Pattern of Urinary Bladder Sonographic Findings in Patients Evaluated for Urinary Schistosomiasis

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ABSTRACT

Background: Urinary schistosomiasis is one of the neglected tropical diseases. Of the 239 million people with active *Schistosoma* infections in 2009, 85% lived in sub-Saharan Africa. The urinary bladder is the main site of pathologic damage in patients with urinary schistosomiasis. **Objectives:** The objectives were to study the prevalence and pattern of sonographic bladder abnormalities in patients evaluated for urinary schistosomiasis. **Materials and Methods:** All consecutive patients being evaluated for urinary schistosomiasis at the Usmanu Danfodiyo University, Teaching Hospital Sokoto and Federal Medical Centre Birnin Kebbi were prospectively scanned at radiology departments of the two centers. All the patients were scanned with Apogee 800 plus (Japan 2002) and Concept D (Dynamic Imaging Scotland) ultrasound scanners with a variable frequency probes at 3.5–5 MHz. Doppler was used to assess the vascularity of urinary bladder masses, and to differentiate between masses and blood clots which is a diagnostic challenge when using brightness mode (B-mode) sonography alone. The gain was set correctly to allow good visualization of the bladder and adjacent structures. Transverse images are obtained in the true axial plane and angled caudal to show the bladder base. Longitudinal and oblique sagittal images are obtained to complete the examination. All the ultrasound findings and images were recorded as hard copies, and the films were reviewed by a qualified radiologist. The results were analyzed using statistical software SPSS 17.0 for windows. **Results:** We evaluated a total of 107 patients. The mean age of the patients was 42.9 ± standard deviation 16.8 years, with a range between 7 and 86 years. There were 84 males accounting for 78.5% and 23 females accounting for 21.5%. Abnormal sonographic findings were seen in 101 (94.4%) of patients evaluated. Urinary bladder stone with wall thickening was the most common finding accounting for 37 (36.4%), followed by bladder wall thickening with internal echoes accounting for 32 (21.5%) of the patients. The incidence of irregular bladder mass was 15 (14.0%) while polypoidal mass accounted for 4 (3.7%). Contracted bladder with wall calcification was seen in 7 (6.5%) while no abnormalities were seen in the urinary bladder in 6 (5.6%) of the patients. **Conclusion:** Abnormal bladder sonographic findings are common in patients evaluated for signs and symptoms of urinary schistosomiasis in North-Western Nigeria, with a prevalence of 94.4% in this current study. Urinary bladder stone with wall thickening followed by bladder wall thickening with internal echoes were the most common findings accounting for 58% of the findings. These sonographic abnormalities should raise the suspicion of urinary schistosomiasis in an endemic region.

Key word: Schistosomiasis; ultrasound; urinary bladder

Introduction

Urinary bladder diseases are a group of medical diseases that affect the urinary bladder, an organ that stores urine. Bladder diseases can be acute or chronic and affect people of all ages. Urinary schistosomiasis is among the chronic diseases affecting the urinary bladder, and the infection

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is caused by *Schistosoma haematobium*. Of the 239 million people with active *Schistosoma* infections in 2009,[1] 85% lived in sub-Saharan Africa, where approximately 112 million and 54 million were infected with urinary and intestinal schistosomiasis, respectively, and the number of persons at risk of infection is >600 million.[2]

The urinary bladder can be demonstrated by ultrasound, computed tomography, cystography, magnetic resonance image, and cystoscopy. However, urinary bladder ultrasound is noninvasive, readily accessible, and easy to use. It has been extensively investigated as a possible substitution for some of the more common invasive modalities used to evaluate the urinary bladder.[3] The urinary bladder is also evaluable with ultrasound and may show thickening or the presence of other abnormalities like bladder diverticular or ureterocoele.[4] The urinary tract is one of the most common sites of bacterial infection in elderly patients, whether male or female, and accounts for about 30% of all episodes of bacteraemia in patients over 65 years old compared with only 16% in those under 65 years.[5]

An important caveat of renal bladder ultrasound is that it is dependent on the skill of the operator, so it is important to have technicians and radiologists who have experience with both ultrasound and pediatric patients.[6] However, traditionally; confirmatory cultures have been obtained to verify the infection and identify the specific organism(s) involved.[7]

This study was aimed to document the incidence of common urinary bladder ultrasound findings in patients been evaluated for schistosomiasis that affect Nigerian population in North-Western Nigeria where it is endemic. In addition, to also document a local standard database about the incidence of urinary bladder diseases, which can be used either in the local or regional studies, because of inadequate baseline data information in our environment.

