

## **CORRELATION OF STONE SIZE AND URINE LEUKOCYTES IN NEPHROLITHIASIS PATIENTS AT ULIN GENERAL HOSPITAL BANJARMASIN**

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**Abstract:** *Nephrolithiasis (Kidney Stone) is a condition where there is stone in the kidney that are formed due to disturbance of the balance between solubility and deposition of salt in urine. This study was aim to determine the correlation between stone size and urine leukocytes in nephrolithiasis patients. This study was conducted at the Ulin General Hospital in Banjarmasin by taking data on medical records for the 2017-2018 period. This study used a cross-sectional retrospective approach with an analytic method. Samples were obtained using total sampling technique based on inclusion and exclusion criteria. A total of 34 nephrolithiasis patients were obtained that met the inclusion and exclusion criteria. The highest proportion of stone size was >20 mm (47.07%). The highest proportion of urine leukocytes was +3 (38.23%). Data were analyzed using the Spearman correlation test and showed  $p = 0.774$  and  $r = 0.051$ . There was no significant correlation between stone size and urine leukocytes in nephrolithiasis patients at Ulin General Hospital Banjarmasin.*

**Keywords:** *Nephrolithiasis, kidney stone size, urine leukocytes.*

## **INTRODUCTION**

Nephrolithiasis (Kidney Stone) is a condition in the presence of stones that form in the kidney due to the imbalance between urine solubility and salt deposition.<sup>1-3</sup> Nephrolithiasis is one of the urinary tract diseases that occurs in approximately 15% of the worldwide population.<sup>4</sup> According to 2013 Riskesdas, Indonesia has a prevalence of 0.6% for nephrolithiasis cases. Nephrolithiasis is ranked 11 for Non-Communicable Diseases (NCDs) data in Indonesia. The highest prevalence of nephrolithiasis was found in Special Region of Yogyakarta (1.2%), followed by Aceh (0.9%), West Java (0.8%), Central Java (0.8%), and Central Sulawesi (0.8%). The prevalence of nephrolithiasis in South Kalimantan is 0.4%. Based on the age group, the highest prevalence of nephrolithiasis is in the 55-64 years age group. The prevalence of nephrolithiasis is higher in male by 0.8% compared to female by 0.4%.<sup>5</sup> The results of study by Irmaya (2013) at Ulin General Hospital Banjarmasin showed that the proportion of urinary stones was 57.89 % in male and 42.11% in females, from a total of 19 urinary tract stone patients.<sup>6</sup> Based on preliminary study data conducted at Ulin General Hospital Banjarmasin, the number of urinary stone patients in 2017 was 69 people and 96 people in 2018. There is currently still no definitive data for specific incidence rates of nephrolithiasis in Ulin General Hospital Banjarmasin.

There is a urine wash out mechanism which acts as a urinary tract defense, wiping out the microbes by urine flow. Disruption of this mechanism can interfere with urine flow and facilitate some microbes to replicate and attach to the urinary tract epithelium (urothelium). Urinary tract obstruction can alter the urinating mechanism and is a risk factor for urinary tract infections. The presence of obstruction will cause urine stasis hence the urine is retained in the urinary tract. One of the conditions that can cause obstruction is the presence of urinary tract stones. Urinary

stasis will make it easier for microbes to develop and increase the risk of urinary tract infections. In addition, inflammation due to narrowing of the tract and injury due to friction of stones can also lead to infections.<sup>7-8</sup>

Medium sized stones those were initially in the kidneys can move down to the ureter due to the force from the pelvicalyceal muscles. Stones that are <5 mm in size may usually come out spontaneously while larger stones may be retained in the ureter and cause obstruction. Patients with multiple stones are also more vulnerable to infection compared to patients with single stone because the likelihood of obstruction is higher. Therefore, the greater the size of the stone, the greater the risk of urinary tract infections.<sup>7-8</sup>

Early detection of urinary tract infections can be done by performing urinalysis and urine culture examinations. The gold standard for diagnosing urinary tract infections is urine culture as it can check the presence of bacteria in the urine. However, urinalysis is more popular because it is relatively less expensive, easier, and faster to perform than urine culture. Urine leukocytes can be used as urinary tract infections screening. Urine leukocytes can be examined by dipstick and microscopic methods. The dipstick method detects leukocyte esterase produced by polymorphonuclear leukocytes (PMNL) when there is an inflammatory reaction occurs.<sup>7,9-10</sup> This study was aim to determine the correlation between stone size and urine leukocytes in nephrolithiasis patients.

