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Original Article

Demographic and Clinical Profile of Urolithiasis Patients Undergoing Extracorporeal Shock Wave Lithotripsy: A Cross-Sectional Study at Al-Hakim Clinic, Tobruk, Libya

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Abstract

Pauper:Extracorporeal shock wave lithotripsy (ESWL) is a non-invasive approach for managing urinary stones and is widely considered effective and safe, particularly for stones smaller than 20 mm. In recent years, the prevalence of urinary lithiasis has risen significantly due to dietary and lifestyle shifts, increasing by 10.6% in men and 7.1% in women. This study aims to provide a comprehensive overview of ESWL treatment for urolithiasis, examining factors such as sex, age, location, nationality, past medical and surgical history, presence of double-J stents, stone size and number, stone location, treatment sessions.

Methodology :This cross-sectional study was conducted at Al-Hakim Clinic in Tobruk, Libya, including 961 patients diagnosed with kidney stones between August and September 2024. Diagnostic confirmation was achieved through X-ray, ultrasound, and non-contrast computed tomography (NCCT) of the kidneys, ureter, and bladder (KUB). Patient records, including medical histories and demographic data, result : organized in Microsoft Excel, and analyzed using SPSS.Results Among the 961 patients, the frequency of cases from 2017 to 2024, calculated with an interquartile range (IQR), was 2019 (2018-2021).discussion: The cohort comprised 604 males (62.9%) and 356 females (37.1%), with a median age of 46 years (IQR 37-55). Most patients were from Tobruk, totaling 309 cases (32.2%). A large proportion of young adults, approximately 388 (40.4%), had stones around 1 cm in size. The right kidney was the most common stone location in both sexes, seen in 316 cases (32.9%).

Conclusion: Males are more frequently affected by urolithiasis, particularly in the right kidney, across all stone sizes. Tobruk exhibits the highest number of cases, with a significant concentration of right kidney stones, predominantly 1 cm and 2 cm in size.

Keywords : ureteral stone , kidney stone , shock wave lithotripsy , ESWL

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INTROUDUTION:

Urolithiasis is a common and painful disease characterized by the recurrent formation of stones in the urinary system. The management of upper urinary tract stones [(1)], commonly known as calculi or urinary lithiasis, has evolved from open surgery to minimally invasive treatment, a procedure known as extracorporeal shock wave lithotripsy. This technique is one of the noninvasive treatments for urinary stones, without the need for anesthesia [(1)]. The primary goals of this procedure are the quick, efficient, and cost-effective disappearance of calculus, with little strain on the patient. Because this revolutionary modality has a high stone removal rate with low complications, it has also changed kidney stone management strategies by making such stones accessible for treatment without the complexities of surgery.[(2)]

The pathogenesis of urolithiasis is complex and influenced by multiple interacting factors. Genetics play a significant role, with certain inherited conditions predisposing individuals to an increased likelihood of developing stones. These genetic factors often overlap with metabolic disorders, such as hypercalciuria (elevated levels of calcium in the urine), hyperuricosuria (high levels of uric acid in the urine) [(1)], and hypocitraturia (low urinary citrate levels)[(2),] which can all promote the formation of stones. Additionally, dietary habits are a well-established contributor to stone formation. Diets high in oxalates, salt, animal proteins, and low in fluids have been associated with an increased risk of developing kidney stones[(1)]. Environmental factors, particularly in regions with hot climates, can also contribute to urolithiasis by promoting dehydration, which reduces urine output and increases the concentration of stone-forming substances in the urine.[(3)]

The characteristic clinical manifestations of urolithiasis include colic[(3)], hematuria, dysuria, strangury, urinary frequency or oliguria, anuria, and even pyuria. However, the absence of these symptoms does not preclude the diagnosis of this condition. Kidney stone formation is influenced by a range of factors, owing to the interactions among genetic, metabolic, dietary, and environmental determinants [(1)]. A number of studies have found several physicochemical and clinical risk factors for developing kidney stones. Despite the significant advances in pharmacologic and surgical treatment, the incidence of urolithiasis has globally risen[(2)], particularly in Western developed countries. In addition, the typically high recurrence rate of kidney stones can be attributed to their unique nature, and thus, an understanding of stone risk factors and their associations is crucial for diagnosis and prevention[(3)].

