The Prevalence of a Clinically Silent Nephrolithiasis in Baghdad Population: An Initial Ultrasound Screening Study From Iraq

Nadhum L. Tahir[1], Qays A. Hassan[2], Harth M. Kamber[2]

[1] *Department of Family Medicine, Al-Rusafa Health Director, Baghdad, Iraq*
[2] *Department of Surgery, Al-kindy College of Medicine, University of Baghdad, Baghdad, Iraq*

Received: 27 Aug. 2018; Accepted: 14 Nov. 2018

Abstract- Asymptomatic or clinically silent kidney stones are possibly serious because, in their expected passage, they may cause infection, obstruction and renal impairment. The purpose of this study was to determine the prevalence of silent kidney stones in a sample of Baghdad population and consider how this value could affect the justification for a screening system. To our best knowledge, this is the first study of its kind conducted in Iraq. We investigated 714 consecutive patients who sustained an abdominal ultrasound at our hospital with further kidney screening. All these patients did not have clinical signs and symptoms of nephrolithiasis. Age, sex, the indication for ultrasound, the size, side, and the number of the discovered stones were recorded. We observed silent kidney stones in 3.4% of patients. Males were stone carriers mostly. Stones were detected more in the left kidney than the right. Distinctly, multiple stones and stones of a large size were minimally seen. We conclude that the prevalence of clinically silent nephrolithiasis of 3.4% does not support a global screening. Yet, this screening may be justified in a limited pattern for those male subjects higher than 50 years, having a positive family history of renal stones, and their socioeconomic status is granted.

Acta Med Iran 2019;57(1):51-56.

Keywords: Silent stones; Kidney; Prevalence; Screening

Introduction

Nephrolithiasis, or kidney stone disease, is a common problem with an enormous socio-economic impact (1,2). Recent data from several countries suggest a worldwide increase in the prevalence of stone disease in the last 3 to 4 decades (3,4). A variety of reasons for increased stone prevalence have been postulated, depending on the geographical area, racial distribution, socioeconomic status, and dietary habits (5). However, it is also possible that the increased utilization of imaging studies in recent years has led to the greater detection of nephrolithiasis, overestimating the true increased prevalence of stones (6,7).

Amongst other countries, kidney stone disease is more prevalent in Iraq where patients with stone represent the bulk of all urological patients (8). Patientskidney stone constitute higher than half of all urological patients in Iraqi hospitals. For a long time, stones may be clinically silent and asymptomatic. But, when they get a clinically significant size beyond an automatic passage through the urinary tract, they may produce infection, obstruction, deterioration of kidney function, and ultimately the renal failure (9,10). Accordingly, it would be most effective and important to discover stones in their initial steps of maturity before they become clinically symptomatic. For such screening, the renal ultrasound would be the most appropriate tool because it is simple to apply, safe, and reliable. However, to estimate the cost-effectiveness associated with this screening, the identification of the supposed prevalence of silent stones detected by ultrasound should be settled first. To our best knowledge, no such study held previously in our country. So, the purpose of this study was to estimate the prevalence of asymptomatic stones in a representative sample of the Iraqi population and judge how this value could influence the approval for the arrangement of a screening system.

Materials and Methods

Study design

This was a cross-sectional prospective study in which all patients were Iraqi and were investigated in

Corresponding Author: Q.A. Hassan
Department of Surgery, Al-kindy College of Medicine, University of Baghdad, Baghdad, Iraq
Tel: +96 477 22604163, Fax: +96 477 63592, E-mail address: qtimeme@yahoo.com

the Department of Radiology in our teaching hospital in Baghdad between April 2016 and March 2017. This study was conducted in accordance with the Declaration of Helsinki and was approved by the hospital's ethics and scientific research committee (registration code: 124/2016). Informed consent was taken from all the patients involved in the study,and their personal health information was safeguarded.

