

Health-related Quality of Life Among Urinary Stone Patients in Central Jordan: A Cross-sectional Study Using SF-36

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What's known on the subject? and What does the study add?

Urinary stone disease can impair health related quality of life, but evidence from Jordan remains limited. This cross-sectional study assessed 288 patients in Central Jordan using the Arabic SF-36. Younger age was associated with higher scores in most domains. Stones >1.3 cm were associated with higher adjusted emotional role, social functioning, pain, and general health scores. Sex and employment status were associated with selected domains. These findings provide regional evidence to inform patient-centered care; the cross-sectional design does not establish causality.

Abstract

Objective: This study evaluated health-related quality of life (HRQoL) among Jordanian patients with urolithiasis using the short form 36 health survey questionnaire (SF-36) and tested associations with demographic and clinical factors.

Materials and Methods: A cross-sectional survey of 288 adults attending As-Salt Hospital's urology clinics between June 2024 and March 2025 was conducted using the validated Arabic SF-36. Consecutive patients attending urology clinics who were aged ≥ 18 years and had no psychiatric or chronic medical illnesses were approached. Clinical variables included stone size, location, number of procedures, and treatment modality. Multivariable linear regression identified independent predictors of SF-36 domains after adjustment for age, sex, marital status, and employment.

Results: Mean age 36.7 ± 10.2 years; 67.4% male; 63.9% married. Physical functioning and social functioning had the highest domain mean scores (64.7 and 60.8, respectively). Energy/fatigue and general health had the lowest scores (50.6 and 51.9, respectively). In multivariable analysis, patients aged 18-29 years had higher physical functioning ($\beta=29.65$, $p<0.001$) and energy/fatigue scores ($\beta=13.57$, $p<0.001$) than those aged >50 years. Ureteric versus both kidney and ureter locations was not significantly associated with physical functioning ($\beta=-6.78$, $p=0.121$). Stones >1.3 cm versus ≤ 1.3 cm were associated with higher emotional role ($\beta=20.07$, $p=0.003$), social functioning ($\beta=8.27$, $p=0.014$), pain ($\beta=7.65$, $p=0.023$), and general health scores ($\beta=3.28$, $p=0.041$).

Conclusion: HRQoL among patients with urolithiasis in Jordan may be associated with age and stone burden. Gender and employment were associated with some domains. Findings emphasize the need for patient-centered management and early evaluation, but do not indicate causality due to the nature of this study.

Keywords: Urolithiasis, quality of life, SF-36, Jordan, urinary stones

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Received: 04.11.2025 **Accepted:** 14.12.2025 **Epub:** 13.10.2026

Cite this article as: Farraj H, Alriyalat S, As'ad A. Health-related quality of life among urinary stone patients in central Jordan: a cross-sectional study using SF-36. J Urol Surg. [Epub Ahead of Print]

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Introduction

Urolithiasis, or urinary stone disease, is a common and recurrent condition with a lifetime prevalence ranging from 1% to 13%, depending on the population and geographical location (1). Over the past few decades, its global incidence has risen significantly, likely due to lifestyle and dietary changes (1,2). Recurrence is a major concern, with studies estimating that 30-50% of patients experience another episode within ten years of their first episode (1).

Urinary stones can present with a range of clinical manifestations, from asymptomatic cases to acute ureteric colic and severe complications, such as infection and sepsis (3). Chronic stone formers often require repeated medical interventions, frequent follow-ups, and they may experience significant disruptions to their daily routines and overall well-being (3). Treatment options depend on the stone's size, location, and symptom severity, and include conservative management, medical expulsive therapy, and various surgical interventions (4,5).

Patients with symptomatic stones report significantly higher levels of stress, anxiety, and depression than the general population (6). Furthermore, many affected individuals are of working age, and time away from employment due to stone episodes can impose substantial economic strain on individuals, their families, and society (7).

Studies have shown that more frequent stone episodes correlate with greater impairment in health-related quality of life (HRQoL), while preventive strategies can improve patient outcomes (8). Factors such as distance to healthcare facilities, travel burden, and delays in accessing care can further worsen HRQoL (9). In addition, socio-economic disparities play a significant role, with patients from low-income or minority backgrounds experiencing disproportionately worse QoL outcomes (10).

Several variables have been identified as key predictors of QoL in stone patients. These include age, body mass index, number of surgical interventions, sleep quality, and even work environment (11,12). This study aims to examine the psychosocial and functional implications of urolithiasis.

Materials and Methods

This cross-sectional, clinic-based survey was conducted at the Urology Department of As-Salt Hospital, Balqa Governorate, Jordan, from June 2024 to March 2025. Consecutive patients attending routine follow-up or pre-operative consultations were approached during outpatient hours.

