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Impact of Urinary Stone Disease on Health-Related Quality of Life in Pediatric Patients: A Comparative Cross-Sectional Study

Ahmed Ahmed El Tantawy El Attar*, Ahmed Refat El-Nahas,
Ahmed Mohamed Elshal, Mohamed Elsayed Dawaba
Urology and Nephrology Center, Faculty of Medicine, Mansoura University, Mansoura, Egypt
***Corresponding author:** Ahmed Ahmed El Tantawy El Attar, **Email:** aelattar93@gmail.com, Phone: +201091154799

ABSTRACT

Background: Pediatric urolithiasis is a rising health concern associated with significant physical and psychological burden. However, limited data exist regarding its impact on health-related quality of life (HRQoL) in children.

Objectives: To assess and compare HRQoL in pediatric patients with urinary stone disease (USD) versus healthy, age- and sex-matched controls using the Pediatric Quality of Life Inventory (PedsQoL).

Patients and methods: In this comparative cross-sectional study, 100 children (50 with urinary stones, 50 healthy controls) aged 2–18 years were enrolled from Mansoura Urology and Nephrology Center between April 2023 and April 2024. QoL was assessed using the Arabic version of the PedsQoL tool. Clinical, laboratory, and radiologic data were collected. Statistical analyses compared total and subdomain PedsQoL scores between groups and examined associations with demographic and stone characteristics.

Results: Children with urinary stones reported significantly lower scores across all QoL domains—physical, emotional, social, and school functioning—compared with healthy controls ($P < 0.001$ for all). Insignificant differences were found between QoL scores and stone characteristics (site, size, number, density) or demographic variables (age, sex, caregiver type).

Conclusions: Pediatric urinary stone disease is associated with substantial deterioration in HRQoL. These findings underscore the importance of integrating QoL assessment into routine evaluation and management of pediatric stone formers.

Keywords: Pediatric urolithiasis; Quality of life; PedsQoL; Urinary stone disease; HRQoL.

INTRODUCTION

Urinary stone disease (USD) is a prevalent and increasingly common disease in both adult and pediatric populations. Historically considered rare in children, pediatric urolithiasis has seen a notable rise in incidence globally over the past few decades [1]. Hospitalizations and health care burdens associated with pediatric stones are steadily growing, and recurrent episodes are common, with nearly 50% of children experiencing recurrence within 2–5 years of their initial diagnosis [2].

The classical presentation in children includes pain, hematuria, and recurrent urinary tract infections [3]. These symptoms, along with the frequent need for hospitalization and multiple interventions, may impair kidney function and adversely affect the child's quality of life (QoL) [4]. Psychological effects, school absenteeism, and limitations in physical and social activities are frequently reported, further exacerbating the disease's impact [5].

Health-related quality of life (HRQoL) is a multidimensional concept that captures a patient's perception of their physical, emotional, and social functioning. Unlike objective clinical measures, HRQoL reflects the patient's lived experience, encompassing factors such as pain, activity limitations, and emotional distress [6]. Traditional imaging and laboratory studies may not fully capture the disease burden, especially in children, where developmental and psychosocial aspects are deeply intertwined with physical health(5).

Multiple generic and disease-specific tools have been developed to measure QoL in clinical practice and research. Generic tools such as the Short Form-36 (SF-36) and the Patient-Reported Outcomes Measurement Information System (PROMIS) offer broad assessments across diseases [7,8]. In contrast, disease-specific tools like the Wisconsin Stone Quality of Life (WiSQoL) questionnaire provide more precise evaluations for stone disease but are validated primarily in adults [9].

Despite the recognized impact of stone disease on HRQoL in adults, data on pediatric populations remain scarce. Children face unique challenges, including dependency on caregivers, developing coping mechanisms, and school performance disruptions, all of which may amplify the disease burden. The Pediatric Quality of Life Inventory (PedsQoL) is a validated tool for assessing QoL in children across four main domains: physical, emotional, social, and school functioning. It has been widely used across various pediatric diseases [10,11], but its application in pediatric urolithiasis has not been well studied.

In this context, we aimed at our study to compare the QoL in pediatric patients with urinary stone disease with that of healthy, age- and sex-matched controls using the PedsQoL.

