

Sonographic Evaluation of Urolithiasis Formation with Positive Family History in the Population of Lahore

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Abstract

Background: The purpose of the research is to know the sonographic evaluation of urolithiasis formation with positive family history in population of Lahore because urolithiasis is a major problem in Pakistan. According to a survey in 1985–1987 the incidence rate reaches to 8.3/100,000 individuals in the Punjab. In Pakistan, urolithiasis is the sixth major cause of surgery. The study was conducted to rule out the role of positive family history in people suffering from urolithiasis. **Materials and Methods:** This was an observational cross-sectional study conducted at the Radiology department of the University of Lahore teaching hospital and Gilani Ultrasound center-Afro-Asian Institute, Lahore, Pakistan. A total of 125 patients were included in the study which were diagnosed with urolithiasis and individuals with any other abnormality were excluded from the study. The duration of the study was from January 2017 to April 2017. Data were tabulated and analyzed using SPSS version 24. The data were reported using descriptive and inferential statistics. The quantitative variable like age was assessed using mean standard deviation and standard errors. The qualitative variables like gender were reported using percentages and frequencies. **Results:** Urolithiasis is commonly seen in the males (77 individuals out of 125) as compared to females (48 individuals out of 125) and mid pole of right kidney is the most common site of the renal stones deposition (13.6%), and the relationship of father is mostly seen as familial history (39.2%). **Conclusion:** It is concluded that positive family history is the major predisposing factor in urolithiasis and one of the cause in the development of stones in the urinary tract or in other words people who have a history of urolithiasis in blood relations have more tendency of stone formation in any part of their lives. Its positive aspect is that we can do a screening in blood relations, especially whose parents or family members diagnosed with stones and can do preventive measures for that. Moreover, its negative aspect is that there are several causes of the stone formation in the urinary tract.

Keywords: Observational cross-sectional study, Pakistan, positive family history, renal stones, ultrasonography

INTRODUCTION

Urolithiasis is a condition when a stone occurs in a urinary tract. The formation mostly starts in the kidney and leave the body in the urine stream. A small stone may pass out without causing any symptom but if a stone is more than 5 mm it may block the urinary tract and can cause many symptoms including pain in lumbar region, hematuria, dysuria, nausea and vomiting, etc., The renal stones form due to the combination of genetic and environmental factors. The risk factors of the renal calculi include: high calcium level in the urine, obesity, and certain foods, drinking inadequate water, some medications, calcium supplements, hyperparathyroidism, and gout. Stones formation starts in the kidney when concentration of minerals

is high in urine. The calculi are classified according to their different locations: if the calculus is present in the kidney then it is termed as nephrolithiasis, if it is present in the ureter then it is termed as ureterolithiasis, if it is present in the urinary bladder then it is known as cystolithiasis and they are also classified according to its composition it can either be made up of calcium, uric acid, cystine or struvite, etc., Patients diagnosed with stone, the main prevention is drinking a lot of water because 2 L of urine is produced per day normally and drinks in which phosphoric acid is present should be avoided such as colas. The stone requires no treatment if it is not

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creating any symptom. Pain can be managed with medicines and the larger stones requires surgical procedures such as lithotripsy, ureteroscopy, or percutaneous nephrolithotomy.^[1-4] About half of the people have the tendency to develop another stone within 10 years after the development of the first renal stone. About 1%–15% of people affect with the renal calculi globally at any point in their lives and according to a survey in 2015, 22.1 million cases are found and become a cause of death in 16,100 worldwide. The renal stones are more commonly found in the Western world since 1970 and men are affected more as compared to women.^[5-7] Urolithiasis can be diagnosed with the help of ultrasound, computed tomography, X-ray, intravenous pyelogram, or with laboratory tests also but in our research, we use ultrasound (kidney, ureter, and bladder) for the diagnosis of stones and its location in the urinary tract. Many researches have been published that shows that family history is one of the different causes of urolithiasis formation. A research was published in 2013 in which 100 patients were included in the study with renal stones and the result shows that 28% of the patients had positive family history while 72% of them had no history (2013). Over the world, from 15% to 68% of patients with stone may have a family history of stone in their first-degree relatives. A family history is related with a before beginning of illness and a more prominent shot of repeat. The lifetime chance (to age 75) for a sibling (brother) of the propositiis ~50%. The purpose behind a high recurrence of stone in the close family may be familial history, dietary, or natural. On the off chance that hereditary elements are available, the legacy shows up polygenetic as opposed to monogenetic.^[8] The rationale of our study is to know that what is the role of positive family history of the stone in urinary tract in the population of Lahore.