MATERIALS AND METHODS:

This cross-sectional study was carried out at Alhakim Medical Center in Tobruk, Libya. Between August and September 2024, data were gathered from 961 patients diagnosed with kidney stone disease. The diagnostic process included X-rays of the kidney, ureter, and bladder (KUB), ultrasounds of the KUB, and non-contrast computed tomography (NCCT) of the KUB to confirm the diagnosis.

Medical records and demographic information of the patients were thoroughly reviewed and organized using Microsoft Excel. The data were then analyzed with SPSS software to ensure a comprehensive and accurate statistical evaluation.

The study's objective was to gain a detailed understanding of the patient profiles and the factors affecting the prevalence and treatment outcomes of kidney stone disease in the Tobruk region. The findings are expected to provide valuable insights for improving the management and treatment strategies for urolithiasis in this population.

RESULT:

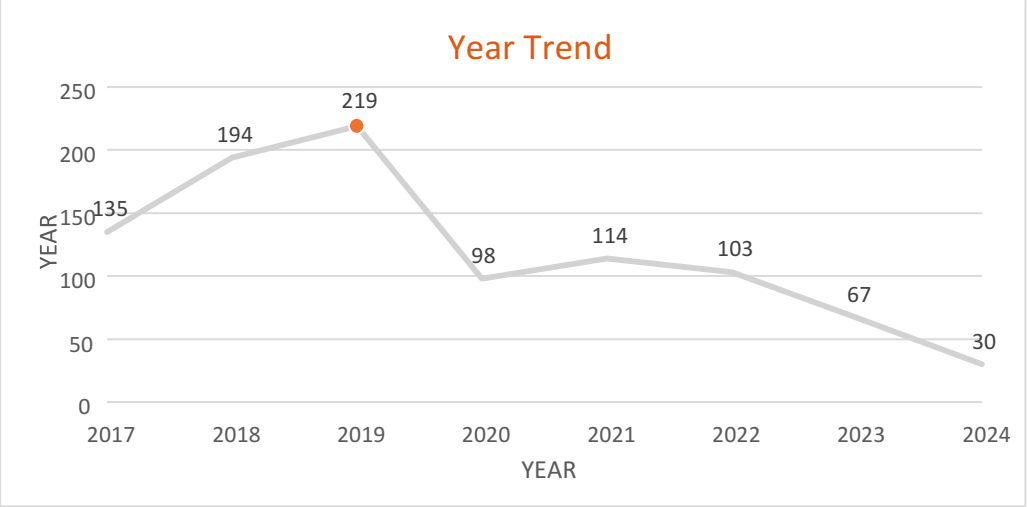
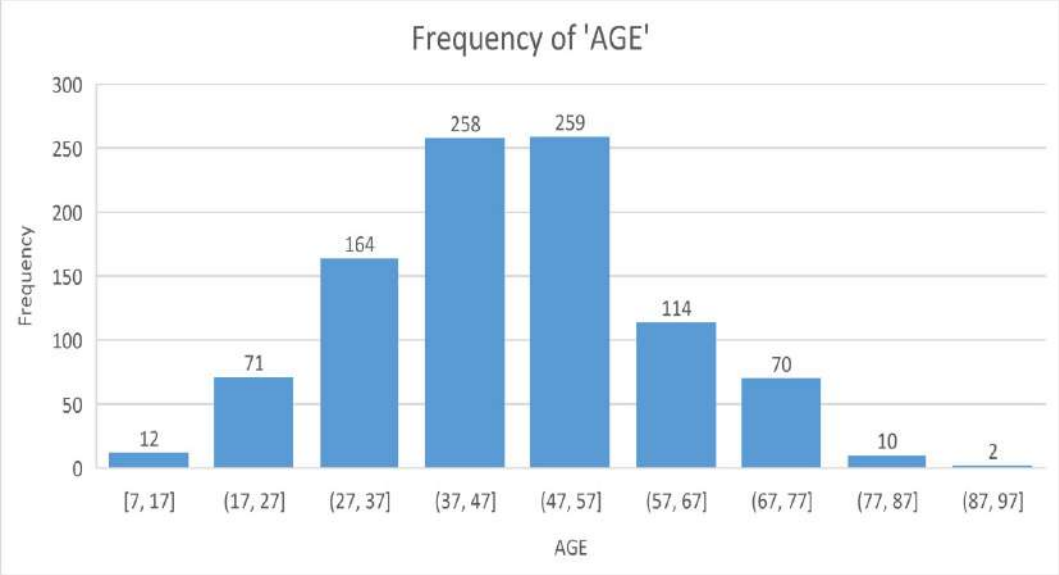
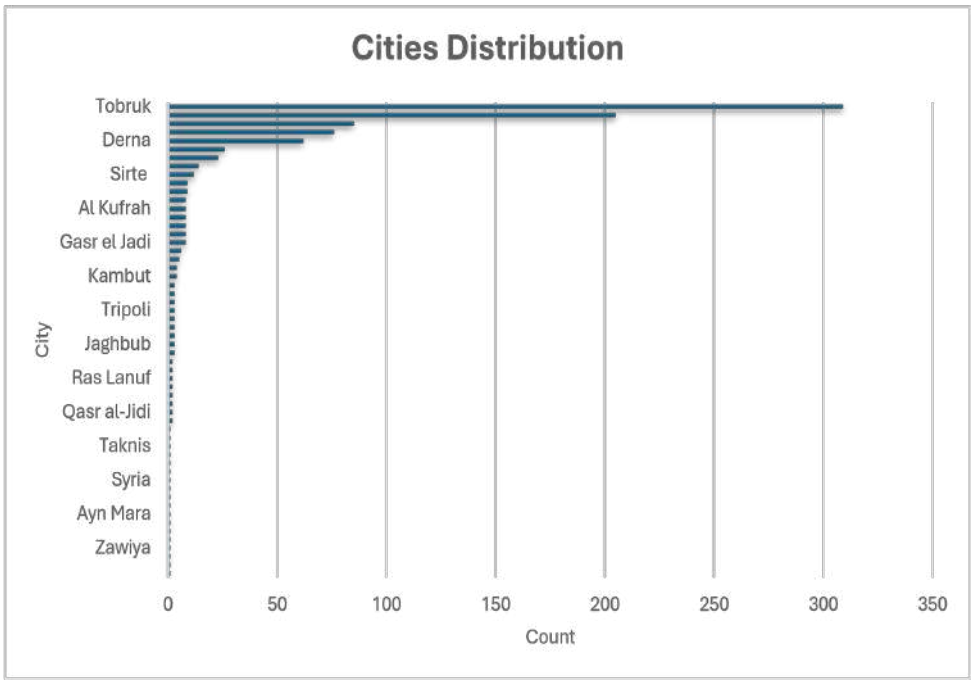


