

Correlation Between Gender and Age with Numbers and Stone Size in ESWL Patients in Saiful Anwar General Hospital

¹Besut Daryanto, ²Yulian Salis P

Abstract--*The aim of this study was to know the correlation of gender and age with numbers of stone and stone size in ESWL patients in Saiful Anwar General Hospital within 3 years. This study uses ESWL medical records from January 2014 until December 2016 in Saiful Anwar General Hospital. Inclusion criteria include patients with urinary tract stone with complete data and grouped by gender, age, numbers of stone, stone size. Incomplete data were excluded from this study. This data was collected and analyzed with analytic descriptive with Chi-Square methods. There were 2027 ESWL patients. With male was 1371 patients (67.6%), and female 656 patients (32.4%). The most patient is 40-54 years old with 988 patients (48.7%). There is no correlation between gender with stone size ($p=0.386$). There is a correlation between gender and numbers of stone ($p=0.000$). There is a correlation between age with stone size ($p=0.015$). There is a correlation between age and numbers of stone ($p=0.003$). Most patients who have urinary tract stones was male. 40-54 years old was the most age of the patients. There is no correlation between gender with stone size. There is a correlation between gender and numbers of stone. There is a correlation between age with stone size. There is a correlation between age and numbers of stone.*

Key Words--ESWL, gender, age, numbers and stone size

I. INTRODUCTION

Urinary tract stones are the most common health problem found in Indonesia and in the world. The prevalence of this disease is estimated at 13% in adult men and 7% in adult women. The prevalence of urinary tract stones in the United States varies depending on race, gender and geographical location. Based on data from the National Health and Nutrition Examination Survey states that 1 in 11 people have this disease and is predicted to continue to increase. This increase in prevalence is due to the increasing rate of obesity and diabetes. In Indonesia the number of urinary tract stones has increased five-fold and it is stated that urinary tract stones often occur in male sex and in productive age.

There are several procedures that can be used as management of urinary tract stones. One of the most common procedures used in Urology is Extracorporeal Shock Wave Lithotripsy (ESWL). ESWL is the destruction of urinary tract stones using shock waves transmitted from outside the body. In this therapy, shock waves are fired towards the rock into several small fragments so that the stone can be removed naturally along with urine.

¹ Department of Urology, Brawijaya University, Faculty of Medicine, Saiful Anwar General Hospital, Malang, Indonesia, besut.daryanto@yahoo.co.id

²Department of Urology, Brawijaya University, Faculty of Medicine, Saiful Anwar General Hospital, Malang, Indonesia.

Since its introduction in 1980, ESWL has had an important role in the management of urinary tract stones, ESWL being the most widely used modality. Data from the UK shows a 55% increase in ESWL use in urinary stones between 2000 and 2010.

The success rate of ESWL management in the urinary tract can reach 96%. Other supporting studies show up to 87% of stone-free figures after being followed for up to three months. Stone-free rate after ESWL management is determined by several parameters such as the location of the stone, size, composition, amount, degree of hydronephrosis, and kidney function. All of these parameters can significantly affect the patient's quality of life.

Until now there is no character data on ESWL management in Dr. Saiful Anwar Malang and the relationship between gender and age on the number of stones and stone size in ESWL patients. Therefore, this retrospective study aims to explain the characteristics of ESWL management in Dr. Saiful Anwar Malang and the relationship between sex and age on the number of stones and stone size in ESWL patients.

II. MATERIAL AND METHOD

This study was an analytic retrospective study. Data was obtained by searching for keywords: ESWL in the medical records of the Regional General Hospital (RSUD) Dr. Saiful Anwar Malang, weekly report and electronic medical record of Urology Recidency Program, Faculty of Medicine, Brawijaya University for the period of January 2014 - December 2016.

Furthermore, data collection on gender, age, number of stones, size of stone, location of stone, and history of previous stone management were carried out. The data was then evaluated analytically using SPSS software and continued with the Chi-Square method. Incomplete data regarding diagnosis, gender, age, number of stones, location of stones, size of stone, and history of stone management were excluded from this study.

III. RESULTS

During the period January 2014 to December 2016, there were 2027 patients who had received ESWL treatment at Dr. Saiful Anwar, where 1371 patients were male (67.6%) and 656 patients were female (32.4%).