MATERIALS AND METHODS

This was a cross-sectional study on sonographic evaluation of renal stone formation with positive family history in population of Pakistan. A total of 125 individuals were enrolled in this study including male and female. The study was carried out in Radiology department of University of Lahore Teaching Hospital and Gilani Ultrasound center-Afro-Asian Institute, Lahore, Pakistan. The duration of the study was from January 2017 to April 2017. Convenient sampling technique was used. The individuals of all ages, male and female with calculus in the urinary tract were included in the study. The individuals with any other abnormality were excluded from the study. Toshiba (Xario 200) with convex transducer frequency range 2–5 MHz was used for this study. Age, gender, location of stone, family history (positive or negative), location of stone, and number of stone were the variables used in this study. Patient was scanned with transabdominal techniques to diagnose calculus and the patient lie in supine position for the evaluation of urinary bladder and ureters and right lateral decubitus position for the evaluation of left kidney and left lateral decubitus position for the evaluation of right kidney with deep inspiration and before the scan history was taken from

the patient. All the patients were scanned under the American Institute of Ultrasound in Medicine abdominal protocols which are routinely observed in this department.

Ethical approval was gained prior from the Ethical Committee of the University before study All information and collected data were kept confidential. Participants were remained anonymous throughout the study. The patient was informed that there is no risk or any harmful effect on the procedure of study. They were also informed that they were free to withdraw at any time during the process. Procedure was properly explained, and consent was signed from the patient or patient's legal attendant. Data were collected through data collection sheets and was tabulated and analyzed using Statistical Package for the Social Sciences (SPSS) version 24 (SPSS 24, IBM, Armonk, NY, United States of America), Microsoft Excel.

RESULTS

We enrolled 125 individuals in this research they all were diagnosed with urolithiasis in which 77 (61.6%) were male and 48 (38.4%) were female. Out of 125 individuals the minimum age was 2 years and maximum age was 88 years. Out of 125 patients, 109 (87.2%) cases have positive familial history of stone formation while 16 (12.8%) cases have negative history of stone formation [Table 1]. The relationships with which history of urolithiasis is positive are as follows: Father 49 (39.2%) cases, brother 32 (25.6%) cases, sister 9 (7.2%) cases, son 8 (6.4%) cases, mother 5 (4%) cases, brother and father 1 (0.8%) case, cousin 1 (0.8%) case, daughter, brother and sister 1 (0.8%) case, daughter (0.8%), daughter and son 1 (0.8%), and sister and father 1 (0.8%) [Table 2]. The

Table 1: Gender × history of stones cross tabulation

Gender	History of stones		Total
	Negative	Positive	
Female	4	44	48
Male	12	65	77
Total	16	109	125

Table 2: Relationship with positive family history

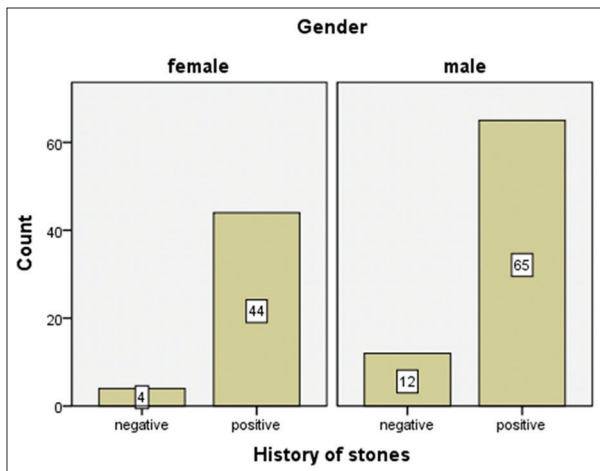
Relationship	Frequency (%)
Brother	32 (25.6)
Brother, father	1 (0.8)
Cousin	1 (0.8)
Daughter, brother and sister	1 (0.8)
Daughter	1 (0.8)
Daughter, son	1 (0.8)
Father	49 (39.2)
Mother	5 (4.0)
No one	16 (12.8)
Sister	9 (7.2)
Sister, Father	1 (0.8)
Son	8 (6.4)
Total	125 (100.0)

cases in which the history was negative = 16 (12.8%). Out of 125 cases of urolithiasis 48 were females in which 4 have negative history and 44 have positive history while 77 were male in which 12 have negative history and 65 have positive history of urolithiasis [Graph 1]. Single and multiple stones were diagnosed in both genders, in females single stones were found in 38 (79.2%) cases and multiple stones were found in 10 (20.8%) cases while in males single stone was found in 47 (61%) cases and multiple stones were found in 30 (39%) cases [Table 3]. Single was diagnosed at different locations of the urinary tract in which the stone was mostly present at the mid pole of the right kidney in 17 (13.6%) cases [Figure 1], lower pole of the right kidney 13 (10.4%) cases [Figure 2], lower pole of left kidney 10 (8%) cases, right ureter 10 (8%) cases, left ureterovesical junction (UVJ) 9 (7.2%) cases, right UVJ 7 (5.6%) cases, upper pole of right kidney 6 (4.8%) cases, mid pole of left kidney 6 (4.8%) cases. Multiple calculus were diagnosed at different locations which includes: mid and upper pole of right kidney 4 (3.2%) cases, left ureter 3 (2.4%) cases, left ureter and lower pole of left kidney 2 (1.6%) cases, lower pole of left kidney and lower pole of right kidney 2 (1.6%) cases, lower pole of right kidney and left UVJ 2 (1.6%) cases,