Adults aged ≥ 18 years with radiologically confirmed urinary stones who were managed for urolithiasis for at least one episode during the preceding year and whose native language

was Arabic were included. This study excluded patients with cognitive or psychiatric impairment, active infection, pregnancy, chronic medical illnesses such as chronic kidney disease, diabetes mellitus, and hypertension requiring pharmacologic treatment, chronic pain syndromes, neoplastic disease, neurologic disorders, or patients who refused to participate.

We applied the exclusion criteria mentioned because of the well-known impact of medical comorbidities on generic QoL measures such as short form 36 health survey questionnaire (SF-36), which we used in this study.

A minimum sample size of 250 participants was estimated using G*Power ($\alpha=0.05$, power=0.80) to detect a moderate effect size ($f^2=0.10$) in a multivariate regression with eight predictors. Allowing for a 10% non-response, 300 patients were targeted. The final analytic sample was 288, representing a 96% response rate over the study period.

Socio-demographic variables included age, sex, marital status, educational level, and employment. Data about stone size (cm) and location (kidney vs. ureter) were abstracted from imaging reports (computed tomography or ultrasound). Stone size was defined as the largest diameter measured radiographically. We collected data on the history and frequency of interventions, such as ureteroscopy (URS), retrograde intrarenal surgery (RIRS), shock wave lithotripsy (SWL), or percutaneous nephrolithotomy (PNL), if any had been performed in the last 12 months.

The SF-36 consists of 36 items assessing eight QoL domains: physical functioning (PF), role limitations/physical, pain, general health (GH), vitality (VT; energy and fatigue), social functioning (SF), role limitations/emotional, and mental health (MH; emotional well-being). The validated Arabic version of the SF-36 (13) was used; domain scores were computed on a 0-100 scale, with higher scores indicating better HRQoL.

We acknowledge that disease-specific instruments, such as the Wisconsin Stone QoL (WISQoL) questionnaires, demonstrate greater sensitivity in detecting urolithiasis-related symptoms. However, the choice of the SF-36 in this study was driven by both feasibility and methodological considerations.

The SF-36 is concise and provides a relatively low respondent burden, making it suitable for routine use in fast-paced clinical settings.

Importantly, the SF-36 has been validated locally and has a well-established psychometric profile. Its prior use in urolithiasis cohorts supports its ability to detect meaningful differences in the general physical and mental health of stone patients, even though it does not evaluate stone-specific symptom domains.

We asked all participants in this research to provide informed consent before completing the questionnaire. We did not collect

personally identifiable data to ensure patient privacy and confidentiality.

The study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval has been sought from the Al-Balqa Applied University, Institutional Review Board at the Faculty of Medicine to ensure that all ethical standards are met throughout the research process (approval no: B.A.T 37/2024, date: 17.07.2024).

Statistical Analysis

Analyses were performed using IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarize demographic and clinical characteristics. SF-36 items were scored following the standard scoring system, including recoding of negatively oriented items and linear transformation of all domains to a 0-100 scale. Descriptive statistics are presented as mean $\pm$ standard deviation (SD) to ensure comparability with existing SF-36 literature. Because SF-36 scores were non-normally distributed, non-parametric tests were used.

Continuous outcomes from the SF-36 quality-of-life domains were summarized using means and SDs. Comparisons between two independent groups (e.g., gender: male vs. female; marital status: married vs. not married; employment status: employed vs. unemployed) were performed using the Wilcoxon rank-sum test (Mann-Whitney U test). For each group comparison, mean SD values for the SF-36 domains are reported for descriptive purposes, and two-tailed p-values from the Mann-Whitney U test are reported to assess statistical significance. Kruskal-Wallis tests were used for three-group comparisons. A p-value <0.05 was considered statistically significant.

Multivariable linear regression analyses were performed with each SF-36 domain as the dependent variable. Independent variables included age, stone size (cm), number of procedures, and treatment modalities (medical expulsive therapy, semirigid URS, RIRS), all entered simultaneously. Age was modeled as an approximately continuous variable using the midpoints of predefined age groups. Treatment variables were coded as binary indicators (1=received, 0=not received). Regression coefficients (β) and corresponding p-values were reported, with $p<0.05$ considered statistically significant.