Materials and Methods

A total of 107 consecutive patients with sign and symptoms of urinary schistosomiasis attending outpatient clinics at the Usmanu Danfodiyo University, Teaching Hospital Sokoto and Federal Medical Centre Birnin Kebbi were prospectively scanned at radiology departments of the two centers. The exclusion criteria were patients with positive urine cultures and those that had been treated with strong clinical suspicion of urinary bladder symptoms. The inclusion criteria were any untreated patient who had either one symptom or more of urinary bladder complaints such as dysuria, burning with micturition, frequency, hematuria, urine incontinence, cloudy, nocturia, lower abdominal or pelvic discomfort, backache, fever, urine retention, and urgency. Informed consent was obtained from the patients. The ethical clearances were obtained from the ethical committee of the two centers.

All the patients were scanned with Apogee 800 plus (Japan 2002) and Concept D (Dynamic Imaging Scotland) ultrasound scanners with a variable frequency probes at 3.5–5 MHz. After the patient had fasted overnight, the examination was performed with the patient in the supine position with a distended bladder which offers a better acoustic window by displacing the small bowel and colon. In obese patients, head down tilt was used to improve the image quality. The lower abdomen was examined after applying coupling agent to avoid trapping of air bubbles between the skin and ultrasound transducer and also to overcome problems from pubic hair. Doppler was used to detect vasculatures of urinary bladder masses and to differentiate between masses and blood clots which is a diagnostic challenge when using brightness mode (B-mode) sonography alone. The gain was set correctly to allow good visualization of the bladder and adjacent structures.[8] Transverse images are obtained in the true axial plane and angled caudal to show the bladder base. Longitudinal and oblique sagittal images are obtained to complete the examination. In both planes, moving transducer cephalic and then steeply angling caudal are necessary was to show the bladder base. All the ultrasound findings and images were recorded on a hard copy, and the films were reviewed by qualified radiologists. The results were statistically analyzed by using statistical software SPSS 17.0 for windows (SPSS Inc., Chicago, IL, USA).

Results

We evaluated 107 cases with urinary bladder symptoms, and all of them met the inclusion criteria. The mean age of the patients was 42.9 ± standard deviation 16.8 years, with a range between 7 and 86 years. There were 84 males accounting for 78.5% and 23 females accounting for 21.5%. The majority of the patients are fish farmers making 40 (24.3%), followed by plants farmers with 26 (24.3%). All the 16 (15.0%) of the female patients were married. Civil servants, teachers, and traders account for 7 (6.5%), 5 (4.5%), and 3 (2.8%), respectively. A wide spectrum of clinical symptoms of the patients with urinary bladder complaints were analyzed in Table 1. Figure 1 is a bar chart showing a spectrum of urinary bladder pathologies following ultrasound. Urinary bladder stone with wall thickening was the most common finding accounting for 37 (36.4%), followed by bladder wall thickening with internal echoes accounting for 32 (21.5%) of the patients. A gray scale ultrasound image shows bladder wall thickening [Figure 2]. The incidence of irregular bladder mass was 15 (14.0%) while polypoidal mass accounted for 4 (3.7%). A gray scale ultrasound image shows an irregular mass with wall thickening [Figure 3]. Contracted bladder with wall calcification was seen in 7 (6.5%) while no abnormalities were seen in the urinary bladder in 6 (5.6%) of the patients. A Doppler ultrasound image shows a vascular bladder mass [Figure 4].

