

The Impact Of Nephrolithiasis On Patients' Quality Of Life: At Khamis Mushayt General Hospital, Institutional-based Cross-Sectional Study

Turky Yaha Alqahtani¹, Abdulaziz Mohammed Bin Shweel², Fawaz Moshaba Alqahtani³, Abdulrahman Bin Saeed Alqahtani⁴, Thammra Mohammed Al-Ahmary⁵, Saoud Abdullah Alshehri⁶, Ameenah Mohammed Alammari⁷, Nasser Mohammed Al-Sharani⁸, Atyah Mohammed Tuhari⁹, Yousef Saad Alqahtani¹⁰, Saud Mohammed Al-Sharani¹¹, Bassem Mohammed Alshahri¹², Hussian Abdulrahman Hashlan¹³

1. MBBS Khamis Mushait general hospital - Internal medicine - Urology department
2. MBBS, SSc, ME, SCC Khamis Mushait general hospital - Internal medicine - Urology department
3. BMSc Khamis Mushait general hospital - laboratory departments
4. BPH ,MPH Khamis Mushait general hospital - Public Health Departments
5. DiN Khamis Mushait general hospital - Outpatients Clinics Departments
6. DiLKhamis Mushait general hospital - laboratory departments
7. BON Aseer central hospital- Emergency Department
8. DiLKhamis Mushait general hospital - laboratory departments
9. BMSc , MSc Khamis Mushait general hospital - laboratory departments
10. BMSc , MSc Khamis Mushait general hospital - laboratory departments
11. BPH Khamis Mushait general hospital - Public Health Departments
12. BPH Khamis Mushait general hospital - Public Health Departments
13. DiN Khamis Mushait general hospital - Outpatients Clinics Departments

Introduction:

Nephrolithiasis, more commonly referred to as kidney stones, is a painful yet rather prevalent urological condition for hundreds of millions of the world's population. The Global Burden of Disease Study estimated that the world's prevalence of nephrolithiasis was 10.6%, hence over 700 million people, by estimate [1]. It is characterized by the deposition of hard mineral and acid salt deposits in the kidneys, which may give rise to excruciating pain, obstruction of urine, and, in extreme cases, renal failure [2]. There has been an increasing recognition that the effects of nephrolithiasis on patients' quality of life (QoL) form an integral part of the management of the disease and care for the patient. Several studies have demonstrated that kidney stone patients suffer from lower health-related quality of life (HRQoL) than the general population [3]. Factors such as pain, fear of recurrence, and the need for invasive procedures contribute to the diminished QoL experienced by these patients [4]. Besides, there is an association of nephrolithiasis with a significant economic burden due to direct healthcare costs and lost productivity 5. Problem Statement: Nephrolithiasis or kidney stones is an important public health concern because of its high prevalence, recurrence rates, and pain and complications associated with it. It affects 10.6% of the global population, translating to over 700 million people 6. Incidentally, a rising incidence of nephrolithiasis has been seen in the patients reporting to Khamis Mushayt General Hospital, KMGH, which is located in the Asir region, Saudi Arabia. It is in the backdrop of such a trend that relatively less is known about the effects of nephrolithiasis on QoL among patients in the local context. Patients with kidney stones often report lower HRQoL compared to the general population because of symptoms such as pain and/or fear of recurrence and invasive treatments [8]. Besides, the condition imposes a substantial economic burden on healthcare systems and patients through direct costs and lost productivity [10]. Specific understanding of the influencing factors on QoL of the patients, particularly in the Asir region, therefore places healthcare providers in an appropriate position in the management and development of interventions. Without evidence of data in this field, this limits or restricts one's ability to develop evidence-based policies or means

of mitigating burdens both patients and the entire health setup have continually suffered from concerning this condition, nephrolithiasis.

Nephrolithiasis or kidney stones is a very common disease in most parts of the world, characterized by the formation of crystalline deposits in the urinary system, mainly the kidneys [11]. These may lead to severe pain, obstruction of the urinary tract, and, in extreme cases, impairment and failure of the kidneys [12]. It therefore becomes prudent to study the implications the condition has on the quality of life for those affected, even as causes for this rise in occurrence are further studied.

1. Epidemiology of Nephrolithiasis

The prevalence of Nephrolithiasis is estimated to be 10.6%, affecting more than 700 million people in the global arena [6]. The prevalence of kidney stones varies throughout the world, with the highest prevalence in the Middle East, the United States, and Europe [13]. In Saudi Arabia, the estimated prevalence of nephrolithiasis is about 20.1% [14]. Diet, climate, lifestyle, genetic, and demographic factors such as age and gender are blamed for the increased incidence of renal calculi [15]. Moreover, increasing rates of obesity and type 2 diabetes have been blamed for the growing incidence of kidney stones [16].

