ISSN 2797-8400 (Print) | ISSN 2797-8419 (Online)
https://e-jurnal.iphorr.com/index.php/msc
DOI: 10.56922

Submitted: 5 August 2026 Revised: 20 September 2026 Published: 30 September 2026

Stone size and serum creatinine levels in patients with unilateral nephrolithiasis

Latiffah Anggun[1]*, Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati
Corresponding Author: Latiffah Anggun. Email: latiffahanggun@gmail.com

Abstract

Background: Kidney stones can impair urinary flow and may be accompanied by changes in renal-function markers. Stone size is routinely considered during clinical assessment, while serum creatinine provides information about renal excretory function. Their association in unilateral nephrolithiasis warrants investigation.
Purpose: To examine the association between stone-size category and serum creatinine in patients with unilateral nephrolithiasis.
Method: This retrospective cross-sectional study analyzed 92 medical records, purposively selected from a reported population of 120 patients at Dr. H. Abdul Moeloek Regional General Hospital, Lampung Province. Records from 2025 were reviewed in February 2026. Stone size was categorized as <5 mm, 5-10 mm, or >10 mm. Serum creatinine was recorded in mg/dL, and the association between stone-size category and serum creatinine was assessed using Spearman's rank correlation.
Results: The sample included 51 men (55.4%) and 41 women (44.6%). Stones measured <5 mm in 52 patients (56.5%), 5–10 mm in 31 patients (33.7%), and >10 mm in 9 patients (9.8%). Mean serum creatinine was 1.61 mg/dL (range, 0.80–3.12). The stone-size category was significantly and positively associated with serum creatinine (r_s = 0.732, $p < 0.001$).
Conclusion: Higher stone-size categories were associated with higher serum creatinine in this hospital-based sample. The retrospective cross-sectional design and unadjusted analysis do not establish causality or an independent association.

Keywords: Nephrolithiasis; Serum Creatinine; Stone Size; Renal Function; Unilateral Kidney Stone.

INTRODUCTION

Nephrolithiasis involves the formation of calculi within the kidney and urinary tract through complex crystallization processes. Its occurrence is associated with environmental, dietary, metabolic, and genetic factors (Ma, Cheng, Jian, Wen, Xiang, Li, Wang, & Jin, 2024; Kachkoul, Touimi, El Mouhri, El Habbani, Mohim, & Lahrichi, 2023). Clinical manifestations may include pain, hematuria, nausea, vomiting, and impaired urinary flow. Stone size is one component of clinical assessment alongside location, number, composition, obstruction, infection, and the patient's condition (European Association of Urology [EAU], 2026; Geraghty, Davis, Tzelves, Lombardo, Yuan, Thomas, Petrik, Neisius, Türk, Gambaro, Skolarikos, & Somani, 2023).

The EAU (2026) stratifies stone size for clinical decision-making and recommends laboratory assessment, including serum creatinine. Contemporary guidance similarly emphasizes integrated assessment of stone characteristics, renal function, metabolic risk, and other clinical factors (Bhojani, Bjazevic, Wallace, Lee, Kaler, Dion, Cowan, Sultan, Chew, & Razvi, 2022; Carvalho, Matos, Santos, Barreto, Barreto, Rodrigues, Pietrobom, da Luz, Constancio, Gomes, & Heilberg, 2025). Stone size characterizes the calculi, whereas serum creatinine contributes to the evaluation of renal excretory function.

Serum creatinine is influenced by renal excretion as well as age, gender, muscle mass, dietary intake, physical activity, medications, hydration, and other clinical conditions (Ávila, Mora Sánchez, Bernal

DOI: https://doi.org/10.56922/msc.v6i5.4367

Amador, & Paniagua, 2025). Its measurement is also method-dependent, and contemporary analytical work continues to refine enzymatic and mass-spectrometric approaches (Hokazono, Haraguchi, Higashinakao, Mominoki, Uchiumi, & Kayamori, 2025; Pineda-Cevallos, Funes Menéndez, González-Gago, Rodríguez-González, & García Alonso, 2024). An isolated elevated creatinine value, therefore, requires clinical context and does not by itself establish chronic kidney disease or prove that a stone caused the abnormality.