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PATIENTS AND METHODS

Study Design:

This was a comparative cross-sectional study conducted at the Urology and Nephrology Center, Faculty of Medicine, Mansoura University, Egypt, between April 2023 and April 2024.

Study Population:

A total of 100 pediatric participants were enrolled in the study. The case group included 50 children aged 2–18 years diagnosed with USD. The control group consisted of 50 healthy, age- and sex-matched children with no history of urolithiasis.

Eligibility Criteria:

Inclusion Criteria:

- Age between 2 and 18 years
- Confirmed diagnosis of urinary stone disease (first-time or recurrent episodes)
- Informed parental consent

Exclusion Criteria:

- Presence of obstructive uropathy or urosepsis
- Surgical intervention within the last 4 weeks
- Presence of indwelling urinary catheter or ureteral stent
- Known cognitive or psychiatric disorders
- Chronic systemic illness affecting QoL (e.g., malignancy, autoimmune diseases)

Data Collection and Assessments:

Demographics and History: A structured questionnaire was used to collect demographic data, medical and surgical history, family history of stone disease, and caregiver status.

Clinical Examination: Anthropometric measurements and physical examination were performed to evaluate general health status.

Laboratory Evaluation: Laboratory investigations included urinalysis, urine culture, complete blood count (CBC), serum creatinine, calcium, magnesium, phosphorus, and uric acid levels.

Radiological Assessment: Stone location, size, number, density, laterality, and hydronephrosis grade were determined using low-dose non-contrast computed tomography (NCCT).

Quality of Life Assessment:

The PedsQoL was administered using validated Arabic versions appropriate for the child's age. Both self- and parent-proxy reports were utilized when applicable. The questionnaire evaluates four domains: physical, emotional, social, and school functioning. Each item was scored on a 5-point scale with higher scores indicating lower QoL. Questionnaires missing over 50% of items were excluded from analysis**.**

Outcome Measures:

Primary Outcome:

- Comparison of total PedsQoL scores between the urinary stone group and healthy controls.

Secondary Outcomes:

- Comparison of domain-specific scores (physical, emotional, social, school)
- Association of QoL scores with demographic factors (age, gender, caregiver type)
- Association with stone characteristics (type, site, laterality, size, density, hydronephrosis).

Ethical Considerations:

The study was registered at ClinicalTrials.gov (NCT06092203) and received approval from the Institutional Review Board of Mansoura University (IRB No. MS.23-01-2278). All procedures involving human participants were conducted in agreement with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration. Written informed consent was obtained from the parents of all participants.

Statistical Analysis:

All statistical analyses were performed using SPSS version 21 (IBM Corp., Armonk, NY, USA). Descriptive statistics were expressed as mean±SD or median (range), depending on distribution. Categorical variables were summarized as frequencies and percentages. Comparisons between groups were made using independent t-tests for continuous variables and chi-square tests for categorical variables. Non-parametric tests were used as appropriate. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

Baseline Characteristics:

A total of 100 pediatric participants were enrolled in the study, including 50 patients with urinary stone disease and 50 healthy age- and sex-matched controls. Both groups showed comparable anthropometric measurements, with all participants falling within normal percentiles for weight and height. No significant differences were observed in family history of stone disease or use of chronic medications (Table 1).

Table (1): Baseline characteristics of the study population.

	Case Group (N=50)	Control Group (N=50)	P value
Age in years Mean ± SD	7.26 ± 3.39	6.88 ± 3.34	0.57
Gender N. (%)			
Boy	28 (56%)	29 (58%)	0.84
Girl	22 (44%)	21 (42%)	
Weight on growth chart Average	50 (100%)	50 (100%)	1
Height on growth chart Average	50 (100%)	50 (100%)	1
Medication history N. (%)			0.360
No	48 (96%)	50 (100%)	
Alkalinization	1 (2%)	0 (0%)	
Tiopronin	1 (2%)	0 (0%)	
Family history N. (%)			0.072
No	45 (90%)	50 (100%)	
1st degree	2 (4%)	0 (0%)	
2nd degree	3 (6%)	0 (0 %)	

Quality of Life Outcomes: Children with urinary stone disease reported significantly lower scores on the Pediatric Quality of Life Inventory (PedsQoL) compared to healthy controls across all measured domains. The median total score in the case group was 15, while it was 6 in the control group, indicating a substantial negative impact of the disease on overall quality of life.

