Abstract

Background: Urolithiasis may result in many complications including renal failure. There is a paucity of documented scientific study on the prevalence of urolithiasis in the University of Abuja Teaching Hospital within the Federal Capital Territory, Nigeria. The aim of the study was to assess the prevalence of urolithiasis in patients undergoing ultrasound at University of Abuja Teaching Hospital.

Materials and Methods: This study which adopted a survey approach was conducted at the Department of Radiology, University of Abuja Teaching Hospital between June 2014 and May 2015. A total of 2310 patients that underwent abdominopelvic ultrasound in the department who aged between 2 and 64 years and met the inclusion criteria participated in the study. They were recruited using a convenience (nonprobability) sampling technique. Data obtained were subjected to descriptive statistics and analyzed using Student’s t-test. P < 0.05 was considered statistically significant.

Results: A total of 2310 patients were scanned, 31 patients were sonographically identified with urolithiasis. The prevalence of urolithiasis was 13.4/1000. The mean age was 31.12 ± 3.69 years. There were 58.06% males and 41.93% females giving a male-to-female ratio of 1.3:1. The peak age of incidence was 21–50 years. Majority (22 [71%]) were located in the upper urinary tract, whereas 9 (27%) were in the lower urinary tract. The most common presenting symptoms were flank/loin pains (renal colic) noted in 12 (40%) patients, followed by hematuria in 4 (13.3%) patients.

Conclusion: The prevalence of urolithiasis was 13.4/1000. This information can be utilized in formulating future health plans for prevention of urolithiasis in the hospitals within this locality.

Keywords: Prevalence, sonography, urolithiasis

Résumé

Informations de base: L’urolithiasis peut résulter en beaucoup de complications y compris l’insuffisance rénale. Il y a manque d’études scientifiques documentées sur la prévalence de l’urolithiasis à l’Hôpital d’Enseignement Universitaire situé au territoire de la capitale fédérale du Nigéria. Le but de cette étude est d’évaluer la prévalence de l’urolithiasis sur les malades qui subissent l’ultrason à l’Hôpital d’Enseignement Universitaire d’Abuja.

Matériaux et méthodes: Cette recherche qui a adopté l’approche d’enquête à l’Hôpital d’Enseignement Universitaire a été faite au Département de Radiologie de l’Hôpital d’Enseignement Universitaire d’Abuja entre juin 2014 et mai 2015. Âgés de 2 et 64 ans, 2.310 de malades au total qui ont subi l’ultrason abnomino-pelvien, ayant répondu aux critères d’inclusion, étaient examinés dans le département. Ils ont été examinés en servant de la technique d’échantillonnage de commodité (non probabilité). Les données obtenues ont été soumises aux statistiques descriptives et analysées en employant le test de t. P < 0,05 était considéré statistiquement significatif.

Résultats: 2.310 de malades au total étaient examinés alors que 31 malades étaient identifiés échographiquement avec l’urolithiasis. La prévalence de l’urolithiasis était 13,4/1000. L’âge médian était 31,12 ± 3,69 ans. Il y avait 58,06% du sexe masculin et 41,93% du sexe féminin donnant la proportion du sexe féminin-au-sexe féminin de 1,3:1. L’apogée de l’âge d’incidence était 21 – 50 ans. La majorité (22 [71%]) se trouvait aux voies urinaires supérieures alors que 9 (27%) était aux voies urinaires inférieures. Les signes d’appel les plus communs étaient les douleurs renales remarquées en 12 (40%) de malades, suivis de hématurie en 4 (13,3%) des malades.

Conclusion: La prévalence d’urolithiasis

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Introduction

Urolithiasis is the development of calculi within urinary system which may result in many complications including renal failure.[1] It is the third most common urological disease after urinary tract infection (UTI) and pathologic conditions of the prostate.[2] The burden of urolithiasis has been noted to increase the number of emergency visits, hospitalizations, and surgical operations in the hospitals.[3] The diagnosis of urolithiasis is suspected when the typical pattern of clinical symptoms such as abdominal or flank loin pains, urinary incontinence, and fever are noted.[4]