Selection of the appropriate model followed a clinical-hierarchical approach: all relevant clinical variables, and those with $p<0.15$ in univariate screening, were entered into the initial multivariable model. We retained variables that were statistically significant or whose removal changed any β coefficient by $\geq 10\%$. Model assumptions were evaluated using residual plots, Q-Q plots, Shapiro-Wilk tests, and tests for homoscedasticity. Collinearity was examined using variance inflation factors; all were <5 . We summarized model performance using R^2 and

adjusted R^2 . Regression coefficients (β), 95% confidence intervals, and p-values are reported for all predictors.

Potential confounders were determined based on clinical relevance, priority, and data from previous research on factors that may affect the severity of stone disease and health-related quality of life. This included factors such as age, stone size, selected treatment modality, and frequency of previous procedures. All treatment modalities were coded as binary variables (yes/no). Every SF-36 domain was modelled separately, using a fully adjusted multivariable linear regression model to estimate the independent effect of each domain on HRQoL, while we kept the other covariates constant.

Results

A total of 288 patients completed the survey (response rate=96%). The mean age was 36.7 ± 10.2 years (range 18-65). Most participants were male (67.4%), married (63.9%), and employed (71.5%). Fifty-two point eight percent had stones ≤ 1.3 cm; 39.9% were in the kidney and 34.7% in the ureter. Approximately 50% underwent more than one procedure. The most frequent intervention was shockwave lithotripsy (48.3%), followed by semirigid URS (32%), and RIRS (29%) (Table 1).

Mean SF-36 domain scores (SD) were physical functioning 64.72 (± 25.63), role limitations due to physical health 52.17 (± 37.82), pain 59.29 (± 23.80), general health 51.89 (± 9.90), energy/fatigue 50.59 (± 17.11), social functioning 60.76 (± 21.29), role limitations due to emotional problems 54.75 (± 41.84), and emotional well-being 55.43 (± 17.04). Energy/fatigue and general health had the lowest mean domain scores. The separate health-change item had a mean score of 52.69 (± 22.07).

Significant differences in SF-36 domain scores were observed based on gender, marital status, and employment status. Female patients reported better QoL than males, with higher scores in PF (69.6 vs. 62.4, $p=0.014$) (Table 2), energy/fatigue (54.8 vs. 48.5, $p=0.011$), emotional well-being (58.8 vs. 53.8, $p=0.021$), SF (65.7 vs. 58.4, $p=0.005$), pain (67.9 vs. 55.1, $p<0.001$), GH (54.6 vs. 50.6, $p<0.001$), and health change (57.2 vs. 50.5, $p=0.041$). Marital status was also associated with significant differences: unmarried participants scored higher than married participants in PF (70.2 vs. 61.6, $p=0.001$); role limitations due to physical health (60.1 vs. 47.7, $p=0.006$); energy/fatigue (55.2 vs. 48.0, $p<0.001$); emotional well-being (58.1 vs. 53.9, $p=0.024$); SF (68.2 vs. 56.6, $p<0.001$); pain (70.9 vs. 52.7, $p<0.001$); GH (54.5 vs. 50.4, $p<0.001$); and health change (59.1 vs. 49.1, $p<0.001$). Employment status was significantly associated only with the pain domain; unemployed individuals reported higher scores than employed participants (64.3 vs. 57.3; $p=0.037$), indicating less pain (Table 2).

Table 1. Demographic and clinical characteristics of included patients

Characteristic	n=288 ¹
Marital status	
Married	184 (63.89%)
Not married	104 (36.11%)
Gender	
Female	94 (32.64%)
Male	194 (67.36%)
Age	
>50	41 (14.24%)
18-29	79 (27.43%)
30-39	87 (30.21%)
40-49	81 (28.13%)
Employment status	
Employed	206 (71.53%)
Not employed	82 (28.47%)
Education combined	
No education	25 (8.68%)
Secondary	111 (38.54%)
University	152 (52.78%)
Stone location	
Both	73 (25.35%)
Kidney	115 (39.93%)
Ureteric	100 (34.72%)
Shockwave lithotripsy	
0	139 (48.26%)
1	99 (34.38%)
2	46 (15.97%)
3	4 (1.39%)
Retrograde intrarenal surgery	83 (29%)
Medical expulsive therapy	66 (23%)
Semirigid ureteroscopy	93 (32%)
Number of procedures	
0	26 (9.03%)
1	119 (41.32%)
2	116 (40.28%)
3	26 (9.03%)
4	1 (0.35%)
Stone size	
1.3 or less	152 (52.78%)
More than 1.3	136 (47.22%)
Physical	64.72 (25.63)
Limitations physical	52.17 (37.82)
Emotional	55.43 (17.04)
Limitations emotional	54.75 (41.84)
Energy	50.59 (17.11)
Pain	59.29 (23.80)
Social	60.76 (21.29)
General	51.89 (9.90)
Health	52.69 (22.07)

