UNIVERSITAS ISLAM AL-AZHAR
JURNAL KEDOKTERAN
MEDIA INFORMASI ILMU KEDOKTERAN DAN KESEHATAN
ISSN 2460-9749 e-ISSN 2620-5890

Characteristics of Kidney Stone Patients with Stonography CT Scan Without Contrast

Ni Putu Diah Witari [1 *], Ni Luh Putu Muliartini[1], Ni Luh Putu Siska Kahari Sari[1], Komang Trisna Sumadewi[1], Anak Agung Ayu Asri Prima Dewi[1], Dewa Ayu Agung Alit Suka Astini[1], Fransiscus Fiano Anthony Kerans[1], Luh Gde Evayanti[1]

[1] Faculty of Medicine and Health Sciences, Universitas Warmadewa, Bali, Indonesia
([*] Corresponding Author: diahkishori@gmail.com)

Date of Submission	Date of Acceptance	Date of Publish
14 March 2023	08 May 2023	25 December 2023

ABSTRACT

Kidney stones are one of the problems that are often found in the field of urology. The composition of stones formed varies and the location of kidney stones is generally in the minor calyx, major calyx, and renal pelvis. Examination to be able to establish a diagnosis, one of which is by CT Scan examination. Management of kidney stones depends on the characteristics of the kidney stones found. So further research is needed to determine the characteristics of kidney stones to provide appropriate management and prevent recurrence. The descriptive design research design used secondary data with 115 samples. The results showed that the number of patients was more male by 83 people (72.2%), kidney stones obtained were as many as 62 (53.9%), patients had right kidney stones measuring >9mm (79%), and as many as 68 (59.1%) patients had left kidney stones measuring >9mm (73.5%), and most of the casein did not suffer from hydronephrosis.

Keywords: Kidney Stones; CT Scan; Characteristic.

INTRODUCTION

Kidney stone disease is a solid mass resembling stones that fill the kidneys with varied compositions, including calcium, struvite, uric acid, and cystine. Calcium oxalate is the most common type of kidney stone. The location of kidney stones is generally in the minor calyx, major calyx, and renal pelvis (Kittanamongkolchai et al., 2018) (Alelign & Petros, 2018; D'Costa et al., 2019).

Two factors facilitate the formation of kidney stones, namely intrinsic and extrinsic factors. Intrinsic factors include age, sex, and heredity (Hadibrata &; Suharmanto, 2022; Kaniya &; Uyun, 2020; Krisna, 2011). Extrinsic factors include diet, occupation, water, intake, geography, and climate (Fitria et al., 2020; Rule et al., 2020; Sohgaura & Bigoniya, 2017).

Management of kidney stones depends on the characteristics of the stone. The type of management can be conservative (observational), non-invasive with (Alelign & Petros, 2018) Extracorporeal Shockwave Lithotripsy (ESWL), minimally invasive with Ureterorenoscopy (URS) with stone disintegration and Percutaneous Nephrolithotripsy (PCNL) and open surgery (nephrolithotomy, pyelolithotomy or nephrectomy). Stones with a size of less than 5 mm can be conservative (observation/waiting) because the size is possible through narrowing along the urinary tract, but if it fails it is necessary to perform actions

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42

such as ESWL, URS with stone disintegration or ureterolithotomy (D'costa et al., 2019a; Edvardsson et al., 2018; Kittanamongkolchai et al., 2018; Li et al., 2019) (D'costa et al., 2019b, 2019a; Ye et al., 2020).

Management for the prevention of kidney stone disease recurrence is still unsatisfactory, so further research is needed on the characteristics and further management and prevention of kidney stone recurrence. This study was conducted to provide preliminary data on the characteristics of patients with kidney stones including the density of kidney stones. The urgency of this study is because the recurrence rate of kidney stone patients is still high, so research is needed to increase efforts to suppress the recurrence of patients with kidney stones by knowing the characteristics of kidney stone disease, especially at the Tabanan Regency General Hospital.

RESEARCH METHOD

This research design uses a descriptive design. This study used secondary data taken from Picture Archiving and Communication System (PACS) with clinical kidney stones from January 2019 to December 2020. The data taken include gender, age, weight, and characteristics of kidney stones including the location of kidney stones, density of kidney stones, and obstruction images due to kidney stones. The data obtained is then carried out with descriptive data analysis. This research has obtained an ethical permit from the Research Ethics Commission of Tabanan Regional General Hospital number 800/0090/KEPEG/RSUD.

