

## Relationship of Urinary Tract Stones with The Incidence of Chronic Kidney Disease at Sultan Agung Islamic Hospital Semarang

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### ABSTRACT

**Introduction:** Chronic Kidney Disease (CKD) caused by many things, one of which is urinary tract stones. Urinary tract stones are stones that form in the urinary tract, which include kidney stones, ureters, bladder, and urethra. The prevalence of CKD in Indonesia is 0.08% (around 200,000 people), and 48% of them are less than 50 years old. Physiologically, starting from the age of 50, the kidneys will experience a significant decrease in function due to a decrease in the number of nephrons about 20%. Each year the death caused by CKD is around 850,000. **Purpose:** this study was to determine the relationship between urinary tract stones and the incidence of CKD at the Sultan Agung Islamic Hospital in Semarang. **Method:** The design in this study is a case control, respondents with consecutive sampling technique, the sample may be 77 urology patients treated at RSI Sultan Agung, univariate test analysis with frequency distribution to see the prevalence of frequency by gender and age, bivariate analysis with Chi Square. **Results:** The results obtained for the age of the respondents, seen from the sexes of the most men, were 77.9% and women were 22.1%, respondents who were seen from the most were <50 years 55.2% and > 50 years 46, 8% In the Bivariate analysis with Chi Square, it was found that there was a relationship between urinary tract stones and the incidence of CKD at Sultan Agung Islamic Hospital Semarang with a p value of 0.018 <0.05. The OR value was 3,861 with an IK / Confidence Interval of 1,203 - 12,388, which means that urinary tract stone patients were a risk factor of 3,861 times the incidence of CKD compared to patients without urinary tract stones. Discussion The relationship between urinary stones and the incidence of CKD at Sultan Agung Islamic Hospital Semarang.

**Keywords:** Urinary Tract Stones, Chronic Kidney Disease (CKD)

### INTRODUCTION

The prevalence of Chronic Kidney Disease (CKD) patients worldwide in 2014 was quite high, namely as much as 0.13% (around 10 million people), 40% of that number were aged less than 50 years. (1). The prevalence of CKD increases dramatically with age. Based on the results

of the National Health and Nutrition Examination Survey 1999-2004, more than one third of those aged 70 years or older have moderate or severe CKD which is defined as an estimated glomerular filtration rate (eGFR)  $<60 \text{ ml / min / } 1,73 \text{ m}^2$ (2). Meanwhile, the prevalence of CKD in Indonesia is 0.08% (around 200,000 people), and 48% of them are less than 50 years old. Each year the death caused by CKD is around 850,000. Physiologically, starting at the age of 50, the kidneys will experience a significant decrease in function due to a reduction in the number of nephrons, which is around 20%.(3).

The prevalence of urinary tract stones varies from place to place. In the world, the prevalence of urinary tract stones varies widely, namely 1% - 20% of cases, while in America it is around 5% -10% of cases(4.5). On the Asian continent the incidence of urinary tract stones ranges from 1% - 19.1%, which is dominated by West Asia, Southeast Asia, South Asia, and several developed countries (South Korea and Japan), namely 5% -19.1%, while only 1% - 8% in most of East Asia and North Asia(6) The prevalence of urinary tract stones in Indonesia is the most common urological case in Indonesia.

Chronic Kidney Disease (CKD) has a high global prevalence with a consistent global prevalence estimate of 11% - 13% with the majority at stage 3(7). The results of health research in Indonesia also show that the prevalence of CKD increases with age, increases sharply in the 35-44 years age group (0.3%), followed by those aged 45-54 years (0.4%), and aged 55. -74 years (0.5%), the highest in the age group  $\geq 75$  years (0.6%). The prevalence in males (0.3%) is higher than females (0.2%)(8).

Chronic Kidney Disease (CKD) is caused by many things, one of which is urinary tract stones. Urinary tract stones (BSK) are stones that form in the urinary tract, which include kidney stones, ureters, bladder, and urethra.(9). Urinary tract stones are often a problem for humans. Urinary tract stones began since the beginning of human civilization in the Babylonian era and ancient Egyptian times, marked by the discovery of evidence of stones in mummies that were preserved 7000 years ago(10). People around the world can develop urinary tract stones without exception in Indonesia, both men and women and it can occur at various ages, from children to the elderly who can develop urinary tract stones.(4.11). The incidence of urinary tract stones is influenced by several factors, such as the geography of a region, climate, race, dietary patterns, and genetics(5).