When grouped by age: ≤ 24 years there were 31 patients (1.6%), 25-39 years there were 223 patients (11%), 40-54 years were 988 patients (48.7%), 55-69 years were 651 patients (32.1%), and ≥ 70 years were 134 patients (6.6%). And grouped based on the position of the stone, it was found in the position of the right stone was 1045 patients (51.5%) and the position of the left stone was 933 patients (46%) and the right and left positions was 49 patients (2.5%).

For the location of the stone, the upper pole was obtained as many as 403 patients (19.8%), the middle pole was 389 patients (19.1%), the lower pole was 743 patients (36.6%). When grouped by the size of the stone, the size of $<10\text{mm}$ was 495 patients (24.4%), 10-20mm was 1222 patients (60.2%), and stone size $> 20\text{mm}$ was 310 patients (15.4%). Based on the number of stones, it was found that patients with 1 stone was 1816 patients (89.5%), 2 stones was 88 patients (4.3%), and ≥ 3 was 123 patients (6.2%).

The results of the table from the relationship between gender with the size of the urinary tract stones were then tested using the Chi-Square test. The test is said to be significant if the significance value (p-value) $> \alpha = 0.05$ (5%). Chi-Square test results obtained as follows

Table 1. Results of Chi-Square Analysis of Gender Relationship with The Size of The Urinary Tract Stones

	Value	Df	Asymptotic Significance(2-sided)
Pearson Chi-Square	1,901 ^a	2	,386
Likelihood Ratio	1,916	2	,384
Linear-by-Linear Association	1,704	1	,192
N of Valid Cases	2026		
a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 99,90.			

Table 1 shows the results of the chi-square test. The significance value obtained in this test is 0.386 when compared with $\alpha = 0.05$, then the significance value $> \alpha = 0.05$ can be ascertained, so that there is no significant relationship between the gender and the size of the patient's urinary tract stones. The meaning of this test results showed that there were no differences in the size of urinary tract stones between female and male sex so that each respondent with female and male gender had the same chance of having <10 mm, 10 - urinary tract stones. 20 mm, or > 20 mm.

Table 2. Characteristics of ESWL patients in RSUD Dr. Saiful Anwar for the period of January 2014 - December 2016

Variable	Number	Percentage
Gender		
Total	2027	100%
Male	1371	67.6%
Female	656	32.4%
Age		
≤24	31	1.6%
25-39	223	11%
40-54	988	48.7%
55-69	651	32.1%
≥70	134	6.6%
Position		
Right	1045	51.5%
Left	933	46%
Bilateral	49	2.5%
Stone Position		

Upper pole	403	19.8%
Middle pole	389	19.1%
Lower pole	743	36.6%
Pyelum	312	15.3%
Uretero-pelvic Junction	73	3.6%
Proximal Ureter	104	5.1%
Distal Ureter	4	0.5%
Stone Size		
<10mm	495	24.4%
10-20mm	1222	60.2%
>20mm	310	15.4%
Number of stone		
1	1816	89.5%
2	88	4.3%
≥3	123	6.2%

The results of the table from the relationship between gender with the number of the urinary tract stones were then tested using the Chi-Square test. Chi-Square test results obtained as follows

Table 3. Results of Chi-Square Analysis of Gender Relationship with The Number Of Urinary Tract Stones

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16,666 ^a	2	,000
Likelihood Ratio	18,508	2	,000
Linear-by-Linear Association	10,110	1	,001
N of Valid Cases	2027		
a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 28,48.			

Table 3 shows the results of the chi-square test. The significance value obtained in this test is 0,000, the value when compared with $\alpha = 0,05$, it can be ascertained that the significance value $<\alpha = 0,05$, so it is stated that there is a significant relationship between gender and the number of urinary tract stones in the patient. The meaning of this test results shows that there are differences in the number of urinary tract stones between female and male sex, so that each respondent with a female and male gender has a different chance of having 1, 2, and 3 urinary tract stones

The results of the table of the relationship between age and size of the urinary tract stones were then tested using the Chi-Square test. Chi-Square test results obtained as follows

Table 4. Results of Chi-Square Analysis of Age with The Size Of Urinary Tract Stones

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19,042 ^a	8	,015
Likelihood Ratio	23,708	8	,003
Linear-by-Linear Association	6,287	1	,012
N of Valid Cases	2026		
a. 1 cells (6,7%) have expected count less than 5. The minimum expected count is 4,73.			