RESULTS

The number of research samples was 115 people, the majority of which were dominated by 83 men (72.2%) and had an average age of 54.98±10.42 years which is presented in table 1.

Table 1. Socio-demographic characteristics of the sample

Variable	Total (N=115)
Gender, n (%)	
Men	83 (72.2)
Women	32 (27.8)
Age, n (%)	
20-49 years	31 (27)
<20 and >49 years old	84 (73)
Mean+standard intersection	54.98+10.42

Table 2 and table 3 show the analysis of the normality of Kolmogorov Smirnov's data. Analysis of normality data shows that only the Hounsfield unit (HU) of the right kidney has a p-value greater than 0.05, so the distribution of data on this variable is normal. Meanwhile, other variables such as right kidney size, right kidney stone size, left kidney size, left kidney stone size, and left kidney Hounsfield unit (HU) have probability values smaller than 0.05, so they have abnormal data distribution.

Data that have a normal distribution are presented in the form of mean and standard intersection while data that have an abnormal distribution are presented in the form of median and interquartile range. The mean value of right kidney HU is 827±365.

Table 2. Characteristics of the right kidney

Characteristics of the right kidney	Mean/ Median	Interchange Standart (IS)	p-value
Kidney size (cm) (N=115)[b]	9.57	2.29	<0.01
Stone size (mm) (N=62)[b]	16.6	15.7	<0.01
Hounsfield unit (HU) rock (N=61)[a]	827	365	0.2

a: Value is expressed in units of mean and standard deviation; b: Value expressed in units of median and interquartile range

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42

Table 3. Characteristics of the left kidney

Characteristics of the left kidney	Mean/ Median	Interchange Standart (IS)	p-value
Kidney size (cm) (N=115)[b]	9.67	2.19	0.017
Stone size (mm) (N=68)[b]	13.55	17.2	<0.01
Hounsfield unit (HU) rock (N=65)[b]	823	713	0.04

a: Value is expressed in units of mean and standard deviation; b: Value expressed in units of median and interquartile range

A total of 62 (53.9%) patients had right kidney stones on a stonography CT scan without contrast. The majority of patients had a right kidney stone measuring >9mm (79%) according to table 4. Stone size in stonography CT scan analysis can help predict the possibility of stone discharge because larger stones tend not to be able to come out spontaneously.

Table 4. Size characteristics of right kidney stones

Variable	Total
Have a right kidney stone, n (%) (N=115)	62 (53.9)
Yes	53 (46.1)
Not	
Stone size, n (%) (N=62)	3 (4.8)
<4mm	7 (11.3)
4.1-7mm	3 (4.8)
7.1-9mm	49 (79.0)
>9mm	

A total of 68 (59.1%) patients had left kidney stones on stonography CT scan which was higher than the number of right kidney stone patients. The majority of patients also had a left kidney stone measuring >9mm (73.5%) according to table 5. Table 6 shows that the majority of patients do not have hydronephrosis in either the right or left kidney.

Table 5. Size characteristics of left kidney stones

Variable	Total
Have a left kidney stone, n (%) (N=115)	68 (59.1)
Yes	47 (40.9)
Not	
Stone size, n (%) (N=68)	3 (4.4)
<4mm	12 (17.6)
4.1-7mm	3 (4.4)
7.1-9mm	50 (73.5)
>9mm	

Table 6. Characteristics of hydronephrosis in samples

Variable	Total (N=115)
Have hydronephrosis	
Yes	32 (27.8)
Not	83 (72.2)

DISCUSSION

Kidney stones are urinary tract stones located in the kidneys. Kidney stones are associated with an increased risk of chronic kidney disease, end-stage renal failure, cardiovascular disease, diabetes, and hypertension. Kidney stones may be a systemic disorder associated with metabolic syndrome. Nephrolithiasis is responsible for 2 to 3% of end-stage kidney cases if it is associated with nephrocalcinosis (Alelign & Petros, 2018; Shoag et al., 2019).

The prevalence and recurrence rate of kidney stone disease continues to increase, with limited effective drug options. Urolithiasis affects about 12% of the world's population at certain stages in various age ranges. Research on the characteristics of kidney stone patients with CT Scan Stonography examination at Tabanan Hospital showed that the majority were 83 men (72.2%) with an average age of 42 years. Based on research and literature urolithiasis affects all ages, genders, and races, but is more common in men than women and in the age of 20-49 years (Edvardsson et al., 2018; Sohgaura & Bigoniya, 2017; Ye et al., 2020). The recurrence rate of secondary stone formation is estimated at 10-23% per year, 50% in 5-10 years, and 75% in 20 years patients. However, the lifetime

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42

recurrence rate is higher in males, although the incidence of nephrolithiasis is also increasing in females. Therefore, prophylactic management is very important in the management of urolithiasis (Akram & Idrees, 2019; Coe et al., 2019; Dai et al., 2019).