## **RESEARCH METHODS**

This study used a cross-sectional retrospective approach with an analytic method. The samples of this study were the medical record data of nephrolithiasis patients diagnosed by a urology specialist at Ulin General Hospital Banjarmasin in the 2017-2018 period obtained by total sampling technique based on inclusion and

exclusion criteria. Data were analyzed using Spearman correlation test. In this study, the inclusion criteria were medical records of patients diagnosed with clinical nephrolithiasis by urology specialists who had carried out urinalysis and USG, BNO, or CT examinations. Exclusion criteria were the medical record data of nephrolithiasis patients with other diseases in the urinary tract and the medical record data of nephrolithiasis patients who

received prior antibiotic therapy.

**RESULTS AND DISCUSSION**

The study was performed by observing the correlation between stone size and urine leukocytes in nephrolithiasis patients at Ulin General Hospital Banjarmasin in the period of 2017-2018 and obtained a total of 34 nephrolithiasis patients who fit the inclusion and exclusion criteria.

Table 1. Characteristics of Subjects

SD	Frequency (n)	Proportion (%)	Mean ± SD*
Age (years old)			
15-24	2	5,88	
25-34	1	2,94	
35-44	7	20,59	
45-54	7	20,59	52,15±14,63
55-64	10	32,35	
65-74	6	17,65	
≥75	1	2,94	
Sex			
Male	19	55,88	
Female	15	44,12	

\*SD = standard deviation

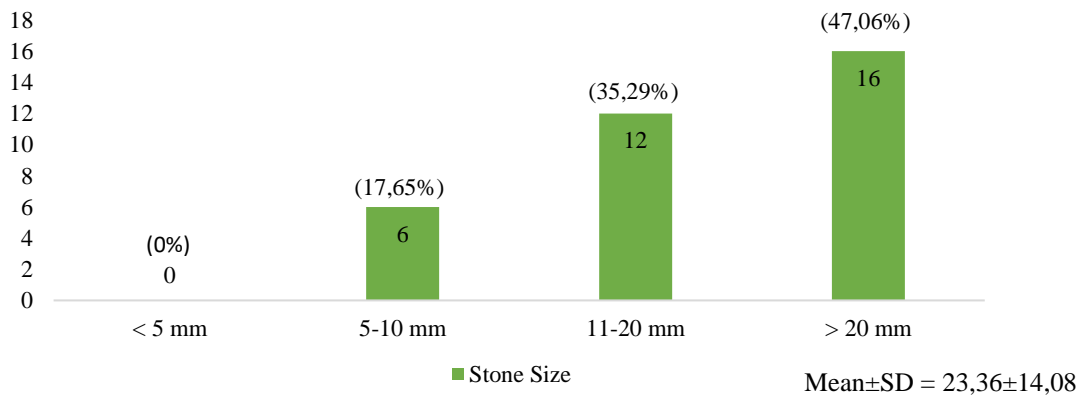


Figure 1. Distribution of Stone Size in Nephrolithiasis Patients in Ulin General Hospital Banjarmasin