Table 4 shows the results of the chi-square test. The significance value obtained in this test is 0.015, this value when compared with $\alpha = 0.05$, it can be ascertained the significance value $<\alpha = 0.05$, so it is stated that there is a significant relationship between age and the size of the patient's urinary tract stones. The meaning of this test results shows that there are differences in the size of the urinary tract stones between the ages of ≤ 24 years, 24 - 39 years, 40 - 54 years, 55 - 69 years, and ≥ 70 years, so that each respondent with age ≤ 24 years, 24 - 39 years, 40 - 54 years, 55 - 69 years, and 70 years have different opportunities to have urinary tract stones measuring <10 mm, 10-20 mm, or > 20 mm.

The results of the table of the relationship between age and the number of the urinary tract stones were then tested using the Chi-Square test. Chi-Square test results obtained as follows

Table 5. Results of Chi-Square Analysis of Age with The Number Of Urinary Tract Stones

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23,011 ^a	8	,003
Likelihood Ratio	21,132	8	,007
Linear-by-Linear Association	,036	1	,849
N of Valid Cases	2027		
a. 2 cells (13,3%) have expected count less than 5. The minimum expected count is 1,35.			

Table 5 shows the results of the Chi-Square test of 0.003 when compared with $\alpha = 0.05$, then it can be ascertained that the significance value $<\alpha = 0.05$, so it is stated that there is a significant relationship between age and the number of urinary tract stones in the patient. The meaning of this test results shows that there are differences in the number of urinary tract stones between the ages of ≤ 24 years, 24 - 39 years, 40 - 54 years, 55 - 69 years, and ≥ 70 years, so that each respondent with age ≤ 24 years, 24 - 39 years, 40 - 54 years, 55 - 69 years, and 70 years have different opportunities to have urinary tract stones amounting to 1, 2, and 3.

IV. DISCUSSION

There are several factors that can cause the formation of urinary tract stones such as race, environment, sex, and age. Stone distribution varies between races. Urinary tract stones are more common in Caucasians and Asians than in Native Americans and Afro-Caribbeans. The incidence of urinary tract stones is higher in areas with hot or dry climates.

Gender is also associated with the occurrence of urinary tract stones. In this study found 61% of male patients compared to 39% of females. These results are consistent with the literature, where urinary tract stones are more common in men with a ratio of 2:1. Other studies that have been carried out in the countries of Israel, China and Taiwan state that male patients are more numerous than women.

The anatomy of the urinary tract in men is different compared to women, so it is understood that men are more likely to suffer from urinary stones compared to women. The male urinary tract is narrower in shape, this narrow place can cause a higher risk of urinary tract formation due to urine precipitation.

Obesity, diet, and fluid consumption also play a role in the process of urinary tract stone formation. Obese women tend to be at risk of urinary tract stones when compared to women who are not obese. Women with a high body mass index tend to have increased oxalate, uric acid, phosphorus, creatinine, and sodium excretion. Similar results are found in men with increased potassium, urea and magnesium. Eating habits such as high consumption of animal protein, low carbohydrates, high salt, and low calcium eating can contribute to the process of stone formation. Recommendations for consuming vegetables and fiber, and limiting the consumption of animal protein to 0.8-1 g/kg/day can inhibit the process of stone formation. Fluid intake is also associated with the risk of urinary tract formation. The recommended fluid intake is 2.5-3 L/day or drinks until the amount of diuresis reaches 2-2.5 L/day to prevent recurrence. Neutral pH drinks are recommended for this prevention. 14 Coffee, tea, alcohol and milk can reduce urine concentration.

In this research it was found that the age with the highest number of patient was at the age of 40-54 years at 48.7%, then aged 55-69 years at 32.1%, and ages 25-39 years at 11%. Sex hormones also have several roles in the process of stone formation. Estrogen can inhibit the process of calcium and oxalate excretion and increase citrate production. While testosterone can reduce citrate excretion. Therefore the incidence of urinary tract stones is more common in men. In addition, the protective effect of estrogen in premenopausal women can increase kidney calcium absorption and reduce bone resorption. This can explain why age is related to the process of stone formation.