Significant differences were observed between the two groups across all PedsQoL domains, including physical functioning domain, emotional, social, and school functioning scores (Table 2).

Table (2): Comparison of total and domain-specific PedsQoL scores between groups.

	Case Group (N=50)	Control Group (N=50)	P value
Physical **Median (range)**	4 (2-10)	2 (1-4)	**<0.001**
Emotional **Median (range)**	4 (1-12)	2 (1-4)	**<0.001**
Social **Median (range)**	2 (2-13)	2 (1-3)	**<0.001**
School **Median (range)**	2 (1-6)	1 (1-2)	**<0.001**
Overall QoL **Median (range)**	15 (8-33)	6 (4-9)	**<0.001**

Subgroup analysis within Stone Patients: No statistically significant associations were found between PedsQoL scores and demographic or clinical variables within the urinary stone group. Variables assessed included age, gender, caregiver type, stone laterality, size, number, site, density, and hydronephrosis grade. All p-values were > 0.05, indicating that quality of life impairment was independent of these factors (Table 3).

Table (3): Subgroup analysis of quality-of-life scores within the urinary stone group.

		N	HRQoL Score Median (range)	P value
Age Group (years)	2.0 –10.0	39	16.0 (8.0 – 33.0)	0.225
	10.1 – 18.0	11	14.0 (8.0 – 20.0)	
Gender	Male	28	13.0 (8.0 – 33.0)	0.283
	Female	22	16.0 (8.0 – 26.0)	
Care giver type	Both parents	50	15.0 (8.0 – 33.0)	-
Stone Type	Non specified	25	16.0 (8.0 – 24.0)	0.976
	Calcium oxalate	11	12.0 (8.0 – 33.0)	
	Uric acid	11	16.0 (8.0 – 26.0)	
	Cysteine	3	18.0 (12.0 – 18.0)	
Stone Site	Kidney	44	14.0 (8.0 – 33.0)	0.382
	Ureter	6	18.0 (12.0 – 24.0)	
Laterality	Right	21	14.0 (8.0 – 28.0)	0.528
	Left	23	16.0 (8.0 – 26.0)	
	Bilateral	6	17.0 (8.0 – 33.0)	
Stone size	< 10 mm	21	14.0 (10.0-33.0)	0.143
	10-20 mm	25	14.0 (8.0-28.0)	
	>20 mm	4	19.0 (16.0-21.0)	
Stone density	<1000 HU	35	14.0 (8.0-33.0)	0.949
	>1000 HU	15	16.0 (8.0-26.0)	
Primary vs secondary stone	Primary	32	16.0 (8.0-28.0)	0.582
	Secondary	18	13.0 (8.0-33.0)	
Hydronephrosis	Absent	11	14.0 (10.0 – 26.0)	0.999
	Mild	33	16.0 (8.0 – 33.0)	
	Moderate	4	14.0 (12.0 – 22.0)	
	Marked	2	16.0 (10.0 – 22.0)	
Number of stones	1 stone	30	14.0 (8.0 – 26.0)	0.181
	2–3 stones	15	16.0 (8.0 – 33.0)	
	>3 stones	5	12.0 (8.0 – 18.0)	

DISCUSSION

Urinary stone disease significantly affects the psychosocial well-being and functional capacity of children, making it a vital public health concern. With increasing recurrence rates, rising hospitalization costs, and potential long-term renal impairment, pediatric stone disease has warranted the attention of healthcare professionals to adopt more holistic approaches that consider not only clinical outcomes but also the QoL of affected children.

The present study demonstrates a significant impairment in HRQoL among pediatric patients with urinary stone disease compared to their healthy counterparts. These results are in agreement with prior literature highlighting the burden of urolithiasis in children [4,5]. Our results reinforce that not only physical but also emotional, social, and academic domains of life are adversely affected, supporting conclusions from earlier studies in adult populations [6,9].

