

# Gender and side distribution of urinary calculi using ultrasound imaging

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## ABSTRACT

**Introduction:** Urinary calculi constitute a significant medical problem worldwide. Due to lack of previous studies on gender and side distribution of urinary calculi, the current study was conducted. **Patients and Methods:** This retrospective study involved 590 urinary calculi from the electronic reports of 266 patients. Gender and side distribution were compared using Chi-square test. Relationship between gender and side of urinary calculi was analyzed using cross tabulation test. **Results:** This study involved 590 urinary calculi reported in 266 patients. Among 590 calculi; 565 (95.8%) were in adults, and 25 (4.2%) were in children. Urinary calculi were in male in 397 (67.3%) and in female in 193 (32.7%). Calculi were 304 (51.5%) in right side, and 286 (48.5%) in left side. Exactly 507 (85.9%) of calculi were in the kidneys, and 83 (14.1%) in the ureters. No significant relationship between gender and side of the calculi ( $P = 0.238$ ), (Odds ratio 0.869, 95% Confidence interval 0.615-1.226). **Conclusion:** Urinary calculi affect male more than female and adults more than children. No significant relationship between calculi and right or left side of the body.

**Keywords:** Gender, side, ultrasound imaging, urinary calculi

## Introduction

Urinary calculi constitute a significant medical problem worldwide. It is a major cause of morbidity which can cause end-stage renal disease. It affects about 12% of people in their lifetime.<sup>[1]</sup> It affects 1 in 17 adults of Chinese population.<sup>[2]</sup> In developed countries, urinary calculi mostly occur due to nutritional habits and sedentary lifestyle, endocrine, and metabolic disorders. Prevention is based mainly on proper diet and specific nutritional components

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such as increase fluid intake, fruits, and vegetables, which can decrease urinary calculi formation. Family doctor practice have an important role in urinary calculi formation prevention.<sup>[3]</sup>

Although, non-contrast computed tomography of kidney, ureter, and bladder (CT-KUB) is the best imaging modality for urinary calculi, it is limited by its high cost and radiation exposure. The European Association of Urology (EAU) recommend CT as the imaging method of choice after inconclusive US.<sup>[4]</sup> Ultrasonography (US) is a non-invasive widely available imaging method that can easily detect kidney calculi. Although US is less sensitive than computed tomography (CT) for detecting ureteric calculi, it is often the initial imaging method used for detection of urinary calculi especially in pregnant women and children.<sup>[5]</sup> The

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presence of Twinkle artifact of Doppler can improve the sensitivity and specificity of ultrasonography in urinary calculi detection.<sup>[6]</sup>

Urinary calculi formation has a lot of causes including nutrition and urinary tract infection. Nutritional management is the best preventive strategy against calculi formation. Proper treatment and follow up of UTI is another strategy. Herein, the role of family doctors and primary care physicians in essential in prevention of urinary calculi formation. Primary care physicians have also an important role in diagnosing, treating, and follow up of patients of urinary calculi.

This study was designed to elucidate the distribution of urinary calculi formation in male and female gender and also in the right and left side of the body. The study will explain why urinary calculi form more in one gender or one side than the other.

## Patients and Methods

### Study design

In this retrospective study, ultrasound reports of 266 patients who underwent renal ultrasound imaging and were diagnosed with urinary calculi were reviewed. All patients were examined in the period from Jan 2016 to Oct 2017 in Amran hospital in Yemen. Ultrasound imaging of all patients were performed by the same radiologist with about 10 years' experience in abdominal ultrasound imaging. Data included the side of calculi and gender distribution of all the reported calculi. Exclusion criteria were the lack of urinary calculi diagnosis and the lack of information on number of calculi.

### Procedure

A Medison, Sono ex-model six color Doppler ultrasound machine used for all the examinations. A curved transducer of 3.5 mega-hertz (MHz) was used for all examinations following the protocol of imaging of the kidneys.<sup>[7]</sup>

### Ethics

Institutional ethical approval was taken and confidentiality of the patient's information was assured during all steps of the research.

### Statistical analysis

The collected data were analyzed using the statistical package for social sciences (SPSS), IMB, version 23 for windows (Armonk, NY: IBM Corp. 2015). Chi-square test was used to compare urinary calculi in gender and side. *P* value was assumed to be significant when < 0.05. Cross tabulation was used to analyze relationship between gender and side distribution of urinary calculi. Results were reported as frequencies and percentages in categorical data.