Previous Indonesian studies have described demographic, risk-factor, imaging, and clinical profiles of nephrolithiasis, including studies at Dr. H. Abdul Moeloek Regional General Hospital (Maulana, Purnanto, Triswanti, & Prasetia, 2023; Rahmawati, Purnanto, Triswanti, & Wahyudi, 2023; Gusna, Hasbie, Dalfian, & Sahara, 2025) and other Indonesian settings (Tombokan, Rondo, & Simanjuntak, 2024; Pradana, Anandasari, Margiani, & Suadiatmika, 2024). However, the association between stone-size category and serum creatinine in the local hospital population remains insufficiently characterized. This study, therefore, examined the association among patients with unilateral nephrolithiasis.

RESEARCH METHOD

This retrospective cross-sectional study used secondary medical record data from Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province. The source population comprised 120 patients with nephrolithiasis, and 92 records were included through purposive sampling. Medical records from 2025 were reviewed in February 2026. The source manuscript did not specify the imaging modality used to determine stone size, the detailed record-selection criteria beyond purposive sampling, or the timing of serum creatinine measurement relative to imaging or treatment; these items are therefore reported as unavailable rather than inferred.

The independent variable was stone-size category, and the dependent variable was serum creatinine. Stone size was categorized as <5 mm, 5-10 mm, or >10 mm based on values documented in the medical record.

Serum creatinine was recorded in mg/dL and analyzed as a continuous variable. For descriptive reporting, the study also classified values relative to gender-specific study thresholds of <=1.3 mg/dL in men and <=1.1 mg/dL in women.

Stone-size categories were coded ordinally as 1 = <5 mm, 2 = 5-10 mm, and 3 = >10 mm. Spearman's rank correlation was used to assess the association between stone-size category and serum creatinine, with statistical significance set at $p < 0.05$.

RESEARCH RESULTS

Table 1. Patient characteristics (N = 92)

Variable	Results
Estimated age, years, mean ± SD	50.21 ± 14.49
Age(n%)	
18–25	3/3.3
26–35	13/14.1
36–45	23/25.0
46–55	16/17.4
56–65	19/20.7
>65	18/19.6

Latiffah Anggun[1], Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati

Corresponding Author: Latiffah Anggun. Email: latiffahanggun@gmail.com

DOI: https://doi.org/10.56922/msc.v6i5.4367

Gender (n/%)	
Male	51/55.4
Female	41/44.6

As presented in Table 1, most patients were male (51 patients, 55.4%). The 36–45-year age group was the most frequent (23 patients, 25.0%), whereas the 18–25-year age group was the least frequent (3 patients, 3.3%). The estimated mean age was 50.21 ± 14.49 years, calculated from grouped age categories. For this approximation, category midpoints were used and the open-ended >65-year category was represented by 70.5 years; this value is an estimate rather than an observed individual-level mean. The actual minimum and maximum ages were not available from the grouped data.

Table 2. Stone size and serum creatinine (N = 92)

Measure	Results
Stone-size category (n/%)	
<5 mm	52/56.5
5–10 mm	31/33.7
>10 mm	9/9.8
Total	92/100.0
Stone size, mean (range), mm	5.76 (1-11)
Serum creatinine category (n/%)	
Within threshold	20/21.7
Above threshold	72/78.3
Serum creatinine, mean (range), mg/dL	1.61 (0.80-3.12)

Table 2 demonstrates the distribution of stone size and serum creatinine. Stones measuring <5 mm were the most common (52 patients, 56.5%), whereas stones >10 mm were observed in 9 patients (9.8%). The mean stone size was 5.76 mm (range, 1–11 mm). Serum creatinine levels were above the study-defined threshold in 72 patients (78.3%), with a mean serum creatinine level of 1.61 mg/dL (range, 0.80–3.12 mg/dL).