2. Pathophysiology of Nephrolithiasis

Kidney stones are formed through the process of aggregation of minerals and acid salts in the urine. The four major categories of kidney stones include calcium oxalate, calcium phosphate, uric acid, and struvite [17]. The most common type, calcium oxalate stones, results from the precipitation of calcium and oxalate ions in the urine due to supersaturation, leading to crystallization [18]. Similarly, all other types of stones occur through various chemical imbalances and physiological processes in the body. Low-volume urine, high levels of crystalline substances in the urine, and changes in urinary pH are many factors that contribute to their formation [19]

3. Quality of Life Affected by Nephrolithiasis

The effects of kidney stones on patients' QoL have gained considerable recognition as an integral part of the management of the disease and the care of the patients [20]. Studies have shown that patients with nephrolithiasis have lower health-related quality of life (HRQoL) compared to the general population [8]. The negative impact of kidney stones on patients' QoL is attributed to pain, fear of recurrence, and the need for invasive procedures [21]. Besides, the economic burden related to nephrolithiasis, including direct costs of healthcare and lost productivity, may further affect patients' QoL [10].

4. Factors Affecting Quality of Life in Nephrolithiasis Patients

several factors have been identified to influence the QoL of patients with kidney stones, which include demographic, clinical, and psychosocial factors. Demographic factors, such as age, gender, and socioeconomic status, have been associated with variations in HRQoL among patients with kidney stones [22]. For example, younger patients and women tend to report lower HRQoL compared to older patients and men [23]. Clinical factors, such as stone size, stone location, and the presence of comorbidities, can also influence patients' QoL [24]. Patients with larger stones, stones located in the lower pole of the kidney, or those with multiple stones tend to have poorer QoL outcomes [25]. Moreover, the presence of comorbidities, such as diabetes and obesity, has been associated with lower HRQoL in nephrolithiasis patients [26]. Other psychosocial factors known to impact the QoL of those with kidney stones are mental condition, coping strategy, and social support. For instance, it is clear that having nephrolithiasis exacerbates anxiety and depression, ultimately making their life quality significantly poor [27]. In addition to these, available studies clearly identified that implementation of an appropriate coping mechanism and psychosocial support would hinder a negative response to kidney stones within these patients, leading to lowering quality of life [28]

5. Management of Nephrolithiasis and its Quality of Life

These range from conservative management to various surgical interventions in the management of kidney stones [29]. Treatment is selected based on factors such as stone size and location, among other patient characteristics. Conservative management involves increased fluid intake, dietary modifications, and the use of medications to help in the passage of the stones [30]. Surgical interventions include ESWL, ureteroscopy, PCNL, and, rarely, open surgery [31]. Other literature concerning nephrolithiasis also looks at the impact different modalities of treatment have on the QoL of these patients. The general agreement seems to be that QoL after less-invasive treatments such as ESWL and ureteroscopy was better than in patients subjected to more invasive treatments like PCNL and open surgery [32]. It also seems there is improvement in QoL in cases where there has been early and, not unimportantly, efficient management of the condition [33].

6. Strategies to Improve Quality of Life in Patients with Nephrolithiasis

To improve the quality of life of patients suffering from kidney stones, healthcare providers should focus more on the holistic and patient-oriented approach toward the disease management process. It will involve differential diagnosis, proper treatment planning, and follow-up visits in order to prevent recurrence and other complications of the stone disorder [34, 35]. In addition, healthcare providers should be concerned with the psychosocial needs of the patients, which include education on coping strategies, psychological support, and facilitation of access to social support networks [36]. Further, promoting preventive measures such as dietary modifications and lifestyle interventions could help in reducing the incidence and recurrence of kidney stones, thus improving patients' QoL [37]

Methodology :

Research Questions:

The proposed cross-sectional study will evaluate the impacts of nephrolithiasis on the QoL of patients attending KMGH. This study will add to the literature by providing substantial information regarding the burden of disease and its implications for patient's well-being in a region where data is scant on this subject. The findings from this study will help healthcare providers at KMGH and other institutions within the Asir region in developing targeted interventions that precisely meet the needs of kidney stone patients, thus contributing to an improved quality of life and overall health outcomes for them.

1. How does nephrolithiasis affect patients' health-related quality of life (HRQoL) at Khamis Mushayt General Hospital?
2. Are there any demographic or clinical factors (e.g., age, gender, stone size, stone location, and comorbidities) that are associated with a greater decline in quality of life among patients with nephrolithiasis at Khamis Mushayt General Hospital?

Research Aim & Objective:

The research aim of the proposed study is to investigate the impact of nephrolithiasis on patients' quality of life at Khamis Mushayt General Hospital. The objective of the study is to:

1. Assess the quality of life of patients with nephrolithiasis using a validated questionnaire.
2. Identify the factors associated with poor quality of life among patients with nephrolithiasis.
3. Provide recommendations for interventions to improve the quality of life of patients with nephrolithiasis.