Study population

In this study, 714 consecutive adult patients who sustained an abdominal diagnostic ultrasound and had a further screening of the kidneys were included. The clinical history of each patient was evaluated using the indication given for the ultrasound study, and, if unclear, using preceding clinical notes. From history, the patients were recognized as asymptomatic subjects on the basis of the absence of typical clinical symptoms for nephrolithiasis (*i.e.*, flank pain, hematuria). In cases where the patient was already known to have a symptomatic stone, or if the patient had a procedure (*e.g.*, lithotripsy, stenting), the patient was categorized as symptomatic and excluded. No time constraints were placed on prior symptoms. Therefore, a documented incident of flank pain or hematuria attributable to nephrolithiasis in the distant past precluded the classification of a patient into the asymptomatic category.

In our initial analysis, stones were regarded as asymptomatic or clinically silent provided that no gross hematuria was present. Thus, patients who had microhematuria could still technically have asymptomatic kidney stones if it could be attributed to causes unrelated to stones. These causes include recent or current bladder catheterization, recent prostatic resection, hemorrhagic cystitis, urinary tract infection, or intrinsic renal disease. Allowing microhematuria to be present among cases of asymptomatic stones may cause the percentage of such cases to be falsely elevated. Therefore, the data were reanalyzed to only allow those patients with no degree of microhematuria to be classified as asymptomatic. Using these more stringent criteria enabled us to generate a minimum value for the percentage of asymptomatic stones. So, the presence of microhematuria was considered to be an exclusion criterion for classifying stones as asymptomatic. Out of four patients examined with urine analysis, three had microhaematuria as additional evidence for the carriage of stone,and those were excluded.

Age, sex, indication for the ultrasound as well as the size, number, side of any detected stones were listed. If the monitoring of known kidney stones was given as the indication for the ultrasound, stones that were previously detected incidentally and had remained asymptomatic up to the time of the imaging were considered asymptomatic.

Ultrasound examination

A General Electric Voluson ultrasound machine with 3.5 MHZ convex probe was used for this study. To exclude inter-observer variation, all ultrasounds were performed by one experienced radiologist with a minimum of 10 years of experience in performing a renal ultrasound. During the ultrasound scan, if a stone was present, it was considered "definite" if an echogenic density was seen with posterior acoustic shadowing. All other cases that were difficult to interpret or the judgment for being a stone was uncertain were excluded.

Data analysis

Statistical Package for Social Sciences (SPSS) version 18 used for data analysis. Continuous variables were shown as mean (M) and standard deviation (SD). T-test for two independent variables used to test the significance of the difference between two normally distributed continuous variables the significance of the extrapolated means is supported by the absence of zero from the 95% confidence interval. Findings with a *P* less than 0.05 considered significant.

Results

The study included a total of 714 patients; 364 (51%) were males,and 350 (49%) were females. The mean age was 48.4±12.1 yr. (ranging 16-80) for all subjects. The commonest age group studied was 40-49 y where it constitutes 35.9% of the study sample.

The abdominal ultrasound scan was indicated for many causes. Table 1presents a list of these indications.

Silent stones were detected in 24 patients. Most were newly identified. Only 3 were previously detected incidentally and had remained asymptomatic up to the time of the imaging. Thus, the prevalence of clinically silent kidney stones was 3.4% in our study population as shown in (Figure 1).

Table 1. Distribution of study sample according to the indications to abdominal ultrasound

Indication	Percent
Unrelated abdominal pain	38
Gynecological problem	18
Musculoskeletal pain	12
General check up	6
Chronic liver disease	4
Diarrhea and constipation	5
Follow up for previously discovered silent stones	5
Follow up for various cancers	3
Other not specific symptoms	8