Figure (1): frequency of cases from 2017 to 2024

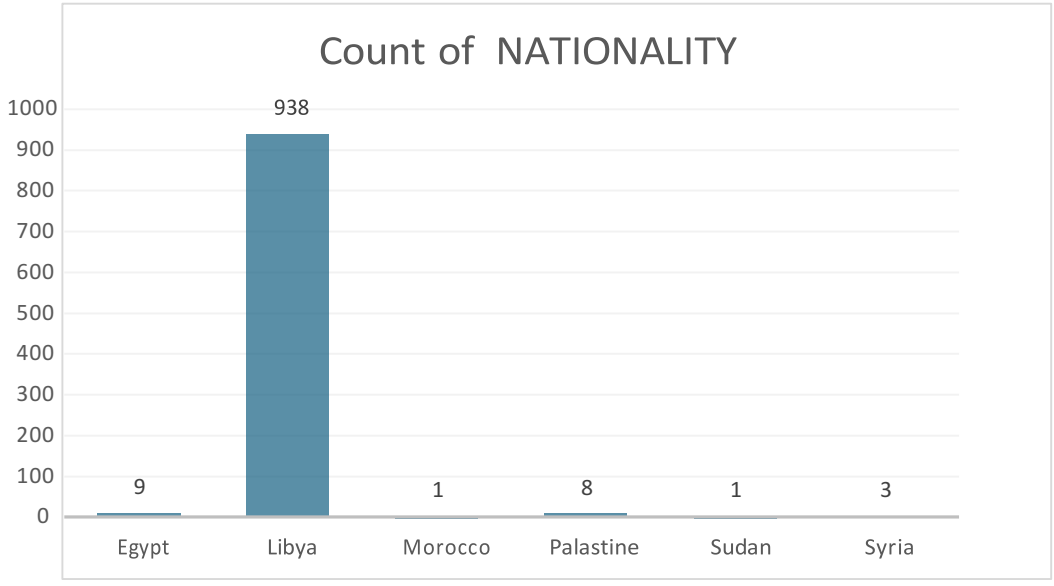
	Age	
Age	Median (IQR): 46 (37-55)	p-value < 0.005