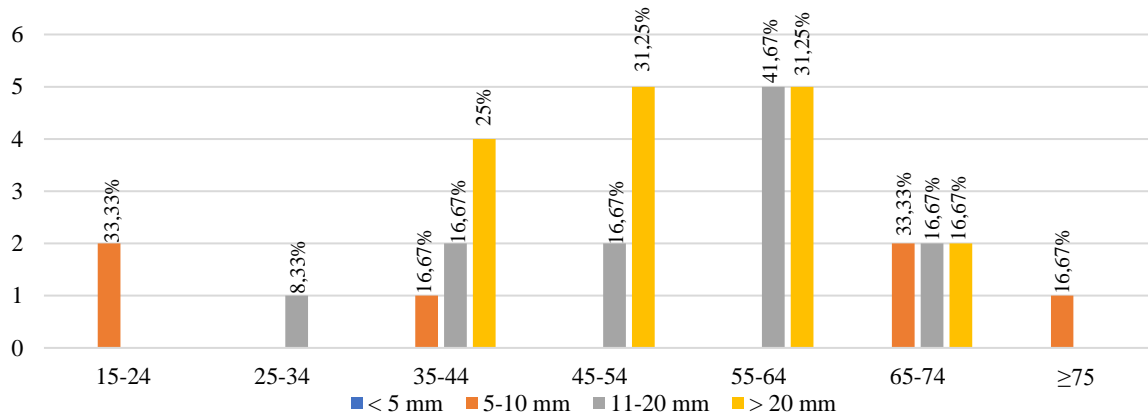


Figure 2. Distribution of Stone Size Based on Age in Nephrolithiasis Patients at Ulin General Hospital Banjarmasin

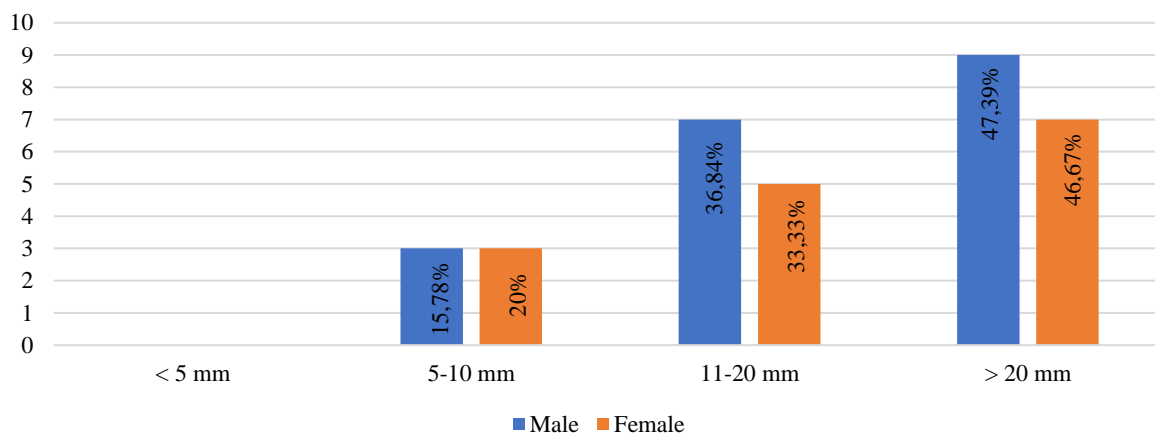


Figure 3. Distribution of Stone Size Based on Sex in Nephrolithiasis Patients at Ulin General Hospital Banjarmasin

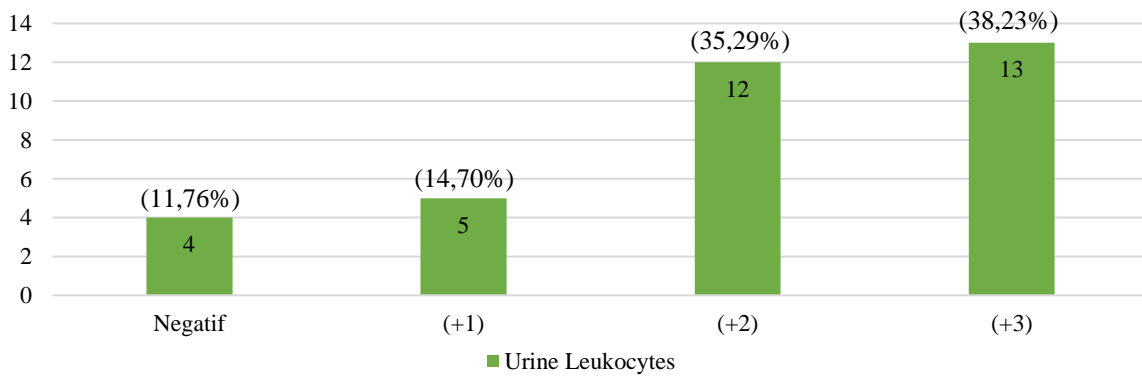


Figure 4. Distribution of Urine Leukocytes in Nephrolithiasis Patients at Ulin General Hospital Banjarmasin