¹: n (%), mean (standard deviation)

Significant differences in SF-36 scores were observed based on stone size and the use of medical expulsive therapy. Participants with stones >1.3 cm appeared to have higher scores in PF (p=0.035) (Table 3), role limitations due to physical health (p=0.003), emotional problems (p<0.001), SF (p=0.001), and pain (p=0.008), compared to those with larger stones. Similarly, patients who did not receive medical expulsive therapy reported higher scores on measures of PF (p=0.017), role limitations due to physical health (p<0.001), emotional problems (p<0.001), SF (p=0.020), and emotional well-being (p=0.030). No significant differences were observed in SF-36 domains associated with semirigid URS (Table 3).

RIRS and stone location were significantly associated with variations in SF-36 scores. Patients who underwent RIRS reported higher scores on role limitations due to physical health (p=0.043) (Table 4), emotional problems (p=0.023), and SF (p=0.039) compared with those who did not undergo RIRS. Stone location also influenced PF (p=0.022), with the highest scores observed in patients with stones in both the kidney and the ureter. Role limitations due to physical health (p=0.018) and emotional problems (p=0.006) also varied significantly by stone location. The number of procedures was not significantly associated with any SF-36 domain (Table 4).

Age and education level were significantly associated with variations in SF-36 scores. SF differed notably across age groups (p<0.001) (Table 5), with the highest scores reported among participants aged 18-29 (75.4%), followed by those aged 30-39 (63.3%). Educational level also influenced SF (p<0.001), with the highest value observed among university-educated individuals (69.3%). Pain scores varied significantly by age (p=0.006) and education (p<0.001), with better scores in younger participants and those with higher education. Role limitations due to emotional problems differed by educational level (p=0.039), with university graduates reporting the highest scores. PF, role limitations due to physical health, energy/fatigue, emotional well-being, and GH varied significantly by age and education (p<0.001), with younger and more educated individuals reporting better outcomes.

Multivariate linear regression identified age and stone size as significantly associated with several SF-36 domains. Compared with participants over 50, those aged 18-29 had significantly higher scores in PF (p<0.001, β =29.6), role limitations due to physical health (p=0.001, β =34.6), and energy/fatigue (p<0.001, β =13.6). Also, they scored better in the rest of QoL domains, and this was significant for all domains except GH. The 30-39 age group also showed higher PF (p<0.001, β =20.8), higher physical role scores (p=0.006, β =19.3), higher energy and fatigue scores (p=0.006, β =8.6), and reported less pain (p<0.001, β =20.1). Stones >1.3 cm were associated with better scores for emotional role limitation (p=0.003, β =20), pain (p=0.02, β =7.65), SF

Table 2. Comparisons between QoL domains vs. gender, marital status, and employment status. Gender, marital status, and employment status were treated as nominal variables. QoL domain scores are continuous and presented as mean (SD)

Characteristic	Gender			Marital status			Employment status		
	Female n=94 ¹	Male n=194 ¹	p ²	Married n=184 ¹	Not married n=104 ¹	p ²	Employed n=206 ¹	Not employed n=82 ¹	p ²
Physical	69.63 (26.67)	62.35 (24.83)	0.014	61.63 (23.63)	70.19 (28.12)	0.001	64.90 (23.76)	64.27 (29.97)	0.7
Role limitations/ physical health	55.59 (41.99)	50.52 (35.63)	0.3	47.69 (34.45)	60.10 (42.17)	0.006	50.97 (35.94)	55.18 (42.26)	0.4
Role limitations/ emotional problems	52.13 (44.68)	56.01 (40.45)	0.6	55.98 (39.59)	52.56 (45.67)	0.6	56.80 (40.65)	49.59 (44.52)	0.3
Energy/fatigue	54.84 (13.47)	48.53 (18.30)	0.011	47.96 (16.49)	55.24 (17.27)	<0.001	50.15 (16.96)	51.71 (17.54)	0.6
Emotional well-being	58.77 (15.00)	53.81 (17.75)	0.021	53.91 (16.60)	58.12 (17.55)	0.024	55.03 (17.54)	56.44 (15.75)	0.4
Social functioning	65.69 (21.84)	58.38 (20.65)	0.005	56.59 (19.34)	68.15 (22.64)	<0.001	59.59 (19.89)	63.72 (24.34)	0.084
Pain	67.87 (23.25)	55.13 (22.99)	<0.001	52.72 (19.98)	70.91 (25.61)	<0.001	57.31 (21.36)	64.27 (28.58)	0.037
General health	54.63 (9.79)	50.57 (9.71)	<0.001	50.41 (9.35)	54.52 (10.35)	<0.001	51.72 (9.46)	52.32 (10.98)	0.5
Health change	57.18 (24.21)	50.52 (20.67)	0.041	49.05 (20.31)	59.13 (23.64)	<0.001	52.06 (20.48)	54.27 (25.70)	0.7