Table 3. Association between stone-size category and serum creatinine

Variables	N	Spearman r_s	*p* value
Stone-size category and serum creatinine	92	0.732	< 0.001

Table 3 shows a strong positive correlation between stone-size category and serum creatinine (r_s = 0.732, p < 0.001). Higher stone-size categories were significantly associated with higher serum creatinine levels in the study sample.

Latiffah Anggun[1], Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati

DOI: https://doi.org/10.56922/msc.v6i5.4367

DISCUSSION

The principal finding was a strong positive association between stone-size category and serum creatinine. The result describes an overall relationship among the 92 analyzed records, but it does not demonstrate that stone size independently determines renal function or that increasing stone size causes the elevation in creatinine.

Obstruction provides a plausible clinical pathway linking stone disease with impaired renal function. The EAU (2026) recognizes obstruction and infection as important considerations in urolithiasis, while reviews similarly emphasize obstruction, infection, stone burden, and patient factors in the assessment and management of urolithiasis (Geraghty et al., 2023; Redfern & Mortimore, 2022). However, the present study did not test an obstructive mechanism or adjust for its severity, so the correlation should not be interpreted as evidence of a specific causal pathway.

Most patients had stones <5 mm, and only nine had stones >10 mm. The unequal category sizes limit interpretation of the largest-stone group. The study also combined all stones >10 mm into a single category, whereas the EAU (2026) uses more detailed size strata in its clinical algorithms. Consequently, these findings apply to the study's three-category classification and should not be generalized to more detailed size groups.

Serum creatinine was above the study-defined threshold in 78.3% of patients. This proportion describes a laboratory classification and should not be interpreted as the prevalence of chronic kidney disease. Creatinine varies with biological and clinical factors (Ávila et al., 2025). Longitudinal evidence has linked urolithiasis with a higher subsequent risk of chronic kidney disease, but such population-level associations do not establish that an elevated creatinine value in an individual patient was caused by a stone (Kim, Lee, Park, & Chang, 2024; Stepanova, 2025). Stone disease is also associated with broader systemic comorbidities that can complicate the interpretation of renal risk (Gambaro, Lombardi, Caletti, Ribichini, Ferraro, & Gambaro, 2022).

Male represented a modest majority of the sample, and the largest age group was 36-45 years. These findings describe the selected hospital records rather than population-level incidence or risk. Stone composition and distribution can vary by age and gender (Siener, Rüdy, Herwig, Schmitz, Schaefer, Lossin, & Hesse, 2024), but the present study did not test whether these demographic characteristics modified the association between stone size and creatinine.

The analysis did not provide serum creatinine summaries separately for each stone-size category. The overall correlation, therefore, does not reflect the magnitude of differences in creatinine between individual categories. Category-specific means, medians, measures of dispersion, and adjusted estimates would provide a more informative description of the observed relationship.

The findings support considering stone characteristics alongside renal function measurements during patient assessment. Current reviews and guidelines emphasize individualized evaluation that integrates stone burden, symptoms, obstruction, infection, laboratory findings, and recurrence risk (Bhojani et al., 2022; Spradling, Ganesan, & Conti, 2022; Carvalho et al., 2025). Clinical interpretation of the present results remains limited by the retrospective design and absence of adjusted analysis. The study does not establish a stone-size cutoff for predicting renal impairment, determine treatment benefit, or support a causal conclusion.

LIMITATIONS

This single-hospital study relied on retrospectively reviewed medical records and was vulnerable to incomplete documentation and selection bias. Its cross-sectional design did not establish temporal order or causality. Reporting of the imaging method, handling of multiple stones, creatinine assay, and reference interval, timing of laboratory testing relative to imaging or treatment, and baseline kidney-function information were incomplete. Hydronephrosis, stone location and number, infection, comorbidities, medications, muscle mass, and hydration were not evaluated in an adjusted model. Only nine patients had stones >10 mm, and the broad stone-size categories further limited interpretation.

Latiffah Anggun[1], Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati

DOI: https://doi.org/10.56922/msc.v6i5.4367

CONCLUSION

Higher stone-size categories were associated with higher serum creatinine among 92 patients with unilateral nephrolithiasis (Spearman rho = 0.732; $p < 0.001$). This association was observed in a retrospectively selected hospital sample and does not establish causality or independence from other clinical factors.