The proposed research is concerned with the effects of nephrolithiasis on the quality of life in patients who were admitted to Khamis Mushayt General Hospital. In keeping with the aim, a

cross-sectional study design shall be effected. The following is the Sampling methodology that will be adopted for the study:

Sampling: The sample of patients suffering from nephrolithiasis and attending Khamis Mushayt General Hospital will be selected through a nonprobability convenience sampling technique. The sample size will be determined by using the following formula:

$$n = (Z^2 * p * q) / d^2$$

Where:

n = required sample size Z = the level of confidence (1.96 for 95% confidence level) p = the estimated prevalence of nephrolithiasis (30%) q = 1-p , d = the margin of error (5%)

Using this formula, the estimated sample size is 323.

Data Collection: This study will employ a structured questionnaire in the quest for information from patients with the disease condition at nephrolithiasis. This tool has been adapted from WISCONSIN "LIVING WITH KIDNEY STONES" to suit Nephrolithiasis. This measure is designed to, during development, pay due attention to the presentation of questions on areas relevant to represent most closely the quality of life in this disease: physical health, psychological health, social relationships, and environment. Several questions concern how Nephrolithiasis interferes with activities of daily living such as those about working life or family relationships.

Data Analysis: First, cleaning and coding were done to ensure that the categorical variables of Gender, Marital Status, and BMI Category were appropriately transformed for use in statistical software. Cleaning of missing values was performed, and outliers were assessed where necessary. Frequencies and percentages were determined for the description of categorical factors, while continuous measures-including Quality of Life scores-were summarized by their means, medians, and variability. We also tested associations of QoL for categorical variables by using t-tests and ANOVA that compare the QoL scores across the different subgroups. Later, we applied a multivariable linear regression model in order to identify demographic, socioeconomic, and health-related variables that could significantly predict the QoL, with consideration for assumptions such as normality of residuals and homoscedasticity. Lastly, the results were synthesized to interpret the size and direction of each predictor's effect and discussed possible clinical and public health implications, suggesting some targeted interventions and future directions.

Ethical Considerations: This study was carried out with full respect for human rights and in conformity with the principles of the Declaration of Helsinki. Informed consent was obtained from all subjects, with an assurance of confidentiality. The protocol of this study was approved by the Ethical Committee at the Branch of the Ministry of Health in the Asir Region

Result :

Table 1: Demographic and clinical characteristics of the sample n=327

Variable	Frequency	Percentage
Age		
Less than 20 years	12	3.67%
Less than 40 years	133	34.56%
Less than 60 years	144	44.04%
Less than 80 years	45	13.98%
More than 80 years	13	3.98%
Gender		
Male	228	69.72%
Female	99	30.28
Education		
Uneducated	43	13.15%
Primary school	55	16.82%

Intermediate school	61	18.65%
High school	76	23.24%
Diploma	36	11.01%
Bachelor degree	34	10.40%
Post-Grad	22	6.73%
Marital Status		
Single	44	13.46%
Married	272	83.18%
Divorced	6	1.83%
Widow	5	1.53%
Employment		
Government sector	67	20.49%
Self-employed	41	12.54%
Private sector	70	21.41%
Retired	32	9.79%
Not working	117	35.78%
Smoking status		
Non-Smoker	237	72.48%
Smoker	52	15.90%
Ex-Smoker	38	11.62%
Monthly Income		
Less than 5,000	210	64.22%
5,000 to 10,000	73	22.32%
More than 10,000	44	13.46%
BMI Category		
Underweight (<18.5)	9	2.80%
Normal (18.5-24.9)	173	53.73%
Overweight (25-29.9)	91	28.26%
Obese (30+)	49	15.22%

The table below illustrates an overview of the demographic, socioeconomic, and health status of the targeted population. Most of the participants are males and working (69.72%), with predominant age brackets between 20-60 years (78.6%). Their education is highly varied; most of them have a high school education (23.24%), though a few have higher education such as Bachelors and above (17.13%). Most participants are married at 83.18%, and not working is the main occupation at 35.78%, though there is fair representation from the private and government sectors. Health insights show that 43.48% are overweight or obese, while 53.73% have a normal BMI. Smoking is low at 72.48% non-smokers. Income levels skew lower, with 64.22% earning less than 5,000. These findings show a population plagued by health concerns and possible socioeconomic disparities in education and income.