¹: Mean (SD), ²: Wilcoxon rank sum test, SD: Standard deviation, QoL: Quality of life

Table 3. Comparisons between QoL domains vs. stone size, medical expulsive therapy, and semirigid ureteroscopy. Stone size was treated as ordinal variable while medical expulsive therapy and semirigid ureteroscopy were categorized as nominal. QoL domain scores are continuous and presented as mean (SD)

Characteristic	Stone size (cm)			Medical expulsive therapy			Semirigid ureteroscopy		
	1.3 or less n=152 ¹	More than 1.3 n=136 ¹	p ²	Yes n=66 ¹	No n=222 ¹	p ²	Yes n=93 ¹	No n=195 ¹	p ²
Physical health	61.78 (26.17)	68.01 (24.69)	0.035	57.42 (28.22)	66.89 (24.45)	0.017	62.63 (27.03)	65.72 (24.94)	0.4
Role limitations/ physical health	46.05 (36.97)	59.01 (37.72)	0.003	37.12 (36.49)	56.64 (37.12)	<0.001	48.39 (38.09)	53.97 (37.65)	0.2
Role limitations/ emotional problems	45.61 (41.62)	64.95 (39.82)	<0.001	37.88 (41.71)	59.76 (40.64)	<0.001	48.39 (43.27)	57.78 (40.90)	0.087
Energy/fatigue	48.68 (16.65)	52.72 (17.43)	0.065	47.65 (17.10)	51.46 (17.05)	0.15	48.28 (17.20)	51.69 (17.00)	0.13
Emotional well-being	53.66 (16.32)	57.41 (17.66)	0.10	51.94 (16.83)	56.47 (17.00)	0.030	53.12 (16.45)	56.53 (17.24)	0.12
Social functioning	57.07 (20.28)	64.89 (21.70)	0.001	55.30 (20.69)	62.39 (21.24)	0.020	58.74 (18.87)	61.73 (22.33)	0.4
Pain	55.86 (23.77)	63.13 (23.32)	0.008	55.38 (23.66)	60.45 (23.77)	0.2	59.11 (26.18)	59.37 (22.65)	0.7
General health	51.12 (9.84)	52.76 (9.94)	0.083	51.67 (10.39)	51.96 (9.78)	0.7	50.91 (9.53)	52.36 (10.07)	0.3
Health change	53.29 (21.66)	52.02 (22.58)	0.6	52.65 (23.26)	52.70 (21.76)	>0.9	54.30 (24.62)	51.92 (20.77)	0.4

¹: Mean (SD), ²: Wilcoxon rank sum test, SD: Standard deviation, QoL: Quality of life

($p=0.01$, $\beta=8.27$), and GH ($p=0.04$, $\beta=3.28$). Male patients had more pain, less energy, greater fatigue, and poorer GH compared with female patients. Unemployed participants scored poorly on measures of PF and GH (Tables 6 and 7).

The choice of procedure does not significantly affect most domains of postoperative quality of life in patients with renal stones, excluding ureteric stones. Regardless of whether patients underwent SWL, RIRS, or PNL, and after adjusting for age, gender, and stone size, general recovery and perceived well-being were broadly similar across physical, emotional, and social domains. Patients managed with RIRS or PNL reported higher GH scores than patients treated with SWL. After adjustment for age, gender, and stone size, URS does not significantly improve or worsen the

SF-36 quality-of-life scores compared with medical expulsive therapy among patients with ureteric stones. Ureteric stones were associated with lower scores in PF, physical role limitations, energy and fatigue, and emotional domains, but none of these associations was statistically significant. No significant associations were found with marital status. Other factors did not demonstrate statistically significant associations.

Discussion

This study provides new evidence on the global HRQoL of patients with urinary stones in Jordan, assessed using the SF-36 instrument.