Figure(2): *age distribution of study participants*



Figure(3): *distribution by city of participants*



Figure(4): nationality of study participants

***Table (1):Frequencies for* PMH (Past Medical History)**

PMH (Past Medical History)	Count (%)
NO	662 (69.0%)
Hypertension	79 (8.2%)
Diabetes Mellitus	60 (6.3%)
Hypertension and Diabetes Mellitus	50 (5.2%)
Recurrent Renal Colic	40 (4.2%)
Urological Conditions	26 (2.7%)
Respiratory Disorder	8 (0.8%)
Other Cardiovascular Disease	7 (0.7%)
Gastrointestinal Disorder	7 (0.7%)
Infectious Diseases	6 (0.6%)
Allergic Conditions	6 (0.6%)
Other Conditions	5 (0.5%)
Oncological Conditions	4 (0.4%)

***Table (2)Frequencies for* PSH (Past Surgical History)**

PSH (Past Surgical History)	Count (%)
No	677 (70.5%)
ESWL	132 (13.8%)
DJ Stent	95 (9.9%)
ESWL and DJ Stent	14 (1.5%)
Cesarean Section	8 (0.8%)
Percutaneous Nephrolithotomy	5 (0.5%)
Ureteroscopy	4 (0.4%)
Cholecystectomy	4 (0.4%)
Open Heart Surgery	2 (0.2%)
Cesarean Section and Cholecystectomy	2 (0.2%)
Appendectomy	2 (0.2%)
DJ Stent and Post Cardiac Catheterization	1 (0.1%)

Post Cardiac Catheterization	1 (0.1%)
Percutaneous Nephrolithotomy and Cholecystectomy	1 (0.1%)
Cystolithotomy	1 (0.1%)
Right Open Pulmonary Surgery	1 (0.1%)
Head Surgery	1 (0.1%)
Cholecystectomy and Finger Amputation	1 (0.1%)
Hemodialysis and Carcinoma in Situ	1 (0.1%)
Percutaneous Nephrolithotomy and Ureteroscopy	1 (0.1%)
Intrauterine Contraceptive Device (IUCD)	1 (0.1%)
Pyeloplasty	1 (0.1%)
Mastectomy	1 (0.1%)
Colonoscopy	1 (0.1%)
APS	1 (0.1%)
Gastric Surgery	1 (0.1%)

Table (3)Frequencies for No. STONE

No. STONE	**No. (%)**
1	588(61.3)
2	133(13.9)
3	46(4.8)
4	8(0.8)
5	2(0.2)
9	1(0.1)
No	76(7.9)
Multiple	106(11.0)

Table (4)Frequencies for SIZE OF STONE

1	**388(40.417)**
2	232(24.167)
3	28(2.917)
4	4(0.417)
5	1(0.104)
7	1(0.104)
NO	306(31.875)

Table (5):Frequencies for NO. of SESSION

NO. of SESSION	**No. (%)**
1	833(86.771)
2	114(11.875)
3	12(1.250)
4	1(0.104)