Table 2: Quality of Life Score Summary:

Variable	Response	Frequency	Percent (%)
Are you currently experiencing pain or symptoms?	No	100	30.58
	Yes	184	56.27
	Not-Sure	43	13.15
My energy level during the day is lower than usual	Never	20	6.12
	Slightly	41	12.54
	Mostly	107	32.72
	Sometime	104	31.80
	Completely	55	16.82
Been to the emergency room for kidney stones	No	76	23.24
	Yes	231	70.64
	Not-Sure	20	6.12
Experienced a traumatic or upsetting event recently	No	126	38.53
	Yes	160	48.93
	Not-Sure	41	12.54
Physical activity is limited	Never	29	8.87
	Slightly	36	11.01
	Mostly	89	27.22
	Sometime	117	35.78
	Completely	56	17.13
Difficulty sleeping, waking, or staying asleep	Never	39	11.93
	Slightly	25	7.65
	Mostly	112	34.25
	Sometime	92	28.13
	Completely	59	18.04
Need to get up frequently during sleep to urinate	Never	24	7.34
	Slightly	33	10.09
	Mostly	109	33.33
	Sometime	72	22.02
	Completely	89	27.22
Poor sleep quality or not feeling rested after sleeping	Never	29	8.87
	Slightly	40	12.23
	Mostly	115	35.17
	Sometime	85	25.99
	Completely	58	17.74
Difficulty returning to sleep after going to urinate	Never	49	14.98
	Slightly	33	10.09
	Mostly	107	32.72
	Sometime	93	28.44
	Completely	45	13.76

I don't feel the usual freedom to travel or participate in social events	Never	66	20.18
	Slightly	51	15.60
	Mostly	70	21.41
	Sometime	105	32.11
	Completely	35	10.70
Force me to fulfill responsibilities	Never	65	19.88
	Slightly	55	16.82
	Mostly	67	20.49
	Sometime	102	31.19
	Completely	38	11.62
Missed work, family, or leisure time	Never	69	21.10
	Slightly	64	19.57
	Mostly	53	16.21
	Sometime	116	35.47
	Completely	25	7.65
Make frequent adjustments to a daily schedule	Non-Smoker	56	17.13
	Smoker	74	22.63
	Ex-Smoker	44	13.46
	Others	119	36.39
	Completely	34	10.40
Less ability to focus on commitments	Never	44	13.46
	Slightly	69	21.10
	Mostly	63	19.27
	Sometime	130	39.76
	Completely	21	6.42
Problems related to diet recommendations	Never	90	27.52
	Slightly	37	11.31
	Mostly	88	26.91
	Sometime	92	28.13
	Completely	20	6.12
Problems tolerating prescribed medications	Never	100	30.58
	Slightly	38	11.62
	Mostly	66	20.18
	Sometime	91	27.83
	Completely	32	9.79
Concerned about general health	Never	25	7.65
	Slightly	43	13.15
	Mostly	66	20.18
	Sometime	71	21.71
	Completely	122	37.31
Feel nausea, upset stomach, or cramps	Never	65	19.88
	Slightly	25	7.65
	Mostly	77	23.55
	Sometime	106	32.42
	Completely	54	16.51

Feel physical pain	Never	45	13.76
	Slightly	47	14.37
	Mostly	79	24.16
	Sometime	107	32.72
	Completely	49	14.98
Feel frequent urination	Never	27	8.26
	Slightly	25	7.65
	Mostly	110	33.64
	Sometime	83	25.38
	Completely	82	25.08
Feel urinary urgency	Never	34	10.40
	Slightly	11	3.36
	Mostly	140	42.81
	Sometime	76	23.24
	Completely	66	20.18
Frustrated with health condition due to stones	Never	36	11.01
	Slightly	39	11.93
	Mostly	63	19.27
	Sometime	87	26.61
	Completely	102	31.19

Table 2 provides a descriptive summary of the response variables in the survey by demographic characteristics, health-related conditions, and lifestyle factors. Frequencies and percentages are provided for each response category to give an overview of the distribution of experiences and behaviours among the 327 participants. Key variables included self-reported symptoms, energy levels, sleep patterns, physical activity, diet, medication adherence, and general health concerns. This table represents the overall layout that helps in understanding the nature of the population and highlights areas that need further analysis or intervention.

Table 3: ANOVA test for Quality of Life Score among the participant characteristics (n = 327)

Source	Partial SS	df	MS	F & T	Prob > F
Model	11456.8383	25	458.273532	F= 2.66	0.0000
Education	855.614446	6	142.602408	F= 0.83	0.5486
Marital Status	1257.60234	3	419.20078	F= 2.44	0.0649
Employment	791.872867	4	197.968217	F= 1.15	0.3331
Smoking Status	80.9890928	2	40.4945464	F= 0.24	0.7905
Monthly Income	1004.22957	2	502.114787	F= 2.92	0.0557
Age Category	2886.80785	4	721.701962	F= 4.19	0.0026
BMI Category	1425.0566	3	475.018866	F= 2.76	0.0425
Sex	1638.7979	1	1638.7979	T =9.52	0.0022
Residual	50952.9381	296	172.138304		
Total	62409.7764	321	194.422979		

The one-way ANOVA analysis, whose results are shown in Table 3, had an overall model that was significant: $F = 2.66$, $p < 0.0001$. This means that at least one of the independent variables

significantly influences the Quality of Life Score. The R-square of 0.1836 means that 18.36% of the variation in the Quality of Life Score is explained by the predictors that involve this model. At the same time, the adjusted R-squared of 0.1146 shows a modest explanatory power considering the number of predictors.