Imaging tests such as plain X-rays, intravenous urography, ultrasound, and computed tomography (CT) are employed to detect and confirm the presence of urolithiasis. Ultrasound is the modality of the first choice because it is nonionizing, noninvasive and has a higher sensitivity and specificity for detection of urolithiasis than plain X-rays and intravenous urography.[5] The epidemiology differs according to geographical areas as well as changing environmental temperatures. The prevalence of urolithiasis is higher in developed countries when compared with their African counterparts. Studies in the United States of America show that the estimated lifetime risk of developing a stone is 12% among Europeans and Americans and approximately 50% of patients with previous urinary calculi can have a recurrence of calculi anywhere within 10 years. The report also indicates that African Americans have a reduced risk of stone disease (1.7%) compared to Caucasian (5.9%) and Mexican Americans (2.6%).[6] Several epidemiological factors such as age, race, infections, nutritional status, diet, and family history including higher environmental temperatures can predispose persons to urinary stone formation.[5] High environmental temperature that can predispose residents to the production of low volume supersaturated uric acid and attendant risk of stone formation has been recorded around the Federal Capital Territory (FCT) and its surroundings. Average daytime temperature ranges from 28.2°C to 37.1°C, and they can soar as high as 40°C in dry seasons.[7]

In many teaching hospitals situated in other geopolitical regions of Nigeria, the prevalence of urolithiasis has been assessed and well documented in literature[5,14] to create awareness and ensure prompt diagnosis and management. However, there is a paucity of documented scientific study on the prevalence and pattern of urolithiasis in the University of Abuja Teaching Hospital FCT, Nigeria, despite the prevailing high-risk factors.

This study, therefore, aimed at assessing the prevalence of urolithiasis in patients undergoing abdominopelvic ultrasound in the University of Abuja Teaching Hospital.

Materials and Methods

This study adopted a cross-sectional survey. This study was conducted at the Department of Radiology, University of Abuja Teaching Hospital within the FCT which has a population of about 1.5 million people[8] between June 2014 and May 2015. A total number of 2310 patients who were referred for abdominopelvic ultrasound in the department and who met the inclusion criteria were enlisted. They were recruited using a convenience (nonprobability) sampling techniques.

A digital Mindray ultrasound equipment model 7700 fitted with transducers of 3.5 MHZ and 5 MHZ frequencies was used to scan the patient kidneys, ureter, and bladder in supine, prone, left, and right oblique positions.

Ethical clearance was obtained from the University of Abuja Teaching Hospital Ethical committee while informed consent was obtained from the patients before the commencement of the study. A structured instrument was used for data collection in line with the objectives of the study.

Statistical analysis

Data were subjected to descriptive statistics and analyzed using statistics of mean, percentages, standard deviation, and Student’s t-test (paired test). P < 0.05 was considered statistically significant.

Limitations of the study

This study though empirically sound had some limitations. First, the inability to verify the results of this study with other imaging procedures such as CT, magnetic resonance imaging, or intravenous pyelogram is considered a major setback for a generalized applicability. Second, our study is hospital based. Community-based studies are recommended in the future to determine the prevalence of urolithiasis in this environment.

Results

During the study period, 2310 patients who met the inclusion criteria underwent abdominopelvic ultrasound scan at the Department of Radiology, University of Abuja Teaching Hospital. Out of this number, 31 patients were sonographically identified with urolithiasis. The hospital prevalence of urolithiasis in this population was calculated using the formula:

\[
\text{Prevalence} = \frac{\text{Total number of patients diagnosed with urolithiasis}}{\text{Total number of patients scanned}} \times K^{[9]}
\]

Where \( K = 1000 \)
The prevalence of urolithiasis in this study is, therefore, 13.4/1000.

Urolithiasis was found in 18 males (58.06%) and 13 (41.93%) females (male:female ratio = 1.3:1). Their ages range from 2 to 64 years with a mean age of 31.12 ± 3.69 years.

From Table 1 and bar chart illustration in Figure 1, 4 patients (13.3%) were below 10 years of age while another 4 patients (13.3%) were below 20 years old. Five patients (16.6%) were between 21 and 30 years. Eight patients (26.6%) were found to be 31–40-year age group. Five patients (16.6%) were aged between 41 and 50 years and three patients (10%) were aged between 50 and 60 years with one patient (3.3%) age between 61% and 70%.

From Table 2, 22 (71%) of the stones were located in the upper urinary tract, while 9 (29%) patients had lower tract stones. Majority of the stones were located in the kidneys with equal number on both sides (26.6%), while 9 patients (29.6%) had stones located in the bladder. In three patients (10%), the stones were located in the ureters. Similarly, in three patients (10%), the stones were bilaterally located in the kidneys.