## METHOD

The design in this study was case control, with consecutive sampling technique, the sample consisted of 77 urology patients who were treated at RSI Sultan Agung. The criteria for case inclusion in this study, among others Patients suffering from CKD, urology patients undergoing treatment at the Sultan Agung Islamic Hospital Semarang from August to October 2020, patients who are willing to become respondents. Case exclusion criteria: urological patients with hypertensive disorders, Diabetes Mellitus (DM), urinary tract infections (UTIs). Inclusion control criteria include: urological patients who do not have CKD, urology patients who seek treatment at the Sultan Agung Islamic Hospital Semarang from August to October 2020, patients who are willing to become respondents. The control exclusion criteria included: urological patients with hypertensive disorders, DM, UTIs. Ethical clearance has been obtained from the Health Research Ethics Committee Health Research Ethics Committee RSI Sultan Agung no.78 EC / KEPK / 2020

## RESULTS

This research was conducted at the Sultan Agung Islamic Hospital Semarang with 77 samples of the research results presented in the following table:

**Table 1. Characteristics of Respondents by Gender (n = 77 Respondents)**

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	60	77.9	77.9	77.9
	Female	17	22.1	22.1	100.0
	Total	77	100.0	100.0	

**Table 2. Characteristics of Respondents by Age (n = 77 Respondents)**

		Age			Cumulative Percent
		Frequency	Percent	Valid Percent	
Valid	<50 Years	41	53.2	53.2	53.2
	> 50 Years	36	46.8	46.8	100.0
	Total	77	100.0	100.0	

**Table 3. Frequency Distribution Based on Average Age and Gender**

(n = 77 Respondents)

		Statistics	
		Gender	Age
N	Valid	77	77
	Missing	0	0
Mean		1.22	1.47
Median		1.00	1.00
Mode		1	1
Std. Deviation		.417	.502
Minimum		1	1
Maximum		2	2

**Table 4. Results Crosstabulation (n = 77 Respondents)**

**STONE \* CKD Crosstabulation**

Count

		CKD		Total
		1	2	
STONE	1	37	5	42
	2	23	12	35
Total		60	17	77

**Table 5. The Relationship between Urinary Tract Stones and Chronic Kidney Disease (CKD) at Sultan Agung Islamic Hospital Semarang (n = 77 respondents)**

<b>Chi-Square Tests</b>					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.559a	1	.018		
Continuity Correction b	4,334	1	.037		
Likelihood Ratio	5,630	1	.018		
Fisher's Exact Test				.027	.018
Linear-by-Linear Association	5,486	1	.019		
N of Valid Cases	77				

- a. 0 cells (, 0%) have expected count less than 5. The minimum expected count is 7.73.  
 b. Computed only for a 2x2 table

**Table 6. Urinary Tract Stones are Risk Factors for Chronic Kidney Disease (CKD) at Sultan Agung Islamic Hospital Semarang (n = 77 respondents)**

<b>Risk Estimate</b>			
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for STONE (1/2)	3,861	1,203	12,388
For cohort CKD = 1	1,341	1,030	1,745
For cohort CKD = 2	.347	.135	.891
N of Valid Cases	77		

## DISCUSSION

### Respondent Characteristics

In terms of the characteristics of the respondents, seen from the age, it was found that the most respondents were aged <50 years, 53.2% and > 50 years, 46.8%, the difference is only slightly. Patients with chronic renal failure CKD 40% at the age less than 50 years.(1). The

prevalence of CKD increases dramatically with age. Physiologically, starting at the age of 50, the kidneys will experience a significant decrease in function due to a reduction in the number of nephrons, which is around 20%.(3). The results of health research in Indonesia also show that the prevalence of CKD increases with age, increases sharply in the 35-44 years age group (0.3%), followed by those aged 45-54 years (0.4%), and aged 55. -74 years (0.5%), the highest in the age group  $\geq 75$  years (0.6%)(8)

Characteristics of respondents based on gender showed that there were more men than women, 77.9% male and 22.1% female. This study is in accordance with previous studies that cases of urinary tract stones are more common in men than women, which is 3: 1 cases.(4,9)The urinary tract stone recurrence rate averaged 7% per year or approximately 50% in 10 years. Identifying the cause of urinary tract stones is important to prevent the recurrence rate and can reduce the incidence of other diseases that can arise due to urinary tract stones(4).

People around the world can develop urinary tract stones without exception in Indonesia, both men and women and also at various ages, from children to the elderly can get urinary tract stones. (4.11). The incidence of urinary tract stones is influenced by several factors, such as the geography of a region, climate, race, diet, and genetics.(5).