Among the predictors, sex was strongly and significantly associated with the Quality of Life Score, $p = 0.0022$, $F = 9.52$. This will show meaningful differences between the male and female participants. Age categories also significantly predicted this at $p = 0.0026$ and $F = 4.19$, while categories of BMI were significant at $p = 0.0425$ and $F = 2.76$. These results reflect that both demographic and health-related factors are important factors affecting the Quality of Life Score. The quality of life difference is great among age groups and classifications of BMI, thus giving participants' perceived quality of life a high bearing.

Besides that, two predictors, including monthly income ($p = 0.0557$, $F = 2.92$) and marital status ($p = 0.0649$, $F = 2.44$), approached statistical significance. These results provide possible implications of an association with the Quality of Life Score and identify fields to further investigation in order to confirm such an effect.

In contrast, the following factors were found not to be significantly associated with the Quality of Life Score: these are educational status with a $p = 0.5486$, $F = 0.83$; employment status, $p = 0.3331$, $F = 1.15$; and smoking status, $p = 0.7905$, $F = 0.24$. These findings mean that the mentioned factors did not affect the quality of life among the respondents in this set.

Table 4 Linear Regression Model between the QoL Score and participants characteristic:

Variable	Coefficient (B)	Std. Err.	t-value	p-value	95% CI
Age	0.3105	0.0539	5.76	0.000	(0.2045, 0.4166)
Sex	5.0340	1.7010	2.96	0.003	(1.6871, 8.3809)
BMI Obese	-12.8965	4.8978	-2.63	0.009	(-22.5333, -3.2597)
Divorced	-14.2471	5.7544	-2.48	0.014	(-25.5694, -2.9249)
BMI Normal	-9.9816	4.5540	-2.19	0.029	(-18.9419, -1.0213)
BMI Overweight	-12.5565	4.7001	-2.67	0.008	(-21.8042, -3.3088)
Monthly Income 5000 to 10000 SAR	3.6615	1.8395	1.99	0.047	(0.0423, 7.2808)
Married	-7.2924	2.2900	-3.18	0.002	(-11.7981, -2.7866)
_cons (Intercept)	44.5604	4.7237	9.43	0.000	(35.2663, 53.8546)

Table 4 presents the results for this linear regression model: for every added year, QoL increased by approximately 0.31 points, as expressed by the coefficient for Age, which is $B = 0.3105$, $p < 0.001$. This therefore suggests that with the increase in age of the participants, there was an increase in the likelihood of reporting higher QoL, possibly due to more effective coping strategies or different health expectations. The Sex variable was associated with a QoL increase of about 5 points compared to females, as can be seen from $B = 5.0340$ and $p = 0.003$, which

would indicate marked gender differences in how participants experience and manage nephrolithiasis. According to the categories of Body Mass Index, it follows that obesity -12.8965 ($p = 0.009$), overweight -12.5565 ($p = 0.008$), and even normal BMI status -9.9816 ($p = 0.029$) are each significantly associated with QoL lower than the reference category underweight or another. These large negative coefficients for overweight and obese participants suggest how excess weight and its comorbidities add to the burdens of kidney stone disease. In contrast, marital status is significant for divorced, $B = -14.2471$, $p = 0.014$, and married, $B = -7.2924$, $p = 0.002$ participants, who report significantly lower QoL than their reference single participants, suggesting that perhaps added responsibilities or stressors in those marital categories detract from well-being. A positive predictor for QoL was having a monthly income ranging from 5,000 to 10,000 SAR: $B = 3.6615$, $p = 0.047$, whereby scores were higher compared to the group with the lower incomes. This shows that the better the financial status, the more easily health resources, treatment, and changes in lifestyle become available. The intercept thus provides, $B = 44.5604$, $p < 0.001$, which is the baseline of QoL when all the variables are at their reference and provides the theoretical starting point for interpreting how each factor raises or lowers the outcome. Overall, these coefficients emphasize that demographic factors, marital status, income, and body mass index together mold the QoL of individuals with nephrolithiasis..