upper pole of left kidney 2 (1.6%) cases, upper, mid pole of right kidney and mid pole of left kidney 2 (1.6%) cases, 1 (0.8%) case were diagnosed at lower pole of left kidney, mid pole of right kidney, right ureter [Figure 3], lower pole of right and lower pole of left kidney, lower pole of right kidney and lower pole of left kidney, lower pole of right kidney and mid pole of left kidney, lower pole of right kidney and mid, lower pole of left kidney, mid, lower pole of right kidney, mid pole of right kidney and left ureter, mid pole of right kidney and lower pole of left kidney, mid pole of right kidney left UVJ, mid pole of right kidney, right ureter and upper, mid and lower pole, right and left UVJ, right kidney and right ureter, right renal pelvis, right ureter and right UVJ, right UVJ [Figure 4], left ureter, lower pole of left kidney [Figure 5], upper and lower pole of right kidney, upper and mid pole of right kidney and lower pole of left kidney, upper pole of left kidney and upper pole of right kidney, upper pole of left kidney and left ureter, upper pole of right kidney and lower pole of right kidney, upper pole of right kidney and right UVJ, upper pole of right kidney and upper pole of left kidney, upper, lower pole of left kidney, upper, lower pole of right kidney, upper, lower pole of right kidney and left UVJ, upper, lower pole of right kidney and multiple tiny stones in all kidney, upper, lower pole right kidney, upper, mid, lower pole of right kidney, right ureter, upper, mid pole of left kidney, upper, lower pole of right kidney and upper, lower pole of right kidney and upper, mid, lower pole of right kidney.

Table 3: Gender × number of stones cross tabulation

Gender	Number of stones		Total
	Multiple	Single	
Female			
Count	10	38	48
Percentage within gender	20.8	79.2	100.0
Percentage within number of stones	25.0	44.7	38.4
Male			
Count	30	47	77
Percentage within gender	39.0	61.0	100.0
Percentage within number of stones	75.0	55.3	61.6
Total			
Count	40	85	125
Percentage within gender	32.0	68.0	100.0
Percentage within number of stones	100.0	100.0	100.0



Graph 1: Bar-chart of History of stone in both genders

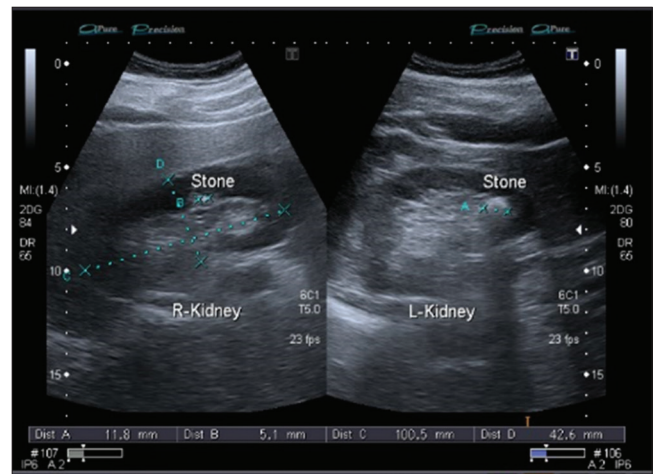


Figure 1: Stone at mid pole of right kidney and stone at lower pole of left kidney

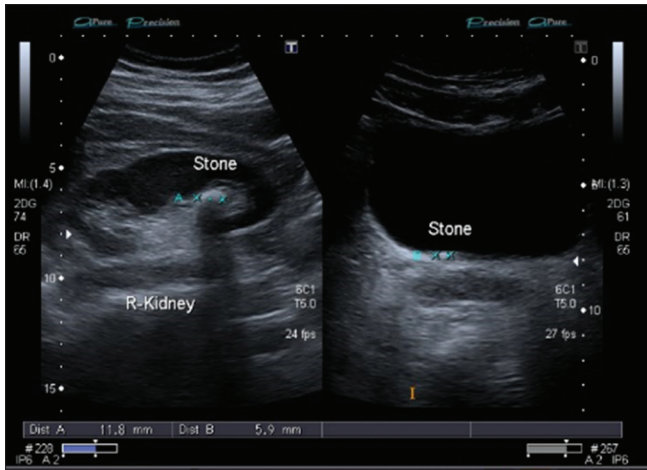


Figure 2: Stone at lower pole of right kidney and stone at right ureterovesical junction