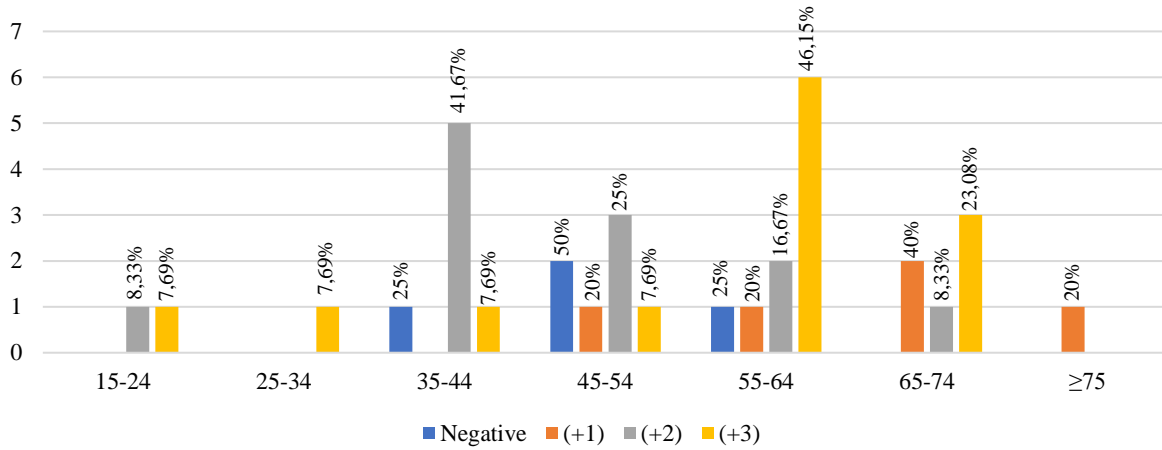


Figure 5. Distribution of Urine Leukocytes Based on Age in Nephrolithiasis Patients at Ulin General Hospital Banjarmasin

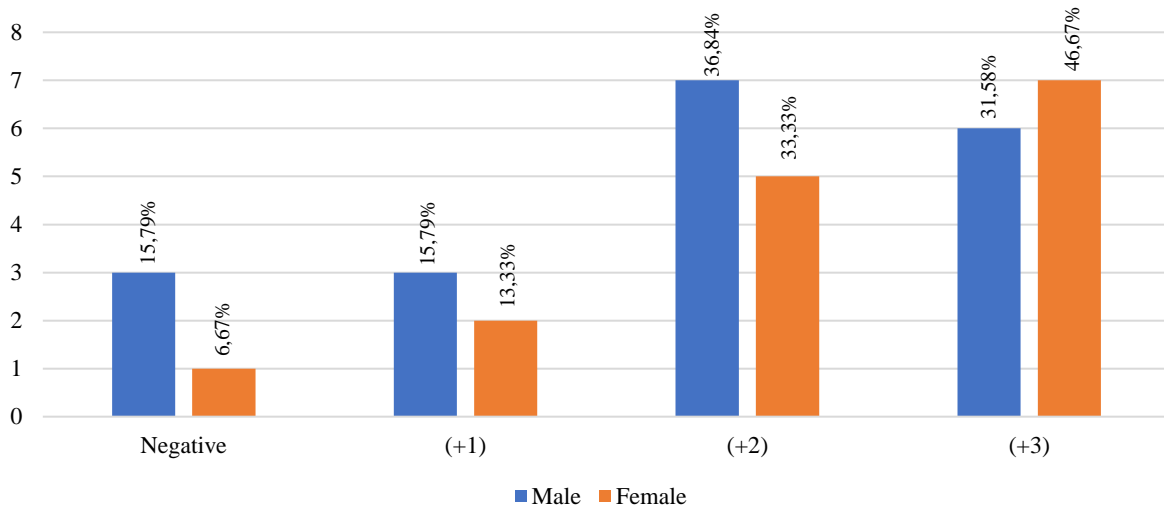


Figure 6. Distribution of Urine Leukocytes Based on Sex in Nephrolithiasis Patients at Ulin General Hospital Banjarmasin