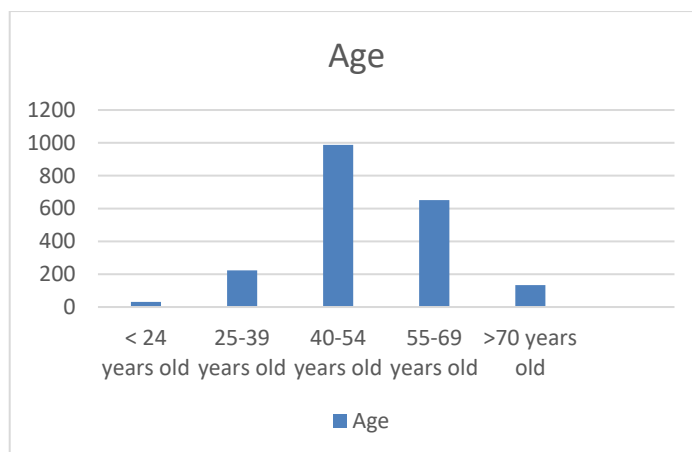


Figure 1. Age distribution of patients with ESWL management

In the study results were obtained: urinary tract stones on the right side at 51.5%, on the left side at 46%, and on the bilateral side at 2.5%. And the position of the lower pole urinary tract stones 36.5%, the upper pole stones 19.7%, and the middle pole stone 19%. The correlation between location and stone formation is still unknown. However, it is suspected that the narrowing of the urinary tract is an important role and increases the occurrence of urinary precipitation.

The most stone size in this study was 10-20mm with a percentage of 55.3%, <10mm was 26.1%, and a size > 20mm was 18.6%. ESWL is the right main modality for 10-20mm urinary tract stones. This is in accordance with the guidelines for managing kidney stones with a size of 10-20mm.

There are several factors that correlate with ESWL success rates such as size, composition, stone consistency and elimination after ESWL action. This can be caused by the size and composition of the stone. However, more information about the composition of stones and Hounsfield stone unit is needed. Recent research shows that stones made from calcium oxalate dihydrate are easier to break than uric acid stones. A positive correlation was found between the size of the stone and the number of ESWL treatments. And also shows that the number of male patients who get advanced stage treatment is more than women. These results correlate with the literature which states that urinary stone recurrence occurs higher in men than women.

The weakness of this study is the incompleteness of medical record data. We will solve this problem by improving the quality of medical record documentation in the future.

V. CONCLUSION

The results of this study indicate that most patients who have urinary tract stones and undergo ESWL are men. The age with the highest number of patient was at the age of 40-54 years. There was no significant relationship between gender with the size of the urinary tract stones. There is a significant relationship between gender with the number of urinary tract stones. There is a significant relationship between age and size of urinary tract stones. There is a significant relationship between age and number of urinary tract stones.