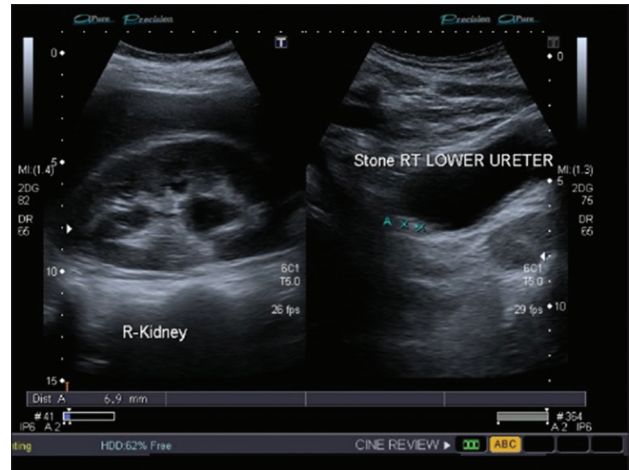


Figure 3: Stone at right lower ureter with mild hydronephrosis in right kidney

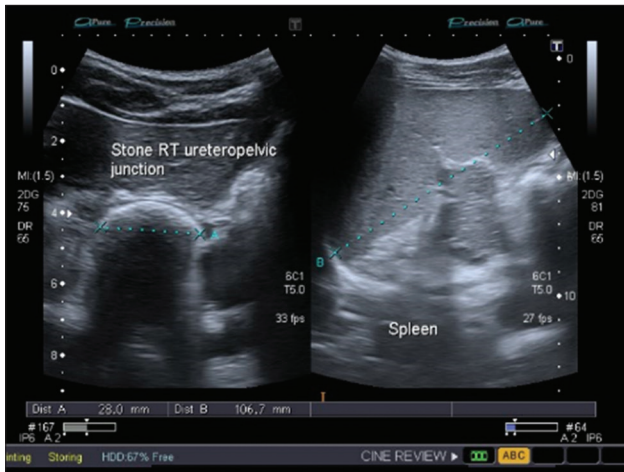


Figure 4: Stone at right ureteropelvic junction



Figure 5: Stone at left lower ureter and stone at lower pole of left kidney

eventually results in calculus, normally some chelating agents are present in the urine which inhibits the growth nucleation and aggregation of the crystals that contains calcium, if these chelating agents are less in the urine they can also be a cause of the stone formation in the urinary tract.^[9-11] Several studies have been published on the importance of positive family history in the development of renal stones. A cohort study was published in which 37,999 male patients were included in the study in which 4873 cases of stones were reported with familial history. 2957 men had personal history of stone formation and in them 17.2% had stone before the follow-up while 6.4% were not.^[12] Another study was conducted for the evaluation of characteristics and etiology of the urolithiasis in the children of Iraq and for that purpose 204 children were included in the study diagnosed with renal stones from the age 4 months to 14 years and the male to female ratio was 2.8:1 and from them 45.1% of children had family history of renal calculi.^[13] A cross-sectional study was published in Tabriz for the evaluation of the role of family history of nephrolithiasis in the patients with calculi and for that purpose they took 210 patients that were diagnosed with the stone in the upper urinary tract and

the results shows that the 28.6% from them had positive family history and mostly siblings are affected, in 210 patients 30% were females and 28.1% were males and it is concluded that one third of the patients had positive familial history of renal calculi.^[14] In 2010, a research was published to know the effect of family history on the patients diagnosed with urolithiasis and for that purpose they included 1595 patients in the study with renal stones and divided them in 2 groups, group 1 included the patients who had positive history and group 2 included the patients who had no family history of stones and the results showed that 437 patients were included in group 1 and 1158 were included in group 2 and female patients had higher rate of family history as compared with male patients and it is concluded that family history plays a fundamental role and helps the physician to know about the severity and the onset of the disease.^[15] According to our study in the population of Pakistan the urolithiasis is very common and mostly seen in males as compared with females and the relationship which has the predominantly positive history of urolithiasis is father and the location at which the stone is present in most of the patients is mid pole of the right kidney. Age is not related with

the stone because in our study the patients diagnosed with urolithiasis ranges from all age groups from 2 to 88 years it can be diagnosed at any stage of life.

CONCLUSION

It is concluded that ultrasound is a very useful diagnostic modality in the diagnosis of the urolithiasis and in the population of Lahore. Stones in the urinary tract are predominantly found in the patients with positive family history. This study only shows the percentage of presence of stone in patients who have positive family history of stone; further studies should be done to know the exact pathophysiology and relationship of stone with family history.

Clinical significance

The performed study was clinically significant. Moreover from the research, it is concluded that patients who had positive family history of urolithiasis are more prone toward the formation of calculi in the future.

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Conflicts of interest

There are no conflicts of interest.

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