Table 4. Comparisons between QoL domains vs. retrograde internal surgery, stone location, and number of procedures. Retrograde internal surgery and stone location were nominal variables. Number of procedures treated as ordinal an ordinal variable. QoL domain scores are continuous and presented as mean (SD)

Characteristic	Retrograde intrarenal surgery			Stone location				Number of procedures		
	Yes n=83 ¹	No n=205 ¹	p ²	Kidney n=115 ¹	Ureteric n=100 ¹	Both n=73 ¹	p ²	Once n=119 ¹	Multiple n=143 ¹	p ²
Physical health	65.48 (25.02)	64.41 (25.92)	0.9	67.43 (25.48)	58.85 (27.34)	68.49 (22.09)	0.022	66.93 (22.84)	63.57 (27.54)	0.5
Role limitations/ physical health	59.34 (36.57)	49.27 (38.02)	0.043	56.96 (38.55)	43.50 (36.35)	56.51 (37.04)	0.018	56.72 (34.70)	51.05 (40.12)	0.056
Role limitations/ emotional problems	63.86 (40.73)	51.06 (41.82)	0.023	58.55 (42.48)	44.00 (40.72)	63.47 (39.74)	0.006	59.66 (39.98)	51.05 (42.94)	0.3
Energy/fatigue	51.51 (17.47)	50.22 (16.99)	0.8	51.48 (17.99)	48.30 (17.01)	52.33 (15.64)	0.3	51.05 (16.15)	49.97 (18.45)	0.7
Emotional well-being	58.07 (17.27)	54.36 (16.87)	0.13	56.21 (18.07)	52.40 (16.45)	58.36 (15.66)	0.053	54.29 (16.32)	56.39 (17.88)	0.8
Social functioning	65.06 (21.27)	59.02 (21.10)	0.039	62.83 (21.74)	57.25 (20.35)	62.33 (21.50)	0.12	60.50 (20.45)	60.75 (21.88)	0.9
Pain	63.64 (23.65)	57.52 (23.69)	0.057	62.35 (23.34)	56.43 (24.16)	58.39 (23.78)	0.14	59.75 (21.16)	59.13 (25.86)	0.9
General health	53.67 (9.66)	51.17 (9.93)	0.020	51.48 (10.00)	51.80 (10.51)	52.67 (8.94)	0.7	51.09 (9.37)	52.13 (10.11)	0.4
Health change	51.81 (21.31)	53.05 (22.41)	0.6	52.39 (21.96)	55.25 (22.56)	49.66 (21.45)	0.2	53.57 (20.40)	51.57 (23.78)	0.6

¹: Mean (SD), ²: Wilcoxon rank sum test, Kruskal-Wallis rank sum test, SD: Standard deviation, QoL: Quality of life

Table 5. Comparisons between QoL domains vs. age grouping and education. Age grouping and education were treated as ordinal variables. QoL domain scores are continuous and presented as mean (SD)

Characteristic	Age grouping					Education			
	>50 n=41 ¹	18-29 n=79 ¹	30-39 n=87 ¹	40-49 n=81 ¹	p ²	No education n=25 ¹	Secondar n=111 ¹	University n=152 ¹	p ²
Physical health	45.00 (25.00)	75.76 (25.00)	68.45 (23.36)	59.94 (22.13)	<0.001	51.40 (21.19)	59.41 (25.72)	70.79 (24.65)	<0.001
Role limitations/ physical health	33.54 (35.62)	67.41 (39.50)	55.17 (38.72)	43.52 (29.52)	<0.001	32.00 (31.06)	47.07 (33.67)	59.21 (40.04)	<0.001
Role limitations/ emotional problems	44.72 (43.21)	58.65 (45.36)	52.49 (42.11)	58.44 (36.72)	0.3	34.67 (37.86)	56.16 (38.66)	57.02 (44.01)	0.039
Energy/fatigue	48.88 (18.60)	60.10 (17.19)	54.90 (15.43)	54.77 (16.74)	0.001	43.52 (14.89)	52.29 (17.33)	59.68 (15.77)	<0.001
Emotional well-being	53.66 (19.01)	71.04 (21.33)	61.78 (21.60)	53.24 (17.65)	<0.001	50.50 (15.93)	55.29 (21.09)	66.45 (20.62)	<0.001
Social functioning	42.93 (23.12)	75.38 (22.13)	63.30 (21.15)	47.56 (16.03)	<0.001	44.20 (16.95)	49.03 (21.55)	69.26 (21.85)	<0.001
Pain	50.37 (9.96)	55.38 (10.06)	50.75 (10.72)	50.49 (7.97)	0.006	45.80 (11.70)	49.91 (8.50)	54.34 (9.84)	<0.001
General health	47.56 (20.77)	61.71 (22.59)	51.44 (24.22)	47.84 (16.86)	<0.001	42.00 (20.05)	50.90 (21.30)	55.76 (22.37)	0.008

¹: Mean (SD), ²: Kruskal-Wallis rank sum test, SD: Standard deviation, QoL: Quality of life