Based on the size of kidney stones, data were obtained from as many as 62 (53.9%) patients had right kidney stones measuring >9mm (79%) (table 4). A total of 68 (59.1%) patients had left kidney stones who had left kidney stones measuring >9mm (73.5%) (table 5). The size of the stone on a stonography CT scan analysis can help predict the possibility of stone discharge because larger stones tend not to be able to come out spontaneously so surgery is needed. The three most common surgical modalities for kidney stones include extracorporeal SWL (40-50% use worldwide), retrograde ureteroscopic fragmentation and retrieval (30-40%), and PCNL (5-10%). Each therapy has a profile of side effects and the success rate depends on the doctor's experience, stone factors (size, location, and composition), and patient characteristics (body habitus, medical comorbidities, and anatomy) PCNL is generally performed for stones measuring > 2 cm or staghorn stones (D'Costa et al., 2019; Ye et al., 2020) (D'costa et al., 2019b; Li et al., 2019). (Alelign & Petros, 2018)

In the examination of kidney stone patients with the CT Scan Stonography method, it can be evaluated whether the kidney stones cause complications of obstruction (hydronephrosis) In this study sample, hydronephrosis complications were obtained as many as 32 (27.8%) which can affect the consideration of therapy that will be carried out next. (D'costa et al., 2019a; Ye et al., 2020).

Computerized Tomography Scan Stonography findings also help predict the likelihood of stone discharge because larger stones are less likely to be able to come out spontaneously. The spontaneous travel rate for ureteral stones is 76% for stones 2-4 mm in diameter, 60% for stones measuring 5-7 mm, 48% for stones measuring 7-9 mm, and less than 25% for stones larger than 9 mm (Alelign & Petros, 2018; Li et al., 2019).

CONCLUSION

Based on the data analysis that has been done, it can be concluded that most of the characteristics of kidney stone patients are male, the average age is 54.98±10.42 years, the size of kidney stones obtained is as many as 62 (53.9%) patients have right kidney stones measuring >9mm (79%) and as many as 68 (59.1%) patients have left kidney stones that have left kidney stones measuring >9mm (73.5%), and most casein do not suffer from hydronephrosis.

ACKNOWLEDGMENTS

The author would like to thank the research funding support provided by the Dean of the Research Unit of the Faculty of Medicine and Health Sciences, Universitas Warmadewa for the funding support and facilities provided so that this research can run well.

CONFLICT OF INTEREST STATEMENT

The author declares that there is no potential conflict of interest concerning the authorship and publication of this article.

REFERENCES

Akram, M., & Idrees, M. (2019). Progress and prospects in the management of kidney stones and developments in phyto-therapeutic modalities. *International Journal of Immunopathology and Pharmacology*, *33*, 2058738419848220. https://journals.sagepub.com/doi/pdf/10.1177/2058738419848220

Alelign, T., & Petros, B. (2018). Kidney stone disease: an update on current concepts. *Advances in Urology*, *2018*. https://www.hindawi.com/journals/au/2018/3068365/

Coe, F., Worcester, E. M., Lingeman, J. E., & Evan, A. P. (2019). *Kidney stones: medical and surgical management*. Jaypee Brothers Medical Publishers. https://books.google.co.id/books?hl=en&lr=&id=bgJBEAAAQBAJ&oi=fnd&pg=PP1&d

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42

q=management+kidney+stones&ots=e04MMs2R5P&sig=TodKM56kOVNEHLUGM70fxUlvGl4&redir_esc=y#v=onepage&q=management%20kidney%20stones&f=false

Dai, J. C., Bailey, M. R., Sorensen, M. D., & Harper, J. D. (2019). Innovations in ultrasound technology in the management of kidney stones. *Urologic Clinics*, *46*(2), 273–285. https://www.urologic.theclinics.com/article/S0094-0143(18)30189-7/fulltext

D'Costa, M., Pais, V. M., & Rule, A. D. (2019). Leave no stone unturned: defining recurrence in kidney stone formers. *Current Opinion in Nephrology and Hypertension*, *28*(2), 148. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6377251/