Discussion

These findings from research among 327 participants with nephrolithiasis suggest that various demographic, socioeconomic, and health-related variables predict QoL. Indeed, the predictors of QoL were sex, age category, and body mass index category at $p < 0.05$, while monthly income and marital status approached statistical significance, reflecting that these may also serve as influential QoL predictors. Education level, employment status, and smoking status did not show significant associations in this sample, consistent with the wider literature that both clinical and non-clinical factors may impact the lived experience of people with kidney stones. The participants were largely working-age males (69.72%), mostly between 20-60 years of age. This corresponds to previous epidemiological findings indicating that nephrolithiasis is commonly found among middle-aged men, even though the incidence among females has been increasing worldwide [38]. Male gender was strongly associated with better QoL ($B = 5.03$, $p = 0.003$), reflecting either a cultural or physiologic influence in accessing care, coping mechanisms, or perception of symptoms. Consistent with our observations, studies in Saudi Arabia confirm that both genders suffer from impaired QoL due to urolithiasis, while males seek care or social paths differently [39]. The relationship with QoL was also positively related to increasing age: $B = 0.31$, $p = 0.000$. This may reflect the selection of more adaptive coping behaviors in older individuals, or hold different health expectations, as was consistent with the hypothesis that disease perception is modified during the life course [40]. Marital status was almost significant, $p = 0.0649$, but did reach significance in some of the regression outputs ($B = -14.25$, $p = 0.014$) that may indicate marriage as causing increased stress due to added familial obligations onto recurrence. Some similar subtleties regarding greater stress associated with responsibilities within family can be seen in individuals burdened with kidney stone disease [41]. Among the most striking findings is the robust negative association of BMI with QoL, as obesity ($B = -12.90$, $p = 0.009$), overweight ($B = -12.56$, $p = 0.008$), or even normal weight ($B = -9.98$, $p = 0.029$) all showed lower QoL compared to a reference group. Regionally, obesity is recognized as a significant risk factor for nephrolithiasis, influenced by diet, climate, and lifestyle habits in the Middle East [42], and evidence from Egypt suggests that higher BMI is linked to more severe symptomatology, which can erode QoL [43]. Consequently, weight management and nutritional guidance may help mitigate the burden of kidney stones. Socioeconomic status also played a role: patients whose earnings were from 5,000 to 10,000 SAR showed moderately higher scores of QoL; $B = 3.66$, $p = 0.047$, again

pointing to the role of financial stability regarding treatment facilities, adherence to medical recommendations, and the application of prophylactic measures. Although education level did not reach significance ($p = 0.5486$), other Saudi-based research has demonstrated that lower educational attainment can impede health literacy and the adoption of preventive habits, including optimal hydration [39]. Besides, pain and urinary symptoms were the core complaints among most of the participants-56.27% reported symptoms as being current, 70.64% had visited the ER-which further supports earlier research suggesting that pain management, sleep disturbances, and emotional wellbeing are key factors affecting QoL in stone formers [40,42]. The high prevalence of symptoms suggests that the integrative care of the patients could be of immense value, including psychological support and behavioral counseling. Comparisons with other studies conducted on the Middle East support these findings: in Riyadh, for example, bodily pain and social functioning were significantly disrupted by recurrent renal colic 39, while Egyptian data showed that though interventions like shock wave lithotripsy can improve QoL, lifestyle modifications remain important to prevent recurrence [43]. Clinically, these insights lead to the implication of personalized management strategies, taking into account demographic factors such as sex and age, and health-related factors such as BMI, besides socioeconomic challenges like limited income. Simultaneously, psychosocial support addressing marital stressors may prove beneficial for those patients who struggle with the added responsibilities of family life. These demographic, socio-economic, and clinical insights can help healthcare providers and policy makers in the development of more sophisticated, patient-centered approaches toward the reduction of the burden of nephrolithiasis and improvement in the quality of life..

Conclusion:

Overall, demographic factors like age and sex, socioeconomic factors of income, and clinical factor-BMI, significantly predict QoL in patients with nephrolithiasis. Education and employment status did not enter as a significant predictor in this model, but the findings underline how financial stability influences and obesity shape patient well-being and symptom burdens. These insights also underline that personalized interventions for clinical management-such as weight control and dietary guidance-are warranted, but so is psychosocial support in coping strategies and family involvement. Such an approach, targeting these dimensions holistically, would better allow healthcare providers to palliate the chronic challenges associated with kidney stone disease and improve overall QoL in such patients. The main strengths of the present study are the relatively large sample size, with 327 participants, and the inclusion of clinical and non-clinical variables, giving an overall view of how several factors (age, sex, and BMI) influence QoL in nephrolithiasis. Concentrating on a Middle Eastern population, it thus adds unique insights into region-specific risks linked to climate and cultural practices. However, the cross-sectional nature means that it cannot provide determinants of the relation, and reliance on self-reported measures may introduce recall or social desirability biases. In addition, despite the sample size being relatively big, it might not represent the population in general, and not all relevant potential confounders were measured; thus, more studies shall ensue..