Based on Table 1, the highest proportion on age group in nephrolithiasis patients showed the age group of 55-64 years old that consisted of 10 patients (32.35%) and accompanied by age group 35-44 years with 7 patients (20.59%). The mean age of nephrolithiasis patients at Ulin General Hospital Banjarmasin was 52.15 years old with a standard deviation of 14.63. This was consistent with the 2013 Riskesdas Data, that stated the highest group was in the age group of 55-64 years at 1.3%.<sup>5</sup> This result was also similar with the results of the study by Ridwan et al. (2015) at Prof. DR. R. D. Kandou Manado

Hospital which stated nephrolithiasis patients were highest in the age group of 56 - 65 years (36.2%) from a total of 105 patients.<sup>11</sup> A study from Abdurrosid et al. (2017) at the Harapan Keluarga Hospital Mataram, the highest proportion of age groups in 2015-2016 was 41-60 years. In 2015 there were 28 (71.8%) from a total of 39 patients and in 2016, there were 14 (50%) out of a total of 28 patients.<sup>12</sup> Increasing age can be a risk of circulatory disorders such as hypertension and high cholesterol. Hypertension can result in calcification of the kidneys which becomes a risk of kidney stone formation. High

cholesterol can trigger aggregation of calcium oxalate crystals and calcium phosphate thus it will be easier for the stones to be formed.<sup>13</sup>

Based on Table 1, the sex proportion in nephrolithiasis patients at Ulin Banjarmasin Hospital showed a total of 19 male patients (55.88%) and 15 female patients (44.12%). This was consistent with the 2013 Riskesdas Data where the prevalence of male nephrolithiasis patients was higher at 0.8% compared to female at 0.4%.<sup>5</sup> The research conducted by Ridwan et al. (2015) at Prof. DR. R. D. Kandou Manado Hospital, was also found that male nephrolithiasis patients were higher, at 62.9% compared to women at 37.1% from a total of 105 patients.<sup>11</sup> The composition of calcium-type stones in male urine was higher than in female. Citrate levels in female urine are higher and act as a barrier to stone formation. A Male have testosterone levels that can increase endogenous oxalate production in the liver, while female have estrogen which can prevent calcium aggregation.<sup>13</sup>

Based on Figure 1, the highest proportion of stone size was > 20 mm by 16 patients (47.06%) and followed by stone sizes of 11-20 mm by 12 patients (32.29%). The average stone size is 23.36 mm with a standard deviation of 14.08 mm. Different results were obtained from the study conducted by Haviz (2017) at the Harapan Keluarga Hospital Mataram in 2016, where the highest stone size group was the 11-20 mm group with 79% from a 28 nephrolithiasis patients.<sup>14</sup> Different results were also obtained from a study by Abdurrosid et al. (2017) in Harapan Keluarga Hospital Mataram which stated the highest stone size group in 2015 was the 5-10 mm group with 17 (36.4%) out of a total of 44 patients and in 11-20 mm size group in 2016 with 22 (79%) out of a total of 28 patients.<sup>12</sup> Another different results were also obtained from studies by Rostami et al. (2012) in the Urology Ward of Shafa Hospital in Iran where the highest group was the <13 mm size with 39 (78%) out of

50 patients.<sup>15</sup> The variations in the results of this study with previous studies may be influenced by the diversities in time and place of the studies. In addition, this can also be influenced by the lack of willingness of the community to have their early medical checkup. Based on research by Nahdi (2013) at Ahmad Yani Metro Lampung Hospital who examined a nephrolithiasis patient with a size of 15 x 20 mm, it was found that since a year before entering the hospital, patients had complained of discomfort and stiffness in the left waist, symptoms had appeared a long time ago but the patient does not go for health checks.<sup>16</sup> In addition, nephrolithiasis can also occur without symptoms.<sup>17</sup> This can be a factor in the patients' delay in checking their health.