SUGGESTION

Future studies should use larger samples, standardized imaging and laboratory measurements, and clearly documented timing of measurements relative to treatment. Assessment of estimated glomerular filtration rate, hydronephrosis, stone location and number, recurrent stones, diabetes, hypertension, body mass index, and other potential confounders would support a more informative analysis. Multivariable and longitudinal approaches could clarify whether stone size remains associated with renal-function measures after adjustment and over time.

ACKNOWLEDGMENT

The authors thank the Faculty of Medicine, Universitas Malahayati, and Dr. H. Abdul Moeloek Regional General Hospital, Lampung Province, for academic and administrative support.

REFERENCES

Ávila, M., Mora Sánchez, M. G., Bernal Amador, A. S., & Paniagua, R. (2025). The metabolism of creatinine and its usefulness to evaluate kidney function and body composition in clinical practice. Biomolecules, 15(1), 41. https://doi.org/10.3390/biom15010041

Bhojani, N., Bjazevic, J., Wallace, B., Lee, L., Kaler, K. S., Dion, M., Cowan, A., Sultan, N., Chew, B. H., & Razvi, H. (2022). UPDATE - Canadian Urological Association guideline: Evaluation and medical management of kidney stones. Canadian Urological Association Journal, 16(6), 175-188. https://doi.org/10.5489/cuaj.7872

Carvalho, M., Matos, A. C. C., Santos, D. R., Barreto, D. V., Barreto, F. C., Rodrigues, F. G., Pietrobom, I. G., da Luz, L. G., Constancio, N. S., Gomes, S. A., & Heilberg, I. P. (2025). Brazilian guidelines on evaluation and clinical management of nephrolithiasis: Brazilian Society of Nephrology. Jornal Brasileiro de Nefrologia, 47(2), e20240189. https://doi.org/10.1590/2175-8239-JBN-2024-0189en

European Association of Urology. (2026). EAU guidelines on urolithiasis. https://uroweb.org/guidelines/urolithiasis

Gambaro, A., Lombardi, G., Caletti, C., Ribichini, F. L., Ferraro, P. M., & Gambaro, G. (2022). Nephrolithiasis: A red flag for cardiovascular risk. Journal of Clinical Medicine, 11(19), 5512. https://doi.org/10.3390/jcm11195512

Geraghty, R. M., Davis, N. F., Tzelves, L., Lombardo, R., Yuan, C., Thomas, K., Petrik, A., Neisius, A., Türk, C., Gambaro, G., Skolarikos, A., & Somani, B. K. (2023). Best practice in interventional management of urolithiasis: An update from the European Association of Urology Guidelines Panel for Urolithiasis 2022. European Urology Focus, 9(1), 199-208. https://doi.org/10.1016/j.euf.2022.06.014

Gusna, A. D., Hasbie, N. F., Dalfian, D., & Sahara, N. (2025). Faktor-faktor risiko yang berhubungan dengan kejadian nephrolithiasis di RSUD Dr. H. Abdul Moeloek Provinsi Lampung. Jurnal Ilmu Kedokteran dan Kesehatan, 12(1), 30-37. https://doi.org/10.33024/jikk.v12i1.16518

Hokazono, E., Haraguchi, Y., Higashinakao, A., Mominoki, A., Uchiumi, T., & Kayamori, Y. (2025). Development of a high-sensitivity double kinetic assay for creatinine using the enzymatic cycling method and its application to serum samples. Analytical Biochemistry, 703, 115877. https://doi.org/10.1016/j.ab.2025.115877

Kachkoul, R., Touimi, G. B., El Mouhri, G., El Habbani, R., Mohim, M., & Lahrichi, A. (2023). Urolithiasis: History, epidemiology, aetiologic factors and

Latiffah Anggun[1], Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati

DOI: https://doi.org/10.56922/msc.v6i5.4367

management. Malaysian Journal of Pathology, 45(3), 333-352.