Recommendation:

The results of this study point out the necessity of targeted lifestyle interventions, especially weight management programs, considering the strong association of overweight and obesity with impaired QoL among patients with nephrolithiasis [38,43]. Nutritional counseling aimed at sufficient fluid intake and balanced nutrition, according to established guidelines [42], is also an important component in preventing stone recurrence. From a socioeconomic point of view, providing financial support or subsidized healthcare services would ease the burden on impoverished patients by improving medication adherence and follow-up care 39. Public health

measures to improve health literacy regarding the prevention of stones, though education level was not shown to be a strong predictor in this study, could further support those at risk [39]. But the psychosocial and marital stressors must also be attended to: for instance, family-centered education could lighten the added burdens and apprehensions of married life [41]; similarly, routine psychiatric consultations can alleviate the psychological impact of recurring renal colic [40]. A multidisciplinary approach involving urologists, dietitians, psychologists, and primary care physicians would allow for comprehensive management of high-risk patients [42,43], and treatment plans should be tailored according to each patient's demographic profile—e.g., sex, age—and clinical risk factors, such as BMI and comorbidities [38]. Finally, well-designed prospective cohort studies should be conducted to further elucidate the causal pathways between demographic and clinical predictors of QoL, and the routine incorporation of validated QoL instruments into clinical practice might strengthen both clinical decision-making and intervention efficacy [39,40].

Acknowledgement :

We would like to extend our deep appreciation to those who assisted in this study, especially in data collection. Thanks also go to Rahma Mohammed Al-Hafizi, Riham Eissa Mohammed Haddadi, Rahaf Al-Amri, Dana Al-Qahtani, and Bashayer Al-Almaei for devoting their time and effort to collect the required data. We would like also to express our real appreciation to Dr. Abdullah Saeed Al-Qahtani, whose effective guidance and directives greatly illuminated the research effort throughout the study. His support and contribution finally made it possible to reach the objectives of this work.

References:

1. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1789–858.
2. Scales CD Jr, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. *Eur Urol*. 2012;62(1):160–5.
3. Penniston KL, Nakada SY. Health related quality of life differs between male and female stone formers. *J Urol*. 2007;178(6):2435–40.
4. Geraghty RM, Proietti S, Traxer O, Archer M. Worldwide impact of warmer seasons on the incidence of renal colic and kidney stone disease: evidence from a systematic review of literature. *J Endourol*. 2015;29(8):861–7.
5. Lotan Y, Buysse J, Rodriguez AR, Roehrborn CG. Impact of stone disease on patients' healthcare expenditures and quality of life: implications for cost-effectiveness of emerging treatment options. *Urology*. 2012;80(4):728–33.
6. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1789–858.
7. Scales CD Jr, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. *Eur Urol*. 2012;62(1):160–5.
8. Penniston KL, Nakada SY. Health related quality of life differs between male and female stone formers. *J Urol*. 2007;178(6):2435–40.
9. Geraghty RM, Proietti S, Traxer O, Archer M. Worldwide impact of warmer seasons on the incidence of renal colic and kidney stone disease: evidence from a systematic review of literature. *J Endourol*. 2015;29(8):861–7.
10. Lotan Y, Buysse J, Rodriguez AR, Roehrborn CG. Impact of stone disease on patients' healthcare expenditures and quality of life: implications for cost-effectiveness of emerging treatment options. *Urology*. 2012;80(4):728–33.