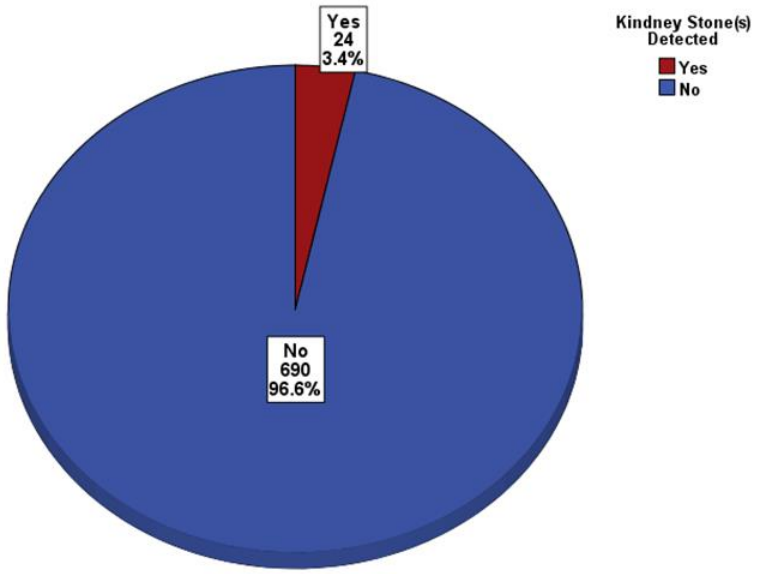

Figure 1. Distribution of sampled patients according to presence or absence of silent kidney stones on ultrasound examination

Interestingly, most incidental stones were detected in males (n=20) accounting for 5.5% of the male population studied and 83.3% of all subjects having silent kidney stones. In only 4 females, incidental stones were detected accounting for 1.1% of the female population studied and 16.7% of subjects having silent kidney stones. For all stone bearers, the mean age was 49±11.9 yr (23-72 yr). Table 2 exhibited the distribution of the subjects having silent kidney stones according to sex and age groups.

Out of 24, 19 (79.2%) subjects had single silent stone,and 5 (20.8%) subjects had multiple silent stones. Stones were more located in the left kidney as compared to the right (58.3% versus 29.2%). Stones were bilateral in 12.5%. The average longitudinal diameter of detected stones was 7.9 mm (5-20 mm). Table 3 showsthe characteristics of the silent kidney stones in 24 subjects.

Out of 24, only four subjects (16.6%) showed a positive family history of renal stones.

On comparing patient characteristics and distribution having silent kidney stones, this study found a significant association between male sex and having silent kidney stones that 20 patients (83.3%) out of 24 subjects detected having kidney stones were males (P=0.001, Figure 2).

There was a non-significant association between having silent kidney stones and other variables such as the age (P=0.401) and family history of renal stones (P=0.822)

Table 2. Distribution of subjects having silent kidney stones according to age and sex

Variable		Number (percent)
Age Group	20-29 y	2 (8.3)
	30-39 y	3 (12.5)
	40-49 y	8 (33.3)
	50-59 y	6 (25.0)
	60-69 y	4 (16.7)
	≥ 70 y	1 (4.2)
Sex	Male	20 (83.3)
	Female	4 (16.7)

Table 3. Characteristics of observed silent kidney stones

Variable		Number	Percent
Number of kidney stones			
Min-Max		1-4	
Distribution of kidney stones	Single	19	79.2
	Multiple	5	20.8
Size of stones (mm)	Min-Max	5-20	
	Mean±SD	7.9±3.5	
The side of kidney stones	Right kidney	7	29.2
	Left Kidney	14	58.3
	Both kidneys	3	12.5

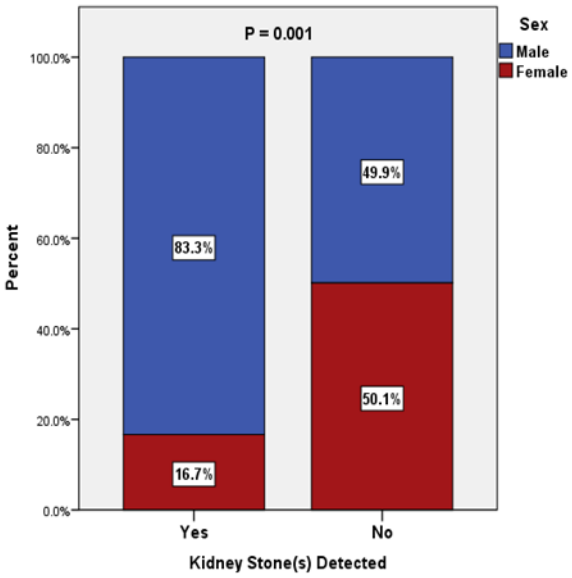

Figure 2. Distribution of sampled patient according to having kidney stones and sex of patients