D'costa, M. R., Haley, W. E., Mara, K. C., Enders, F. T., Vrtiska, T. J., Pais, V. M., Jacobsen, S. J., McCollough, C. H., Lieske, J. C., & Rule, A. D. (2019a). Symptomatic and radiographic manifestations of kidney stone recurrence and their prediction by risk factors: a prospective cohort study. *Journal of the American Society of Nephrology*, *30*(7), 1251–1260. https://journals.lww.com/jasn/pages/articleviewer.aspx?year=2019&issue=07000&article=00014&type=Fulltext

D'costa, M. R., Haley, W. E., Mara, K. C., Enders, F. T., Vrtiska, T. J., Pais, V. M., Jacobsen, S. J., McCollough, C. H., Lieske, J. C., & Rule, A. D. (2019b). Symptomatic and radiographic manifestations of kidney stone recurrence and their prediction by risk factors: a prospective cohort study. *Journal of the American Society of Nephrology*, *30*(7), 1251–1260. https://journals.lww.com/jasn/pages/articleviewer.aspx?year=2019&issue=07000&article=00014&type=Fulltext

Edvardsson, V. O., Ingvarsdottir, S. E., Palsson, R., & Indridason, O. S. (2018). Incidence of kidney stone disease in Icelandic children and adolescents from 1985 to 2013: results of a nationwide study. *Pediatric Nephrology*, *33*, 1375–1384. https://link.springer.com/article/10.1007/s00467-018-3947-x

Fitria, L., Prihartono, N. A., Ramdhan, D. H., Wahyono, T. Y. M., Kongtip, P., & Woskie, S. (2020). Environmental and occupational risk factors associated with chronic kidney disease of unknown etiology in West Javanese rice farmers, Indonesia. *International Journal of Environmental Research and Public Health*, *17*(12), 4521. https://www.mdpi.com/1660-4601/17/12/4521

Hadibrata, E., & Suharmanto. (2022). FAKTOR-FAKTOR YANG BERHUBUNGAN DENGAN TERJADINYA BATU GINJAL Exsa. *Jurnal Penelitian Perawat Profesional*, *4*(3), 1377–1386.

Kaniya, T. D., & Uyun, D. (2020). *Ct-Scan Non Kontras Pada Pasien Batu Saluran Kemih*. *11*(1), 284–291. https://doi.org/10.35816/jiskh.v10i2.272

Krisna, D. N. P. (2011). Faktor Risiko Penyakit Batu Ginjal. *Jurnal Kesehatan Masyarakat*, *7*(1), 51–62.

Kittanamongkolchai, W., Vaughan, L. E., Enders, F. T., Dhondup, T., Mehta, R. A., Krambeck, A. E., McCollough, C. H., Vrtiska, T. J., Lieske, J. C., & Rule, A. D. (2018). The changing incidence and presentation of urinary stones over 3 decades. *Mayo Clinic Proceedings*, *93*(3), 291–299. https://www.sciencedirect.com/science/article/abs/pii/S0025619617308443

Li, X., Zhu, W., Lam, W., Yue, Y., Duan, H., & Zeng, G. (2019). Outcomes of long-term follow-up of asymptomatic renal stones and prediction of stone-related events. *BJU International*, *123*(3), 485–492. https://bjui-journals.onlinelibrary.wiley.com/doi/abs/10.1111/bju.14565

Rule, A. D., Lieske, J. C., & Pais, V. M. (2020). Management of kidney stones in 2020. *Jama*, *323*(19), 1961–1962. https://jamanetwork.com/journals/jama/article-abstract/2763484

Shoag, J. E., Patel, N., Posada, L., Halpern, J. A., Stark, T., Hu, J. C., & Eisner, B. H. (2019). Kidney stones and risk of narcotic use. *The Journal of Urology*, *202*(1), 114–118. https://www.auajournals.org/doi/abs/10.1097/JU.0000000000000197

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42

Sohgaura, A., & Bigoniya, P. (2017). A review on epidemiology and etiology of renal stone. *Am J Drug Discov Dev*, *7*(2), 54–62.

Ye, Z., Zeng, G., Yang, H., Li, J., Tang, K., Wang, G., Wang, S., Yu, Y., Wang, Y., & Zhang, T. (2020). The status and characteristics of urinary stone composition in China. *BJU International*, *125*(6), 801–809. https://bjui-journals.onlinelibrary.wiley.com/doi/abs/10.1111/bju.14765

DOI: http://dx.doi.org/10.36679/kedokteran.v9i1.42