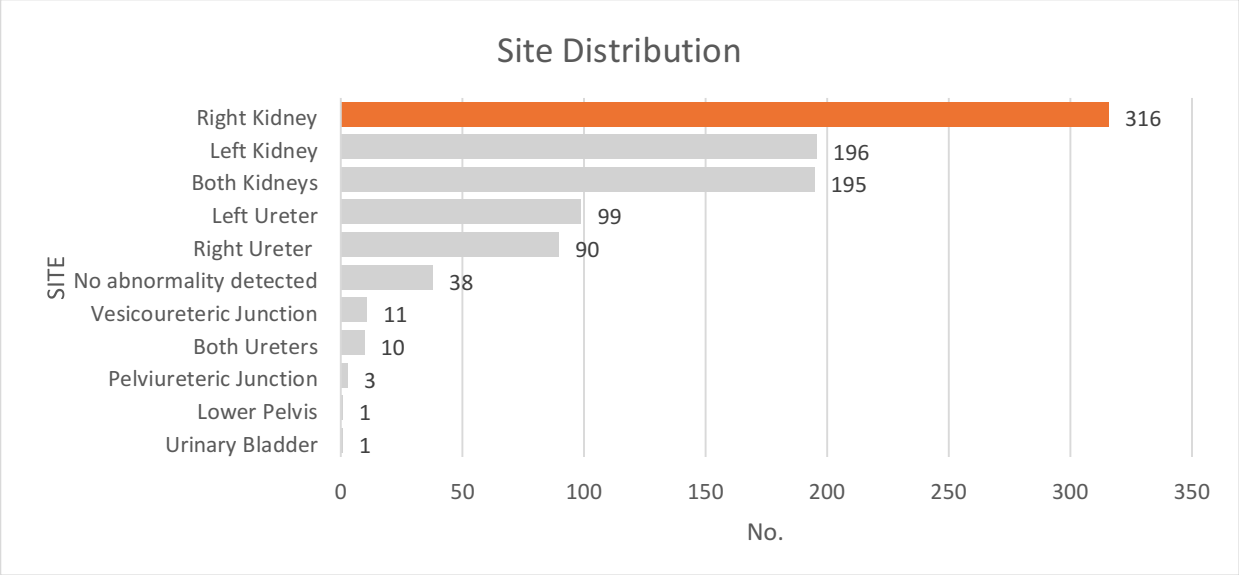


Figure (5): distribution of stone locations

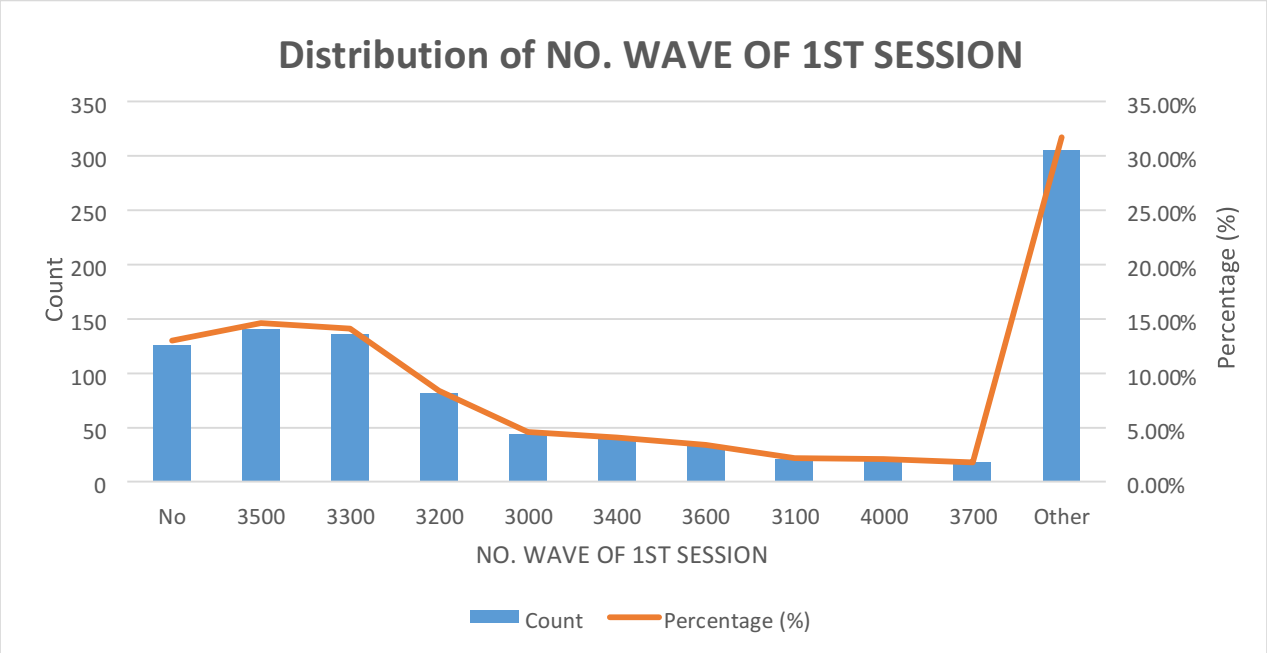


Figure (6) : How about variation in number of First Session waves.