Discussion

Today, the lifetime chance for an individual to have a stone is estimated at approximately 12% (1,11).The prevalence of nephrolithiasis is rated at 2-3% (1,2,11).It has a large socioeconomic burden through treatment and recovery associated costs, time missed from employment, and attendant morbidity (12).Kidney stone disease is a basic health dilemma in Iraq because of its geographical position in Middle-East (Middle-East lies within the stone belt zone extending from Indonesia to North Africa), financial and dietary factors, dehydration, hot weather and perhaps genetic factors (13).In Iraq, the climate is hot and dry where the temperature is raising during the summer months to more than 50°C. Moreover, cooking habits may serve a substantial role in

my population eating a lot of meat and animal protein.

Renal stones could produce infection, obstruction, kidney damage, and, unfortunately, renal failure once they become clinically symptomatic and large in size. Yet, early discovery and prompt management of these stones prior to the onset of symptoms might be essential to prevent this hazard.

The goal of this study was to determine the prevalence of stones in patients who did not have symptoms of stones at the time of the study, and who had never had a symptomatic stone. These patients would represent a population who could report a history of asymptomatic stones detected solely by ultrasound. Without this reviewed imaging study, these patients would not have been included in estimates of stone prevalence.

On the set of a generally increased risk of stone formation for my population and in order to judge whether screening for renal stones would be supported, we tried to estimate, therefore, the prevalence of clinically silent and asymptomatic stones. The ultrasound is the tool of choice for such screening because it is safe, reproducible, cost-effective, regularly accessible, simple to manipulate and does not employ ionizing radiation.

Out of 714 ultrasonographically screened subjects, we identified 24 stone bearers,so the prevalence of clinically silent stones was 3.4%. This comes near another study performed in Pakistan in 2003 where Buchholz NP *et al.*, examined 201 adult subjects for the detection of silent stones and they reported a prevalence rate of 3% (14).

In the current study, most patients with stone were men. This agrees with the literature reports of 3:1 men-to-women ratio (14,15).However, some studies in the USA reported that the male-to-female ratio has changed over the past 25 years, from 3:1 to now less than 2:1 (16,17) which was attributed to changes in lifestyle factors, such as increasing obesity among women (18).

There was no attributable reason for answering the inquiry why most of the stones happened on the left side kidney. It is distinguished that multiple stones and those of large size were minimally seen in this study.

In our country, screening for silent renal stones with a value of 3.4% appears hard to sustain and launch because of many issues related to the local health system. One of these issues is that the treatment-related costs have to be paid directly by the patient in most situations and the patient financial capacity remains a large concern. However, the results of this study complement the already present epidemiological data on nephrolithiasis,and comparable data from other sectors of the world are advisable.

The present study is seen to have many points of strength such as 1) the first study of its sort from Iraq; 2) enough sample size; 3) strict roles for data gathering and interpretation. Although actions were done to accomplish the aims with best possible correctness, the inclusion of patients from a unique hospital might narrow the generalization of the results. Additional limitations we acknowledged in this work are 1) ultrasonography was used as the imaging modality to assess the number of incidental stones instead of non-contrast Computed Tomography (CT). The latter is known to be more sensitive for detecting nephrolithiasis and has largely replaced ultrasonography for evaluation of patients with symptoms of acute renal colic (19,20,2) the ultrasound was not sensitive for diagnosis of tiny stones smaller than 5mm as these stones don't show posterior acoustic shadowing; and 3) the geographical and seasonal variations were not evaluated and compared. In Iraq, we suspect high prevalence of stone formation in the hottest southern regions and during the warmer summer months than the colder winter months as the temperature varies by more than 20°C, so future studies taking these concerns in their consideration are recommended.