Table 1: Spectrum of clinical urinary bladder symptoms of the patients

Clinical symptoms	Frequency (%)
Hematuria alone	34 (31.8)
Dysuria alone	19 (17.7)
Cloudy urine with hematuria	12 (11.2)
Dysuria and hematuria	7 (6.5)
Hematuria and frequency	7 (6.5)
Hematuria and urgency	7 (6.5)
Dysuria and cloudy urine	5 (4.0)
Suprapubic discomfort	4 (3.7)
Urgency alone	3 (2.8)
Cloudy urine alone	3 (2.8)
Nocturia	2 (1.9)
Frequency	2 (1.9)
Lower abdominal pain	1 (1.8)
Urinary retention	1 (0.9)
Total	107 (100)

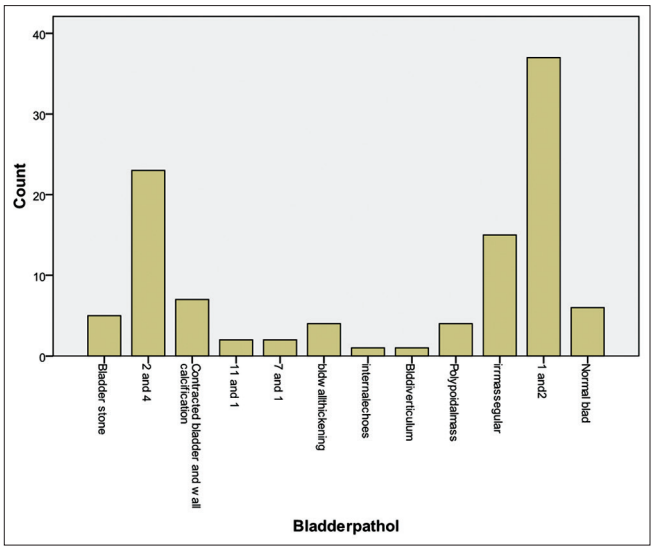

Figure 1: Bar chart is showing a spectrum of urinary bladder pathology following ultrasound. Key: 2 and 4 = Bladder wall thickening and internal echoes, 11 and 1 = Contracted bladder and bladder stone, 7 and 1 = Irregular ladder mass and bladder stone, 1 and 2 = Bladder stone and bladder wall thickening

Discussion

Schistosomiasis, or bilharzia, is a neglected tropical parasitic disease caused by blood flukes of the genus *Schistosoma*. Globally, it rank third among the most devastating tropical diseases (after malaria and intestinal helminthiasis), and is a major cause of morbidity and mortality for developing endemic countries,[9] it is relatively common in developing countries, especially on the continent of Africa[10] and in central rural zones of Egypt and China.[11]

The urinary bladder is the primary site for *S. haematobium* infection and it induces pathology in the bladder leading to obstruction (hydronephrosis), haematuria, and in a significant number of cases, development of urinary bladder carcinoma. Ultrasonography can be used to identify many renal abnormalities, such as abnormalities of renal size and shape, hydronephrosis, or hydroureters which are all as a result of bladder pathology secondary to schistosomiasis. The bladder is also evaluated with ultrasound and may show thickening or the presence of other abnormalities like bladder diverticula or ureteroceles.[12] Doppler scan is more expensive than the ultrasound model with basic function; it has been extensively used to differentiate between masses and blood clots which is a diagnostic challenge when using B-mode sonography alone in field setting; however, it needs additional training for the ultrasonographers and radiologist.

In our study the prevalence of urinary bladder disorders was more common in males 84 (78.5%) rather than females 23 (21.5%) such findings were different in many studies that revealed that lower urinary tract disorders are common among females and more than in men (Singh *et al.*,[13] Ferry *et al.*,[14] Nurullaev,[15] Narayan,[16] Mahmoud and Elkhader.[17] These difference could be as a result of most of our female