Table (6):Correlation and Associations Comparisons

Test	Variable(s) Compared	Group	N	U* **or** X^{2**}	p-value
Mann-Whitney U Test	AGE	Male	604	80476.0	<.001
		Female	356	-	-
Mann-Whitney U Test	SIZE OF STONE	Male	404	47079.5	0.092
		Female	250	-	-
Chi-Squared Test	PMH vs SEX	-	960	56.4	<.001
Chi-Squared Test	PSH vs SEX	-	960	51.6	0.001
Chi-Squared Test	SITE vs SEX	-	960	22.3	0.014
Pearson's Correlation	AGE and SIZE OF STONE	-	-	r = 0.11***	0.004
Chi-Squared Test	SITE vs CITY	-	960	809.34	<.001
Chi-Squared Test	Age vs SITE	-	960	675.1	0.928
Chi-Squared Test	PSH vs PMH	-	960	403.9	<.001
Chi-Squared Test	CITY and SIZE OF STONE	-	960	273.7	0.989

Table(7): study participants sex distribution

SEX	No. (%)
Male	604(62.9)
Female	356(37.1)

DISCUSSION:

The demographic and clinical findings of this study reveal important insights into the urolithiasis burden among patients at Alhakim Clinic in Tobruk, Libya, and reflect broader trends in urolithiasis epidemiology and treatment. The predominance of male patients (62.9%) (figure 1) our cohort aligns with previous research that has shown a higher incidence of kidney stones in men than in women (table 7). This discrepancy may stem from sex-based differences in risk factors such as diet, fluid intake, hormonal influences, and metabolic rates. Men, on average, tend to consume more protein and oxalate-rich diets [(4)], both of which are significant contributors to stone formation male hormone testosterone has been associated with a higher risk of stone formation [(6)], while estrogen in women may play a protective role by reducing calcium oxalate stone formation . Geographic andntal factors also appear to play a crucial role in the epidemiology of urolithiasis in this population. Tobruk,(figure3) a region with a hot, arid climate, experiences high levels of dehydration [(7)], which is a known risk factor for stone formation due to reduced urine volume and increased urine concentration. Several studies have noted an increased prevalence of urolithiasis in regions with hotter climates[(12)], where individuals are more likely to experience dehydration. This condition concentrates solutes such as calcium and oxalate in the urine, enhancing the likelihood of stone formation . The study's finding thauk represent the largest proportion of cases (32.2%) suggests that environmental factors specific to this location might contribute significantly to urolithiasis incidence in the region. Dietary habits are another major contributor to stone formation, particularly in Libya, where diets rich in sodium, animal proteins, and oxalates are prevalent. High sodium intake can increase calcium excretion, thus heightening the risk for calcium-based stones [(5)]. Likewise, diets low in potassium and magnesium, essential minerals that inhibit crystal formation (table1), have been associated with a greater likelihood of urolithiasis . Education on dietary management, such as rlt and animal protein intake and increasing water consumption, could therefore play an instrumental role in reducing stone formation in at-risk populations, especially in hot climates like that of Tobruk.

Our study found that comorbidities such as hypertension and diabetes were frequently observed among patients with urolithiasis, which is consistent with findings in other populations (table1). The association between metabolic syndrome components

and stone formation is well-documented, with studies indicating that insulin resistance can lower urinary citrate levels while increasing calcium and oxalate excretion[11]. Both diabetes and hypertension contribute to metabolic changes that favor lithogenesis, such as increased calcium excretion and reduced urinary citrate, which are critical risk factors for stone formation . This connection highlights the importance of managiing metabolic conditions to reduce the incidence and recurrence of kidney stones[6].Moreover, prior urological interventions were common in our study population, with a significant portion of patients having undergone previous ESWL or placement of a double J (DJ) stent. This finding highlights the recurrent nature of urolithiasis, as many patients require repeated interventions (figure 5). Studies have shown that despite successful treatment, urolithiasis has a high recurrence rate, with around 50% of patients developing another stone within five years of the initial episode . This recurrence is partly due to the metabolic abnormalitieone formation, which remain unchanged without targeted preventive measures.[7]The correlation analysis in our study revealed significant associations between age, stone size, and other clinical characteristics [12]. Specifically, older patients tended to have larger stones, which could be attributed to prolonged exposure to risk factors and accumulated effects of lifestyle (table4), metabolic, and environmental contributors over time. This association underscores the importance of early diagnosis and intervention to prevent the growth of kidney stones to larger sizes that may require more invasive treatments.[13]