Table 6. Multivariable linear regression for SF-36 domains, predictors of physical, role, and emotional SF-36 domains

Predictor	Physical functioning	Role physical	Role emotional	Energy/fatigue	Emotional well-being
Not married vs. married	-0.61 (p=0.884)	-2.45 (p=0.703)	-11.78 (p=0.105)	1.33 (p=0.646)	0.70 (p=0.815)
Male vs. female (REF)	-5.56 (p=0.099)	0.52 (p=0.919)	3.99 (p=0.491)	-4.90 (p=0.035)	-3.83 (p=0.109)
Age 18-29 vs. >50	29.65 (p=0.000)	34.66 (p=0.000)	22.54 (p=0.015)	13.57 (p=0.000)	9.30 (p=0.015)
Age 30-39 vs. >50	20.84 (p=0.000)	19.29 (p=0.006)	3.06 (p=0.696)	8.62 (p=0.006)	5.15 (p=0.113)
Age 40-49 vs. >50	11.64 (p=0.014)	7.23 (p=0.315)	7.33 (p=0.365)	2.39 (p=0.460)	4.77 (p=0.154)
Not employed vs. employed	-7.74 (p=0.036)	-3.16 (p=0.574)	-8.18 (p=0.197)	-4.34 (p=0.087)	-2.25 (p=0.390)
>1.3 cm vs. ≤1.3 cm	1.80 (p=0.649)	9.21 (p=0.128)	20.07 (p=0.003)	3.81 (p=0.161)	2.11 (p=0.452)
Kidney vs. both locations	-1.09 (p=0.764)	-1.82 (p=0.742)	-8.78 (p=0.159)	-1.49 (p=0.549)	-2.28 (p=0.376)
Ureteric vs. both locations	-6.78 (p=0.121)	-6.07 (p=0.363)	-6.92 (p=0.358)	-1.01 (p=0.738)	-3.93 (p=0.207)

Model fit: Physical functioning R²=0.186, adjusted R²=0.160; Role physical R²=0.126, adjusted R²=0.098; Role emotional R²=0.108, adjusted R²=0.079; Energy/fatigue R²=0.143, adjusted R²=0.116; Emotional well-being R²=0.078, adjusted R²=0.048

REF: Reference, SF-36: Short form 36 health survey questionnaire

Table 7. Multivariable linear regression for SF-36 domains, predictors of social, pain, general health, and health change domains

Predictor	Social functioning	Pain	General health	Health change
Not married vs. married	3.57 (p=0.315)	6.51 (p=0.069)	1.97 (p=0.250)	4.17 (p=0.276)
Male vs. female (REF)	-4.34 (p=0.127)	-8.23 (p=0.004)	-3.70 (p=0.007)	-4.75 (p=0.120)
Age 18-29 vs. >50	13.95 (p=0.002)	26.35 (p=0.000)	3.26 (p=0.136)	11.74 (p=0.016)
Age 30-39 vs. >50	7.32 (p=0.058)	20.16 (p=0.000)	0.08 (p=0.966)	4.14 (p=0.317)
Age 40-49 vs. >50	-1.03 (p=0.796)	4.93 (p=0.217)	-0.20 (p=0.919)	0.86 (p=0.840)
Not employed vs. employed	-3.93 (p=0.206)	-4.75 (p=0.128)	-3.23 (p=0.031)	-4.96 (p=0.137)
>1.3 cm vs. ≤1.3 cm	8.27 (p=0.014)	7.65 (p=0.023)	3.28 (p=0.041)	1.82 (p=0.611)
Kidney vs. both locations	-1.30 (p=0.670)	2.41 (p=0.433)	-1.67 (p=0.258)	2.44 (p=0.457)
Ureteric vs. both locations	0.39 (p=0.916)	4.20 (p=0.257)	1.29 (p=0.469)	7.20 (p=0.070)
Model fit: Social functioning R ² =0.108, adjusted R ² =0.080; Pain R ² =0.197, adjusted R ² =0.172; General health R ² =0.127, adjusted R ² =0.099; Health change R ² =0.095, adjusted R ² =0.066 REF: Reference, SF-36: Short form 36 health survey questionnaire				

Our updated results emphasize that younger patients consistently reported better QoL scores, particularly in PF, energy, and emotional well-being. In contrast, patients older than 50 years reported lower scores across most domains, and these findings were consistent with previous studies showing that age is an important predictor of the physical and psychological impact of urinary stone disease (14,15). These findings might be explained by greater physiological resilience and a short duration of symptoms before diagnosis. On the other hand, older patients may experience long-standing comorbidities and treatment delays.