### **Bivariate Analysis**

The results of the bivariate analysis showed that there was a relationship between urinary tract stones and the incidence of CKD at Sultan Agung Islamic Hospital Semarang. This is consistent with previous studies showing a significantly higher incidence of CKD in patients with a history of recurrent stones(12). Other studies conducted in Kendal and Semarang also showed a relationship between a history of urinary tract stones and chronic kidney disease(13). The increase in urinary tract stone cases is partly due to the strong association with metabolic syndromes such as obesity, hypertension and diabetes, in which cases of this metabolic syndrome also continue to increase in this study which is a confounding variable that has been controlled with inclusion & exclusion criteria, namely respondents with obesity, hypertension. , and DM and UTIs(14).

The results of this study were obtained OR value is 3,861 with IK / Confidence Interval 1,203 - 12,388, which means that urinary tract stone patients are a risk factor for 3,861 times the incident CKD compared with patients without urinary tract stones. This is in accordance with previous research that Metabolic disorders associated with urinary tract stones, especially kidney

stones, are risk factors for CKD (14). Recurrent and severe urinary tract stones, especially from rare genetic disorders, such as primary hyperoxaluria and cystinuria are also thought to increase the risk of CKD(15). In a previous study Saucier et al (2010) conducted a study in Minnesota-United States, regarding the risk factors for CKD in people suffering from kidney stones using the case control method. The results of this study showed that kidney stone patients had comorbidities with hypertension and diabetes. has a relationship with the incidence of CKD.(16)

In 2013, Wardani et al also conducted a study on the relationship of urinary tract stones and chronic kidney disease using the case control method, 57 cases and 57 controls, in a special hospital for Annur surgery in Jogjakarta. In conclusion, history of UTIs (OR = 3.43; p = 0.002), history of hypertension (OR = 2.44; p = 0.023), recurrent stones (OR = 2.44; p = 0.04) were significant risk factors. The insignificant risk factor was a history of diabetes mellitus (OR = 1.2; p = 0.671).

Chronic kidney disease is caused by many things, one of which is urinary tract stones (17). There are many types of urinary tract stones, such as kidney stones, ureteral stones, bladder stones and urethral stones(9). Stones that cause urinary tract obstruction for a long time or kidney stones that are left untreated for a long time will increase the incidence of CKD(17). Partial or total obstruction results in decreased glomerular filtration rate and decreased tubular solute reabsorption, impaired excretion of potassium and hydrogen, impaired concentration capacity due to vasopressin resistance. Accompanying pathologic disorders include glomerular and tubular fibrosis, tubular atrophy, and occasionally focal glomerular sclerosis (Setiati et al., 2017). With early protection with cognitive intelligence by strengthening the emotional and spiritual intelligence of patients, their health will be maintained, especially paying attention to lifestyle to avoid CKD(18)(19) The patient's ability to detect the disease cannot be separated from the education of health workers, especially doctors, so that the community understands that urinary tract stones are a risk factor for CKD(20). A study conducted by Mira et al., 2013 showed a consistent relationship between a history of nephrolithiasis and an increased risk of CKD and ESRD, understanding the characteristics that influence CKD can provide better information about how to manage nephrolithiasis patients optimally in order to prevent complications(14). Treatment of urinary tract stones can be performed with percutaneous nephrolithotomy, ureteroscopy, shockwave lithotripsy, and retrograde as well as internal surgery. The doctor is very important in

deciding the most convenient treatment for the patient's method of treatment. Effective and fast treatment of urinary tract stones is essential in maintaining kidney function(11).

## CONCLUSIONS AND SUGGESTIONS

### Conclusion

The characteristics of respondents based on gender are mostly male, namely 77.9% and for women 22.1%, the characteristics of the most respondents based on age were <50 years at 53% and > 50 years at 46.8%. Bivariate analysis p value 0.018 <0.05 so that the results are there. The relationship between urinary tract stones and the incidence of CKD at Sultan Agung Islamic Hospital Semarang. OR value The OR value is 3,861 with IK / Confidence Interval 1,203 - 12,388, which means that urinary tract stone patients are a risk factor for 3,861 times the incident CKD compared with patients without urinary tract stones.

### Suggestion

It is necessary to be vigilant about urinary tract stones in urological patients because it will result in CKD so that patients with urinary tract stones need further treatment so that there is no more serious disorder, namely CKD.

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