Based on Figure 2, the highest proportion of 5-10 mm stone size in the age group of 15-24 years old and 65-74 years old by 2 (33.33%) out of 6 patients. The highest proportion of 11-20 mm stone size in the 55-64 years age group was 5 (46.67%) out of 12 patients. The highest proportion of > 20 mm stone size in the 55-64 years and 45-54 years age group was 5 (31.25%) out of 16 patients.

Based on Figure 3, the highest proportion of stone size in men was a > 20 mm stone size group by 9 (47.39%) out of 19 patients. The highest proportion of stone size in females was also in the size group > 20 mm with 7 (46.67%) out of 15 patients.

Based on Figure 4, the highest proportion of urine leukocytes was urine +3 by 13 patients (38.23%) and followed by urine leukocytes +2 by 12 patients (35.29%). This was consistent with research conducted by Swonke et al. (2018) in one hospital in Texas, United States, which from five cases of nephrolithiasis patients, all urinary leukocytes were found to be +3.<sup>18</sup> This was because stones in the kidney can cause urinary tract obstruction. Urinary tract obstruction can trigger urinary tract infections. Detection of urinary tract infections can be done by examining dipstick urinalysis by observing the

presence of leukocyte esterase which is usually also accompanied by nitrite.<sup>7,19</sup>

Based on Figure 5, the highest proportion of negative urine leukocytes was in the 45-54 age group by 2 (50%) out of 4 patients. The highest proportion of urine leukocytes +1 is in the age group of 65-74 years by 2 (40%) out of 5 patients. The highest proportion of urine leukocytes +2 was in the age group of 35-44 by 5 (41.67%) out of 12 patients. The highest proportion of urine leukocytes +3 was in the age group of 55-64 years by 6 (46.15%) out of 13 patients.

Based on Figure 6, the highest proportion of urine leukocytes in males was leukocytes urine +2 by 7 (36.84%) out of 19 patients, while the highest proportion of urine leukocytes in females was leukocytes urine +3 by 7 (46.67%) out of 15 patients.

The results of Spearman correlation test showed  $p = 0.774$  and  $r = 0.051$ . The value of  $p = 0.774$ , meaning that the correlation between stone size and urine leukocytes in nephrolithiasis patients was not significant ( $p < 0.05$ ).

Urine leukocyte examination was performed by examining leukocyte esterase using dipstick urinalysis method and can be used to detect urinary tract infections. Low levels results can be found due to an increase in specific gravity, protein, glucose, boric acid, or ascorbic acid which can inhibit reagent reactions. Urine contaminated with vaginal fluid may cause false positive results, since *Trichomonas* and eosinophils can be sources of esterase, as well as oxidizing agents and formalin.<sup>20-21</sup> These are some factors that cannot be controlled and can affect the results of this study.

Symptomatic urinary tract infections are usually given antibiotics as therapy.<sup>5</sup> Antibiotics can give false negative results on urine leukocyte examination.<sup>20</sup> The use of antibiotics has been excluded, but there are some medical record data with incomplete prior medicine history. This can affect the results of the study because it was unknown whether the patients used

antibiotics or not.

The limitation of this study includes the fact that not all stone sizes listed in the Medical Records Section, such as staghorn stones and multiple stones. Staghorn stone itself is a stone that formed in the pelvis and renal calix that will lead to an obstruction. Research by Yongzhi et al. (2018), stated from a total of 64 patients who had staghorn stones, 33 patients (48.44%) were accompanied by urinary tract infections. The sizes of multiple stones are mostly only listed the largest stone size thus it can affect the test results. This is also supported by research from Yongzhi et al. (2018) that multiple stones are more at risk of urinary tract infections because of the tendency for higher obstruction. From a total of 191 multiple stone patients, 79 patients (41.36%) had urinary tract infections.<sup>8</sup>

## CONCLUSION

There was no significant correlation between stone size and urine leukocytes in nephrolithiasis patients at Ulin General Hospital Banjarmasin.

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