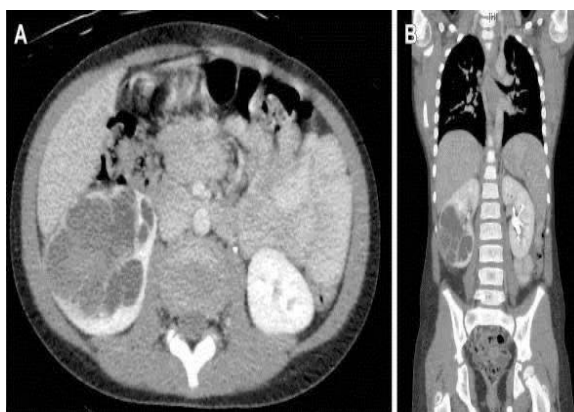


Fig 3: Shows unilateral multiple cyst¹⁵.

IX. CONCLUSION

This study concluded that the cause of renal cysts remains unknown. However, the presence of renal cysts, according to the Bosniak classification, was truly associated with an increased incidence of elevated blood pressure. Characteristics such as unilateral, bilateral, or multiple cysts, the number of cysts (one, two, or more), size greater than 1 cm, and age group, as classified by Bosniak, were related to hypertension. The exact relationship between kidney cysts and arterial blood pressure is still unclear.

The study found that there was a heightened risk of hypertension when renal cysts, classified by the Bosniak system, were unilateral, bilateral, or multilateral, especially if there were more than two cysts with each being larger than 1 cm. Size of renal cyst based on unilateral, bilateral and multiple cysts, there was an association ($p < 0.05$) between unilateral, bilateral cyst and kidney cyst size. This study linked the size of renal cysts, as classified by the Bosniak system, to the likelihood of developing elevated blood pressure.

A limitation of this study is that the potential impact of kidney cyst on the probability of elevated blood pressure was not considered during the study design phase. Additional research is necessary to better understand the relationship between kidney cysts and hypertension, as the current study's sample size is too small. Another limitation of this study did not include all types of renal cyst patient based on bosniak classification.

If the relationship between kidney cyst and elevated blood pressure is clarified through the suggested measures, the increased risk of hypertension could be further investigated through observational studies. Probability of kidney cyst is high than other type of renal cyst based on bosniak classification with distribution of unilateral, bilateral and multiple cyst or size of cyst larger than 1cm or less than 1cm.

LIMITATION OF THE STUDY

The study is restricted to:

- Patient who are undergone surgery and have contrast media allergy.
- Pregnant women.
- The patient who is not willing to participate.
- The study is conducted only in one hospital of Delhi NCR
- We are not consider the other risk factor for renal cyst such as lifestyle

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