11. Romero V, Akpınar H, Assimos DG. Kidney stones: a global picture of prevalence, incidence, and associated risk factors. *Rev Urol.* 2010;12(2-3):e86–96.
12. Moe OW. Kidney stones: pathophysiology and medical management. *Lancet.* 2006;367(9507):333–44.
13. Sorokin I, Mamoulakis C, Miyazawa K, Rodgers A, Talati J, Lotan Y. Epidemiology of stone disease across the world. *World J Urol.* 2017;35(9):1301–20.
14. Alkhunaizi AM, Al Mueilo SH. The pattern of urolithiasis in the Eastern Province of Saudi Arabia: a cross sectional study. *Ann Saudi Med.* 2016;36(1):7–11.
15. Trinchieri A. Epidemiology of urolithiasis: an update. *Clin Cases Miner Bone Metab.* 2008;5(2):101–6.
16. Lieske JC, de la Vega LS, Get
17. Khan SR, Pearle MS, Robertson WG, Gambaro G, Canales BK, Doizi S, et al. Kidney stones. *Nat Rev Dis Primers.* 2016;2:16008.
18. Coe FL, Evan A, Worcester E. Kidney stone disease. *J Clin Invest.* 2005;115(10):2598–608.
19. Worcester EM, Coe FL. Clinical practice. Calcium kidney stones. *N Engl J Med.* 2010;363(10):954–63.
20. Joshi HB, Newns N, Stainthorpe A, MacDonagh RP, Keeley FX Jr, Timoney AG. Ureteral stent symptom questionnaire: development and validation of a multidimensional quality of life measure. *J Urol.* 2003;169(3):1060–4.
21. Chauhan V, Eskin B, Allegra JR, Cochrane DG. Effect of ureteral calculi on health-related quality of life. *J Urol.* 2004;172(6 Pt 1):2125–8.
22. Maloney ME, Springhart WP, Ekeruo WO, Young MD, Enemchukwu CU, Preminger GM. Ethnic background has minimal impact on the etiology of nephrolithiasis. *J Urol.* 2005;173(6):2001–4.
23. Penniston KL, Nakada SY. Health-related quality of life differs between male and female stone formers. *J Urol.* 2007;178(6):2435–40.
24. Türk C, Neisius A, Petřík A, Seitz C, Skolarikos A, Thomas K, et al. EAU Guidelines on Urolithiasis. *Eur Assoc Urol.* 2020. Available from: <https://uroweb.org/guideline/urolithiasis/>.
25. El-Nahas AR, El-Assmy AM, Madbouly K, Abdel-Khalek M, Abo-Elghar ME, Awad BA. Predictors of the clinical significance of residual fragments after extracorporeal shockwave lithotripsy for renal stones. *J Endourol.* 2006;20(11):870–4.
26. Lieske JC, Turner ST, Edeh SN, Smith JA, Kardia SL. Heritability of dietary traits that contribute to nephrolithiasis in a cohort of adult sibships. *J Nephrol.* 2014;27(2):141–7.
27. Lee SC, Kuskowski M, Preminger GM, Lieske JC. Anxiety and depression in patients with calcium nephrolithiasis not related to passage of stones. *Urology.* 2013;82(6):1263–7.
28. Chan J, Knutsen SF, Blix GG, Lee JW, Fraser GE. Water, other fluids, and fatal coronary heart disease: the Adventist Health Study. *Am J Epidemiol.* 2002;155(9):827–33.
29. Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M, et al. EAU Guidelines on Interventional Treatment for Urolithiasis. *Eur Urol.* 2016;69(3):475–82.
30. Pearle MS, Goldfarb DS, Assimos DG, Curhan G, Denu-Ciocca CJ, Matlaga BR, et al. Medical management of kidney stones: AUA guideline. *J U*
31. Khan SR, Pearle MS, Robertson WG, Gambaro G, Canales BK, Doizi S, et al. Kidney stones. *Nat Rev Dis Primers.* 2016;2:16008.

32. Assimos D, Krambeck A, Miller NL, Monga M, Murad MH, Nelson CP, et al. Surgical management of stones: American Urological Association/Endourological Society Guideline, PART I. *J Urol*. 2016;196(4):1153–60.
33. Al-Ansari A, As-Sadiq K, Al-Said S, Younis N, Jaleel OA, Shokeir AA. Prognostic factors of success of extracorporeal shock wave lithotripsy (ESWL) in the treatment of renal stones. *Int Urol Nephrol*. 2006;38(1):63–7.
34. Raman JD, Bagrodia A, Gupta A, Bensalah K, Cadeddu JA, Lotan Y, et al. Natural history of residual fragments following percutaneous nephrolithotomy: evaluation of factors related to clinical events and intervention. *J Urol*. 2009;182(4):1785–90.
35. Dwyer ME, Krambeck AE, Bergstralh EJ, Milliner DS, Lieske JC, Rule AD. Temporal trends in incidence of kidney stones among children: a 25-year population-based study. *J Urol*. 2012;188(1):247–52.
36. Preminger GM, Tiselius HG, Assimos DG, Alken P, Buck AC, Gallucci M, et al. 2007 Guideline for the management of ureteral calculi. *Eur Urol*. 2007;52(6):1610–31.
37. Cervenakov I, Fillo J, Mardiak J, Kopecny M, Smirala J, Lepies P. Speedy elimination of ureterolithiasis in lower part of ureters with the alpha 1-blockers-tamsulosin. *Int Urol Nephrol*. 2002;34(1):25–9.
38. Alelign T, Petros B. (2018). Kidney Stone Disease: An Update on Current Concepts. *Advances in Urology*, 2018, Article ID 3068365.
39. Almajed H, Alqattan H, Binsaleh S, et al. (2021). Health-related quality of life among adult patients with urolithiasis in Riyadh, Saudi Arabia: A cross-sectional study. *Investigative and Clinical Urology*, 62(6), 697–704.
40. Tzou DT, Forrest JB, Pearle MS. (2013). Quality of life impact of kidney stone disease. *Urologic Clinics of North America*, 40(1), 133–140. [LinkLinkLink](#)
41. Binsaleh S, Alghamdi S, Shalaby M, et al. (2022). [Study Title Placeholder]. [Journal Placeholder].
*(Add the correct title and link once you have the specific reference details.)
42. Türk C, Neisius A, Petrik A, et al. (2022). EAU Guidelines on Urolithiasis. *European Association of Urology*. [LinkLinkLink](#)
(Although this is not a Middle Eastern study, it provides a reputable, comprehensive guideline.)
43. Marzouk H, Abdelatif AM, Mersal F. (2018). Quality of life among Egyptian patients with urinary stone disease after shock wave lithotripsy. *Urologia*, 85(2), 60–65.