The data also revealed variations in stone location, with the right kidney being the most common site of stone formation (figure6). Although the underlying reasons for this laterality preference are not fully understood, studies suggest that anatomical variations[2], physiological factors, or even hydration patterns might influence the side on which stones are more likely to form .In conclusion, this study underscores the multifactorial nature of urolithiasobruk population, with demographic, environmental, dietary, and comorbid factors all playing important roles in stone formation and recurrence. Future studies could focus on further exploring genetic predispositions and specific lifestyle factors within this population to create more targeted public health interventions. Encouraging dietary adjustments[9], promoting hydration, and managing metabolic conditions are likely to have a positive impact on reducing the urolithiasis burden in Tobruk and similar regions with high prevalence.[10]

CONCLUSION:

The findings from this study underscore the multifactorial nature of urolithiasis among patients undergoing ESWL at Alhakim Clinic in Tobruk, Libya. Demographic factors such as age, gender, and geographic distribution, combined with comorbidities like hypertension and diabetes, appear to significantly influence the risk and recurrence of kidney stones. The study reveals a high recurrence rate, as evidenced by a significant proportion of patients with prior urological interventions, highlighting the persistent nature of urolithiasis despite treatment.

Given the substantial association of lifestyle factors, especially hydration and diet, with urolithiasis risk, future public health initiatives could benefit from emphasizing

dietary modifications, increased fluid intake, and management of underlying comorbidities. Further research may enhance the understanding of regional environmental and genetic factors contributing to urolithiasis, enabling more personalized and effective prevention and treatment strategies.

Recommendations

1. **Broader Studies**: Future research should include a larger, more diverse population and multiple geographic locations to enhance the generalizability of the findings.
2. **Longitudinal Research**: Conducting longitudinal studies would help establish causal relationships and monitor the long-term outcomes of ESWL treatment in urolithiasis patients.
3. **Seasonal Analysis**: Incorporate data collection across different seasons to understand the potential impact of seasonal variations on urolithiasis incidence and treatment outcomes.
4. **Enhanced Data Collection**: Improve the accuracy and completeness of patient records and consider prospective data collection methods to reduce bias.
5. **Follow-Up Studies**: Include follow-up assessments to evaluate the long-term effectiveness and potential complications of ESWL treatment in the patient population.

REFERENCES:

1. Tamborino F, Cicchetti R, Mascitti M, Litterio G. Pathophysiology and main molecular mechanisms of urinary stone formation and recurrence. *Int J ...*. 2024. Cited by 13.

2. Kachkoul R, Touimi GB, El Mouhri G, et al. Urolithiasis: history, epidemiology, aetiologic factors and management. *Malays J ...*. 2023. Cited by 12.

3. Madaminov M, Shernazarov F. Causes, symptoms, diagnosis and treatment of kidney stones (urolithiasis). *Sci Innov*. 2022. Cited by 13.

4. Pearle MS, Calhoun EA, Curhan GC. Urologic diseases in America project: urolithiasis. *J Urol*. 2005;173(3):848-57.

5. Romero V, Akpinar H, Assimos DG. Kidney stones: a global picture of prevalence, incidence, and associated risk factors. *Rev Urol*. 2010;12(2-3).

6. Worcester EM, Coe FL. Clinical practice. Calcium kidney stones. *N Engl J Med*. 2010;363(10):954-63.

7. Sas DJ, Hulsey TC, Shatat IF, Orak JK. Increasing incidence of kidney stones in children evaluated in the emergency department. *J Pediatr*. 2010;157(1):132-7.

8. Fakheri RJ, Goldfarb DS. Ambient temperature as a contributor to kidney stone formation: implications of global warming. *Kidney Int*. 2011;79(11):1178-85.

9. Taylor EN, Curhan GC. Dietary calcium from dairy and nondairy sources, and risk of

symptomatic kidney stones. *J Urol*. 2013;190(4):1255-9.

10. Daudon M, Frochot V. Factors influencing urinary stone composition. *J Nephrol*. 2016;29(3):367-77.

11. Johnson CM, Wilson DM, O'Fallon WM, Malek RS, Kurland LT. Renal stone epidemiology: a 25-year study in Rochester, Minnesota. *Kidney Int*. 1979;16(5):624-31.

12. Chauhan V, Eskin B, Allegra JR, Cochrane DG. Effect of season, age, and gender on renal colic incidence. *Am J Emerg Med*. 2004;22(7):560-3.

13. Weimar JA, Elbadawi AM, Lu C, Ruggiero KE. Right vs left kidney: what's the difference? A retrospective evaluation of differences in outcomes based on lateral kidney location. *Urolithiasis*. 2021;49(2):197-203.