Kim, J. Y., Lee, J. K., Park, J. T., & Chang, T. I. (2024). Risk of incident chronic kidney disease among patients with urolithiasis: A nationwide longitudinal cohort study. Clinical Kidney Journal, 17(3), sfae030. https://doi.org/10.1093/ckj/sfae030

Ma, Y., Cheng, C., Jian, Z., Wen, J., Xiang, L., Li, H., Wang, K., & Jin, X. (2024). Risk factors for nephrolithiasis formation: An umbrella review. International Journal of Surgery, 110(9), 5733-5744. https://doi.org/10.1097/JS9.0000000000001719

Maulana, K., Purnanto, E., Triswanti, N., & Prasetia, T. (2023). Hubungan antara usia dan jenis kelamin dengan kejadian nephrolithiasis di ruang rawat inap bedah RSUD Dr. H. Abdul Moeloek Provinsi Lampung. Jurnal Ilmu Kedokteran dan Kesehatan, 10(5), 1964-1970. https://doi.org/10.33024/jikk.v10i5.10063

Pineda-Cevallos, D., Funes Menéndez, M., González-Gago, A., Rodríguez-González, P., & García Alonso, J. I. (2024). Correction of creatine-creatinine conversion during serum creatinine quantification by two-dimensional liquid chromatography and double-spike isotope dilution tandem mass spectrometry. Clinica Chimica Acta, 554, 117778. https://doi.org/10.1016/j.cca.2024.117778

Pradana, I. G. A., Anandasari, P. P. Y., Margiani, N. N., & Suadiatmika, D. G. M. (2024). Karakteristik imaging CT-scan pada penderita batu ginjal dan batu saluran kemih di RSUP Prof. Ngoerah tahun 2021-2022. Essential: Essence of Scientific Medical Journal, 21(2), 10-15. https://doi.org/10.24843/essential.v21i2.109214

Rahmawati, R., Purnanto, E., Triswanti, N., & Wahyudi, A. (2023). Hubungan gambaran ultrasonografi (USG) ginjal dengan tingkat nyeri pada pasien nephrolithiasis berdasarkan Visual Analogue Scale (VAS) di RSUD Dr. H. Abdul Moeloek Provinsi Lampung. Jurnal Ilmu Kedokteran dan Kesehatan, 10(6), 2090-2096. https://doi.org/10.33024/jikk.v10i6.9580

Redfern, V., & Mortimore, G. (2022). Renal and ureteric stones: A clinical review. British Journal of Nursing, 31(9), S14-S22. https://doi.org/10.12968/bjon.2022.31.9.S14

Siener, R., Rüdy, J., Herwig, H., Schmitz, M.-T., Schaefer, R. M., Lossin, P., & Hesse, A. (2024). Mixed stones: Urinary stone composition, frequency and distribution by gender and age. Urolithiasis, 52(1), 24.

Spradling, K., Ganesan, C., & Conti, S. (2022). Medical treatment and prevention of urinary stone disease. Urologic Clinics of North America, 49(2), 335-344. https://doi.org/10.1016/j.ucl.2021.12.007

Stepanova, N. (2025). Balancing stone prevention and kidney function: A therapeutic dilemma. Journal of Clinical Medicine, 14(11), 3678. https://doi.org/10.3390/jcm14113678

Tombokan, N. G. E., Rondo, A. G. E. Y., & Simanjuntak, M. L. (2024). Gambaran ultrasonografi ginjal pada penderita penyakit ginjal kronis dengan nefrolitiasis di RSUP Prof. Dr. R. D. Kandou periode Juli 2022 hingga Juli 2023. e-CliniC, 12(3), 258-264. https://doi.org/10.35790/ecl.v12i3.53393

Latiffah Anggun[1], Yusmaidi[2], Nia Triswanti[3], Veronica Ella Rimawati[4]

[1]Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Malahayati
[2]Departemen Bedah Digestif Rumah Sakit Umum Daerah Dr. H. Abdul Moloek
[3]Departemen Biologi Kimia Fakultas Kedokteran Universitas Malahayati
[4]Departemen Histologi Fakultas Kedokteran Universitas Malahayati

DOI: https://doi.org/10.56922/msc.v6i5.4367