REFERENCES

1. Segura JW, Preminger GM, Assimos DG, et al. Nephrolithiasis Clinical Guidelines Panel Summary Report on The Management of Staghorn Calculi. American Urological Association. 2013.
2. Endrika Noviandri, Ponco Birowo, Nur Rasyid. Urinary stone characteristics of patients treated with extracorporeal shock wave lithotripsy in Cipto Mangunkusumo Hospital Jakarta. 2015.
3. Emil AT, Jack WMA. Smith's General Urology Ed 18th. USA: Mc Graw Hill medical. 2013.
4. Satoshi, H. Kidney Stone Disease and Risk Factor of CHD. International Journal of Urology. 12(10):859-863. 2014.
5. Junuzovic D, Prstojevic JK, Hasanbegovic M, Lepara Z. Evaluation of extracorporeal shock wave lithotripsy (ESWL): efficacy in treatment of urinary system stones. Acta Inform Med;22(5):309-14. 2014.
6. Elkholy MM, Ismail H, Abdelkhalek MA, Badr MM, Elfeky MM. Efficacy of extracorporeal shockwave lithotripsy in ureteral stones. Urol Ann;6(4):346-51. 2014.
7. Politis G, Griffith DP. ESWL: stone-free efficacy based upon stone size and location. World J Urol. ;5:225-8. 2013
8. Pal RP, Mellon JK. Renal Stone Disease. Foundation Years;4(5):199-203. 2012
9. Kalbu DU, Golan S, Livne PM, Pode D, Duvdevani M, Lifshitz D. Urinary stone composition in Israel: current status and variation with age and gender-A bicenter study. J Endourol;27(12):1539-42. 2013
10. Menon M, Parilkar BG, Drach GW. Urinary Lithiasis: etiology, diagnosis, and medical management. In: Walsh CP, Retik AB, Vaughan ED, Wein AJ, editors. Campbell's Urology. 11th ed. Philadelphia: WB Saunders p 2662-5. 2016.
11. Wu W, Yang B, Ou L, Liang Y, Wan S, Li S, et al. Urinary stone analysis on 12,846 patients: a report from a single center in China. Urolithiasis;42(1):39-43. 2014
12. Huang WY, Chen YF, Carter S, Chang HC, Lan CF, Huang KH. Epidemiology of upper urinary tract stone disease in a Taiwanese population: a nationwide, population based study. J Urol;189(6):2158-63. 2013.
13. Burnett AL, Rodriguez R, Jarrett TW. Genitourinary system: male anatomy and physiology. In: Greenfield LJ, Mulholland MW, Oldham KT, Zelenock GB, Lilimoe KD, editors. Essentials of Surgery Scientific Principles and Practice. 2nd ed. New York: Lippincott Williams & Wilkins;p.1111-8. 2012.
14. Nowfar S, Pallazi-Churas K, Chang DC, Sur RL. The relationship of obesity and gender prevalence changes in United States inpatient nephrolithiasis. Urology;78(5):1029-33. 2011.
15. Negri AL, Spivacow FR, Del Valle EE, Forrester M, Rosende G, Pinduli I. Role of overweight and obesity on the urinary excretion of promoters and inhibitors of stone formation in stone formers. Urol Res;36(6):303-7. 2008.
16. Skolarikos A, Straub M, Knoll T, Sarica K, Seitz C, Petřík A, et al. Metabolic evaluation and recurrence prevention for urinary stone patients: EAU guidelines. Eur Urol;67(4):750-63. 2015.
17. Pearle MS, Lotan Y. Urinary lithiasis: etiology, epidemiology, and pathogenesis. In: Wein AJ, Kavoussi LR, editors. Campbell-Walsh Urology. Philadelphia: Elsevier Saunders;p.1257-60. 2012.
18. Taylor EN, Curhan GC. Diet and fluid prescription in stone disease. Kidney Int;70(5):835-9. 2013.
19. Kato Y, Yamaguchi S, Kakizaki H, Yachiku S. Influence of estrus status on urinary chemical parameters related to urolithiasis. Urol Res;33(6):476-80. 2013
20. Turk C, Knoll T, Petrik A, Sarica K, Seitz C, Straub M. Indication for active stone removal and selections of procedures. In: EAU Guidelines on Urolithiasis. 2017.
21. Tarawneh E, Awad Z, Hani A, Haroun AA, Hadidy A, Mahafza W, et al. Factors affecting urinary calculi treatment by extracorporeal shock wave lithotripsy. Saudi J Kidney Dis Transpl;21(4):660-5.2013
22. Alizadeh, A., Kiavar, M., Assadian-Rad, M., Morady, B., Alasti, M., Sadeghi, A., Emkanjoo, Z. Evaluation of the patients with syncope during the first month after coronary artery bypass graft(2011) Journal of Cardiovascular Disease Research, 2 (3), pp. 186-189.
DOI: 10.4103/0975-3583.85267
23. Mikhalchenko, A.V., Mikhalchenko, V.F., Zhidovinov, A.V., Yarygina, E.N., Mikhalchenko, D.V. Using the cytologic method for curing diseases of the oral cavity mucous membrane after prosthetics(2018) International Journal of Pharmaceutical Research, 10 (4), pp. 152-158.
<https://www.scopus.com/inward/record.uri?eid=2s2.085056145032&partnerID=40&md5=bf877d91c9bd f47a3b60a91b1bc73cd7>
24. Trehan S, Sharma G, Misra A. "siRNA: Sojourn from Discovery to Delivery Challenges and Clinics." Systematic Reviews in Pharmacy 1.1 (2010), 1-16. Print. doi:10.4103/0975-8453.59507