This study revealed a prevalence of 3.4% silent stones that may only be detected by screening or incidentally. This was not surprising for a "stone country" like Iraq. However, and because of the socioeconomic impact, we think that a global renal screening for nephrolithiasis is not justified in our country. Yet, this screening may be justified in a limited pattern for those male subjects higher than 50 years, having a positive family history of renal stones, and their socioeconomic status is granted. The results of this study complement the already present epidemiological data on nephrolithiasis.Values from other regions in the world have yet to be estimated and compared with the current results.

References

1. Scales CD Jr, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. EurUrol 2012;62:160-5.
2. Parmar MS. Kidney stones. BMJ 2004;328:1420.
3. Curhan GC. Epidemiology of stone disease. UrolClin North Am 2007;34:287-93.
4. Coe FL, Evan A, Worcester E. Kidney stone disease. J Clin Invest 2005;115:2598-608.

5. Lopez M, Hoppe B. History, epidemiology, and regional diversities of urolitheasis. PediatrNephrol 2010;25:49-59.
6. Bhargavan M, Sunshine JH. Utilization of radiology services in the United States: Levels and trends in modalities, regions, and populations. Radiol 2005;234:824-32.
7. Goldfarb DS. Increasing prevalence of kidney stones in the United States. Kidney Int 2003;63:1951-2.
8. Al-Jebouri MM, Atalah N. A study on the interrelationship between renal calculi, hormonal abnormalities and urinary tract infections in Iraqi patients. Open J Urol 2012;2:6-10.
9. Burgher A, Beman M, Holtzman JL, Monga M. Progression of nephrolithiasis: Long-term outcomes with observation of asymptomatic calculi. J Endourol 2004;18:534-9.
10. Inci K, Sahin A, Islamoglu E, Eren MT, Bakkaloglu M, Ozen H. Prospective long-term follow up of patients with asymptomatic lower pole caliceal stones. J Urol 2007;177:2189-92.
11. Lieske JC, Peña de la Vega LS, Slezak JM, Bergstralh EJ, Leibson CL, Ho KL, et al. Renal stone epidemiology in Rochester, Minnesota: an update. Kidney Int 2006;69:760-4.
12. Lotan Y, Cadeddu JA, Roerhborn CG, Pak CY, Pearle MS. Cost-effectiveness of medical management strategies for nephrolithiasis. J Urol 2004;172:2275.
13. Hussein YF, Abdulhussein BJ, Nawar AH, Osman MT, and Daher AM. Extracorporeal Shock Wave Lithotripsy in the Treatment of Single Ureteric Stone. Initial Data from Iraq. Open J Urol 2015;5:49-56.
14. Buchholz NP, Abbas F, Afzal M, Khan R, Rizvi I, Talati J. The prevalence of silent kidney stones - an ultrasonographic screening study. J Pak Med Assoc 2003;53:24-5.
15. Bansal AD, Hui J, Goldfarb DS. Asymptomatic nephrolithiasis detected by ultrasound. lin J Am SocNephrol 2009;4:680.
16. Pearle MS, Calhoun EA, Curhan GC, Urologic Diseases of America Project. Urologic diseases in America project: urolithiasis. J Urol 2005;173:848.
17. Scales CD Jr, Curtis LH, Norris RD, Springhart WP, Sur RL, Schulman KA, et al. Changing gender prevalence of stone disease. J Urol 2007;177:979-82.
18. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. JAMA 2006;295:1549.
19. Ulusan S, Koc Z, Tokmak N. Accuracy of sonography for detecting renal stone: Comparison with CT. J Clin Ultrasound 2007;35:256-61.
20. Fowler KA, Locken JA, Duchesne JH, Williamson MR. US for detecting renal calculi with nonenhanced CT as a reference standard. Radiology 2002;222:109-13.