The observed reduction in physical functioning aligns with previous findings where pain and decreased physical activity were noted as central complaints in stone disease [4,6].

Similarly, the diminished emotional and social functioning mirrors studies reporting anxiety, fear of recurrence, and social withdrawal in pediatric stone formers [5,10]. Impairments in school functioning, such as absenteeism and reduced concentration, have been noted in chronic pediatric conditions and were confirmed in our findings [10].

Notably, the present study is one of the few to assess QoL in pediatric urolithiasis using a validated child-specific tool (PedsQoL), filling a gap in literature where most existing studies have focused on adults or relied on generic instruments [7-9]. This contributes

valuable pediatric-specific evidence and provides a reference for future comparative studies.

Interestingly, our subgroup analysis did not reveal any significant correlation between QoL scores and variables such as stone size, laterality, number, or hydronephrosis. This suggests that the impact on QoL may be more related to the psychological perception and chronicity of illness than to disease severity—a hypothesis echoed in prior qualitative studies [4,6].

This study is one of the few to explore HRQoL in pediatric patients with USD, a population that has been underrepresented in previous research. The use of the PedsQoL, a validated and widely accepted tool, added robustness and reliability to our findings. Additionally, the comparative design with age- and sex-matched healthy controls provides a clear benchmark to assess the impact of urinary stone disease on QoL.

Despite its strengths, our study has some limitations. Cross-sectional design prevents establishing causality between urinary stone disease and QoL deterioration. Furthermore, the sample size, while optimum for initial findings, could restrict the generalizability of results to broader populations. Subjective self-reported data, particularly from younger participants, may also introduce response bias. Lastly, the lack of data on long-term follow-up restricts insights into the persistent effects of the disease and its management on QoL.

CONCLUSION

This study revealed that pediatric urinary stone disease significantly impairs children's quality of life across physical, emotional, social, and academic domains. These findings emphasize the need for a multidisciplinary approach that addresses both the medical and psychosocial aspects of care. Integrating QoL outcomes into clinical practice is essential, and future research should aim to develop targeted interventions that enhance well-being in this vulnerable population.

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REFERENCES

1. **Ziemba J, Matlaga B (2017):** Epidemiology and economics of nephrolithiasis. Investigative and Clinical Urology, 58(5): 299-306.
2. **Tasian G, Kabarriti A, Kalmus A *et al.* (2017):** Kidney stone recurrence among children and adolescents. The Journal of Urology, 197(1): 246-52.
3. **Issler N, Dufek S, Kleta R *et al.* (2017):** Epidemiology of paediatric renal stone disease: a 22-year single centre experience in the UK. BMC Nephrology, 18(1): 136.
4. **New F, Somani B (2016):** A complete world literature review of quality of life (QOL) in patients with kidney stone disease (KSD). Current Urology Reports, 17(12): 88.
5. **Lundeen C, Lim J, Scotland K *et al.* (2020):** What is the relationship of stress to patients' kidney stone-related quality of life? Canadian Urological Association Journal, 15(5): E256.
6. **Ellison J, Williams M, Keeley Jr FX (2018):** Patient-reported outcomes in nephrolithiasis: can we do better? Journal of Endourology, 32(1): 10-20.
7. **Donnally III C, Gupta A, Bensalah K *et al.* (2011):** Longitudinal evaluation of the SF-36 quality of life questionnaire in patients with kidney stones. Urological Research, 39(2): 141-6.
8. **Borofsky M, Lane G, Neises S *et al.* (2017):** Patient-Reported Outcomes Measurement System (PROMIS®) for patients with urolithiasis: initial report. The Journal of Urology, 198(5): 1091-7.
9. **Penniston K, Nakada S (2013):** Development of an instrument to assess the health related quality of life of kidney stone formers. The Journal of Urology, 189(3): 921-30.
10. **Smyth M, Jacobson K (2021):** Pediatric Quality of Life InventoryTM version 4.0 short form generic core scale across pediatric populations review data. Data in Brief, 39: 107599.
11. **Haverman L, Limperg P, Young N *et al.* (2017):** Paediatric health-related quality of life: what is it and why should we measure it? Archives of Disease in Childhood, 102(5): 393-400.