Gender-based differences were also observed: our findings indicated that women had better outcomes than men in several quality-of-life domains, including pain, energy, fatigue, and GH. Although previous literature usually links women with higher levels of pain and emotional distress (16-18), our findings suggest that social factors, such as strong social support and a supportive culture may reduce the disease burden in this context.

This study also showed that married individuals scored significantly worse in the domains of pain, physical health, and GH. These findings may be surprising, since marriage is generally expected to provide greater emotional and social support. We may attribute these findings to the added stress of caregiving, financial strain, or social responsibilities, which are usually greater in married patients. However, marital status was not found to be an independent predictor of quality of life when it was tested in the multivariable regression model, suggesting that those early observations might have been influenced by other factors, such as age and gender (8,19).

Existing evidence indicates that the level of education and improved access to information enable patients to seek medical care earlier, manage symptoms more efficiently, and maintain a better lifestyle. In our study, patients with a higher level of education consistently reported better scores across most physical and emotional domains (20,21).

Stone-related factors, such as size and location, also had a notable impact on overall quality of life. Patients with ureteric stones reported lower scores in PF, emotional health, and role limitations. Patients with stone sizes less than 1.3 cm reported more pain, lower SF, and poorer GH. These findings contradicted the previously known link between larger stone size and reduced HRQoL (14,15). This contradiction might be attributed to factors such as the short duration of this study, but it can also be explained by the fact that patients with larger stones may have benefited from more definitive treatments, including new minimally invasive technologies such as RIRS and highpower laser technology, which reduce the need for multiple procedures and are often associated with less postoperative pain.

Previous studies have shown that early intervention, especially medical expulsive therapy or URS for patients with ureteric stones, is associated with better QoL, highlighting the value of timely, minimally invasive treatment (8,16). However, this cross-sectional study did not show a significant impact of URS or medical expulsive therapy on QoL.

RIRS also appeared to reduce limitations in both physical and emotional roles compared with those who did not undergo this procedure. This supports the increasing use of RIRS in modern urology because it offers a favorable balance between efficacy and invasiveness (8).

Employment can be associated with the physical and mental strain of maintaining work responsibilities while coping with a painful condition such as urolithiasis (22,23). However, we did not find a strong association in this study.

Study Limitations

This study is limited by its single-center design. Its cross-sectional nature prevents long-term assessment. The sample size may not fully represent all patient groups. The exclusion of patients with medical comorbidities limits the generalizability of our findings to more medically complex populations with urinary stones. Our

future plans will focus on evaluating QoL outcomes in larger, comorbidity-inclusive cohorts using disease-specific instruments and multivariable adjustment strategies. The exclusion of patients with mental health conditions underestimates the psychological burden. Additionally, using a generic QoL tool like SF-36 instead of a disease-specific measure limits condition-specific insight. Self-reported measures may introduce recall bias.

Although this study, utilizing a general tool, provides insight into the situation in the local population and may help provide a better initial understanding, we still need to conduct a multicenter study with broader representation and longitudinal follow-up to assess long-term impacts. Disease-specific QoL tools, such as WISQoL, provide more precise insights. The study's cross-sectional design precludes causal inferences.

Conclusion

This study highlights the significant and multifactorial impact of urinary stones on patients' quality of life. Age and stone characteristics play an important role in shaping physical and emotional well-being. Our findings reinforce the importance of individualized, patient-centered management approaches, particularly for older adults, patients with large or ureteric stones, and those without access to early intervention. Understanding these factors can guide clinicians in optimizing care and improving outcomes for patients with this common yet burdensome condition.

Ethics

Ethics Committee Approval: The study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval has been sought from the Al-Balqa Applied University, Institutional Review Board at the Faculty of Medicine to ensure that all ethical standards are met throughout the research process (approval no: B.A.T 37/2024, date: 17.07.2024).

Informed Consent: We asked all participants in this research to provide informed consent before completing the questionnaire. We did not collect personally identifiable data to ensure patient privacy and confidentiality.

Acknowledgments

We would like to express our sincere thanks to medical students: Ghufraan Bani Amer, Aseel Abu Atieh, Meera Jaber, Yasmeen Alsakhen, Yazeed Awamleh, Aya Wishah, Mahmoud Gharaibeh, Alaa Alsoud, and Khaled Shawabkeh, who assisted with data collection.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.F., S.A., A.A., Concept: H.F., Design: H.F., S.A., Data Collection or Processing: H.F., S.A., A.A., Analysis or Interpretation: H.F., S.A., A.A., Literature Search: H.F., S.A., A.A., Writing: H.F., S.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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