Table 3 summarizes that the most common presenting symptoms were flank loin pain 12 (40%), followed by hematuria 4 (13.3%), obstruction 3 (10%), while UTI 2 (6.6%) patients. One case (3.3%) presented with frequent nocturia while incidental findings were seen in three patients (10.0%). There were two cases (6.6%) of documented family history of urolithiasis.

**Discussion**

Urolithiasis is a common disorder in this subregion compared to other regions in the Southern part of the country. The prevalence of urolithiasis in this study is 13.4/1000. This is observed to be higher than the past findings by other researchers in the Southern parts of the country but lower than core Northern Parts of Nigeria. This may be due to variation of risk factors responsible for urolithiasis formation, especially changing climatic conditions, diet, and drinking habits.

According to literature, urolithiasis is more common in males than females. Similarly, in this study, there was a male preponderance of stone formers with male-to-female ratio of 3.4:1. This may be because the men are more exposed to hot weather (during farming) and also they are engaged in more rigorous work which exposed them to dehydration more than the females. It is also reported by Mshelia et al. that males in this environment take a lot of roasted meat (suya), which contains both high animal protein and sodium, two of the major...
factors that predispose to urolithiasis.\textsuperscript{[12]} Previous researchers in other sections of the country also reported similar findings of higher male-to-female ratio.\textsuperscript{[5,12]}

One of the previous studies has demonstrated that urolithiasis usually occurs between the third and fourth decades of an individual’s life and that the prevalence rate varies considerably according to age, while the peak incidence is from 20–40s.\textsuperscript{[16]} Similarly, this study found a maximum prevalence of 62. Nearly 5% (19) in the age range of 21–50 years. The finding also agrees with Marak et al. (2013) who reported that the highest incidence of kidney stone is in 30–45-year age group and decreases after the age of 50 years. This condition, therefore, impacts negatively on the economically active population representing significant health-care cost burden, as it is associated with restricted activity and/or hospitalization. The lowest prevalence was seen in 61–70-year age group in just one case (3.3%). The decreasing urolithiasis prevalence among the older age groups (61–70 years) could be due to differences in sampling methods used or as a result of subjects with stones dying at a younger age. This is because urinary stone formation has been linked to a number of medical comorbidities including obesity, diabetes mellitus, hypertension, chronic kidney, and cardiovascular diseases.\textsuperscript{[14,15]}

In this study, 22 (71%) of the stones were located in the upper urinary tract, whereas only 9 (27%) were seen in the lower urinary tract. This agrees also with the finding of other researchers from other geopolitical regions of Nigeria.\textsuperscript{[5,13,16]} It is believed that stones occur more frequently in the upper urinary tract as the society becomes industrialized with improvement in the standard of living and it is also a reflection of the differences in the pathogenesis of stones’ formation between the upper and lower urinary tract.\textsuperscript{[10]}

In this study, 9 (27%) of the patients were found with bladder stones and predominantly in the males (55%). Stone formation in the bladder is primarily a disorder of men who are have obstruction or infection of lower urinary tract and is frequently associated with bladder outlet obstruction, diverticulum, and cystocele.\textsuperscript{[14,15]}

The most common presenting symptoms were flank loin pains (renal colic) 12 (40%) followed by hematuria 4 (13.3%). This agrees with earlier reports in literature\textsuperscript{[5]} that renal colic is a common emergency department presentation. However, another reported study in Thanga, India, found urolithiasis prevalence to be higher among those with a history of UTI. Incidental findings of urolithiasis were noted in three patients (9.9%). This supports the claim by Brown that, in developing countries, the prevalence of stones is sometimes underestimated because of the presence of asymptomatic stones.\textsuperscript{[17]}

Comparing the findings of this study with the previously reported studies, it can be noted that urolithiasis was rare in the Southern part of Nigeria, but it is very high in the Central/Northern parts of Nigeria. This is attributed to the high temperature and harsh weather conditions that can predispose persons to dehydration in this environment.

**CONCLUSION**

The study has thus highlighted a better knowledge on the prevalence of urolithiasis in the University of Abuja Teaching Hospital - FCT, Nigeria. It has also given the peak age of prevalence, the male-to-female ratio, and the most common clinical symptoms in the affected subjects. The prevalence values obtained in this study can tentatively serve as baseline data to assist for better planning on preventive services against urolithiasis by the hospitals present in this locality. Patient education and counseling to promote lifestyle changes with emphasis on the importance of vigorous hydration, and administration of diuretics to flush the kidneys and other dietary adjustments is recommended.

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**Conflicts of interest**

There are no conflicts of interest.

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