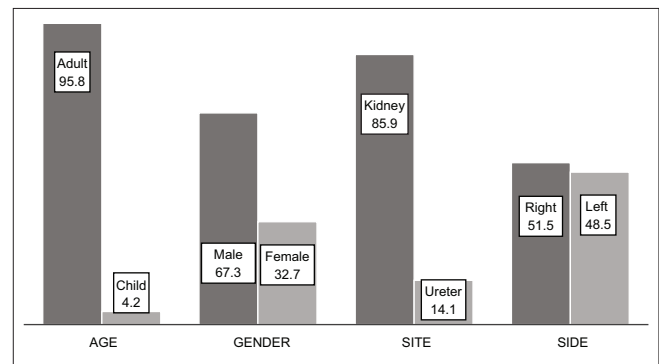
## Results

This study involved 590 urinary calculi reported in 266 patients. Among 590 calculi; 565 (95.8%) were reported in adults, and

25 (4.2%) were in children. Urinary calculi were present in male in 397 (67.3%) and in female in 193 (32.7%) [Table 1]. Calculi were reported in right side in 304 (51.5%), and left side in 286 (48.5%). Exactly 507 (85.9%) of calculi were detected in the kidneys, and 83 (14.1%) in the ureters [Table 2]. Cross-tabulation between gender and side of the calculi revealed no significant relationship (*P* = 0.238, Odds ratio 0.869, 95% Confidence interval 0.615-1.226). Cross-tabulation between gender and site of the calculi revealed no significant relationship (*P* = 0.075, Odds ratio 0.660, 95% Confidence interval 0.389-1.118)- [Figures 1 and 2].

## Discussion

Urinary calculi constitute a significant medical problem and it is a major cause of morbidity. It affects about 12% of people in their lifetime. This study was designed to elucidate the distribution of urinary calculi in male and female and in the right and left side of the body. Our results revealed that urinary calculi affect male



**Figure 1:** Illustrated diagram elucidate the distribution of urinary calculi in different parameters including age and gender of the affected patient. Site of calculi and the affected side

**Table 1: Sociodemographic data of the patients of the urinary calculi**

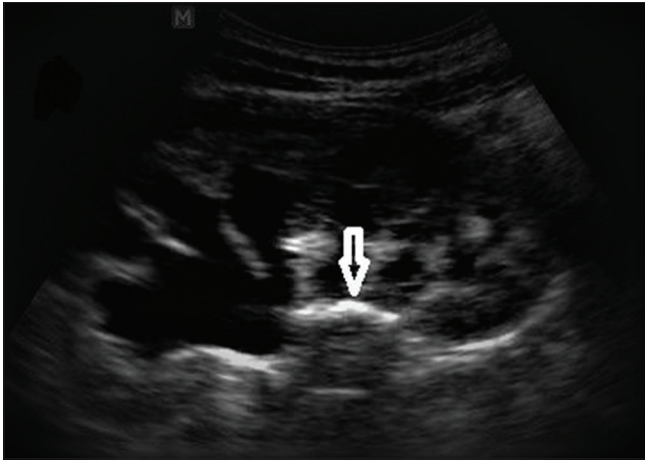
	No.	%	<i>P</i>
Adult	565	95.8	<i>P</i> <0.001
Child	25	4.2	
Total	590	100%	
Male	397	67.3	<i>P</i> <0.001
Female	193	32.7	
Total	590	100%	

Table revealed significant association between urinary calculi and adults (*P*<0.001), and male gender (*P*<0.001)

**Table 2: Common sites of the reported stones in this study**

	No.	%	<i>P</i>
Right	304	51.5	<i>P</i> =0.484
Left	286	48.5	
Total	590	100%	
Kidney	507	85.9	<i>P</i> <0.001
Ureter	83	14.1	
Total	590	100%	

Table revealed significant association between urinary calculi and kidneys (*P*<0.001), but no association between calculi and side (*P*<0.484)



**Figure 2:** Ultrasound image shows calculus (arrow) in the renal pelvis causing hydronephrosis

twice as female. This result is consistent with the results of Nassir, Alkhunaizi *et al.*, Nuraj *et al.*, Ahmed *et al.*, who reported that urinary calculi is more common in males than in females.<sup>[8-11]</sup> The predominance of urinary calculi in male was explained by Ahmed *et al.*, by the effect of sex hormone. Androgens increase oxalate excretion and deposition of calcium oxalate in the kidney while estrogen decrease oxalate excretion in female.<sup>[11]</sup> Other explanation was introduced by Ahmed *et al.*, and Chand *et al.*, as the greater muscle bulk in male cause production of more metabolic waste products due to breakdown of the tissues, and third explanation was the complicated urinary tract in males than in females.<sup>[11,12]</sup> Chen *et al.*, reported an explanation for predominance of uric acid stones in male by the low urine PH and impaired renal function mediators.<sup>[13]</sup> Our results revealed no significant difference in urinary calculi distribution between right and left side. This result is consistent with Ogreden *et al.*, who reported that no significant difference between right and left sides in affection by calculi.<sup>[14]</sup> The slight predominance of urinary calculi in the right side detected in this study was explained by the religious habit in Yemeni population to sleep on the right decubitus and this is consistent with Chuang *et al.*, who discovered that sleep posture is associated with unilateral formation of urinary calculi.<sup>[15]</sup> In our study, the prevalence of urinary calculi was more common in adults than in children. This result is consistent with Ogreden *et al.*, and Chuang *et al.*, who reported that urinary calculi is a common problem in adults.<sup>[14,15]</sup>

### Limitation

This study was limited in that it was a single-center study, and the age of patients were available by categories (child, adult) and not by years.

### Conclusion

Urinary calculi affect male more than female and adults more than children. Most urinary calculi are present in the kidneys.

No significant relationship between calculi and right or left side of the body.

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### Conflicts of interest

There is no conflicts of interest.

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