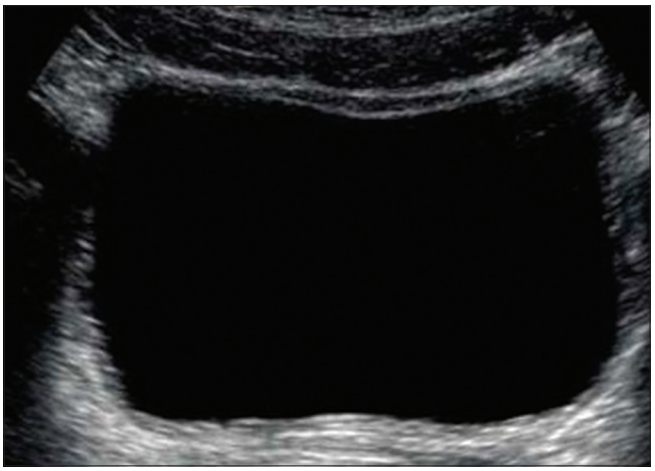

Figure 2: Gray scale ultrasound image showing bladder wall thickening

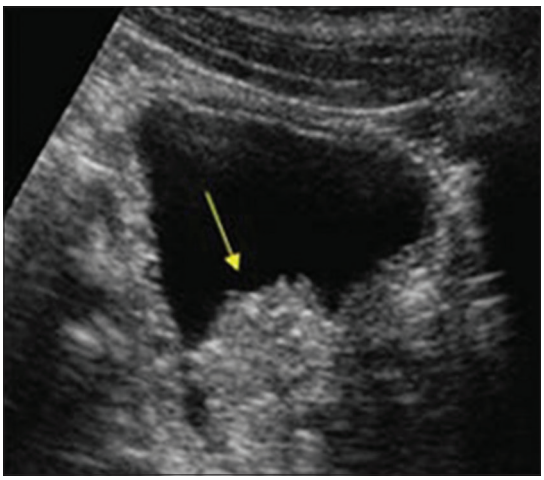

Figure 3: Gray scale ultrasound image showing an irregular mass with wall thickening

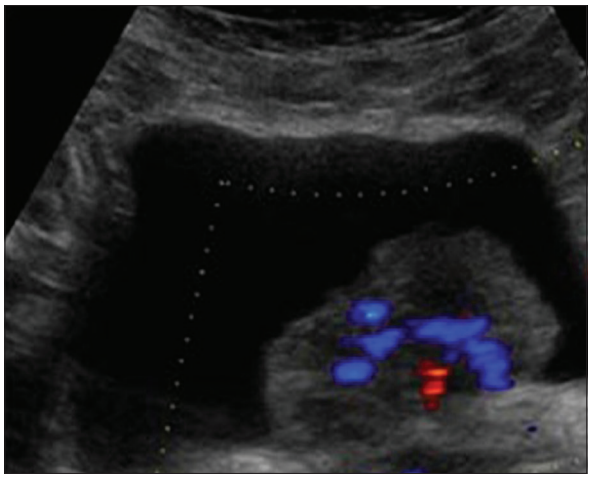

Figure 4: Doppler ultrasound image showing vascular bladder mass

subjects are full-time housewives and are not frequently expose into the farming activities. The age distribution of urinary bladder pathologies in our study was highest between the ages of 41 and 50 years similar findings was seen in studies like Mahmoud and Elkhader[17] (mean age 40 ± 1.6 years). Boyle *et al*.,[18] and Møller *et al*.[19] They reported that prevalence increases with age; in older men is about 78% have a higher incidence of bladder disorders and in women aged 40–60 years frequently have bothersome higher urinary bladder symptoms. Hematuria was the commonest clinical signs of urinary bladder disorders in our study in 34 (31.8%). However, Mahmoud and Elkhader[17] show that the common clinical features detected were dysuria presents in (20.4%), and haematuria, with (18.4%).

Our study detected a wide spectrum of abnormalities in the urinary bladder with bladder stone and wall thickening seen in 37 (34.6%) followed by bladder wall thickening and internal echoes with 23 (21.5%). Other findings are irregular mass, bladder stone and polypoidal mass were seen in 15 (14.0%), 5 (4.7%) and 4 (3.7%), respectively. However, Nmorsi *et al*.[20] in their study shows that bladder wall thickening in 24 (55.8%), abnormal shape of the bladder 30 (69.8%), internal echoes 30 (69.8%). They also documented the incidence of bladder masses and pseudopolyp in 10 (23.3%) and 2 (2.7%), respectively. These observations are similar to our study. Thomas *et al*.[21] revealed that bladder cancer was common in Zimbabwe and reported that the preponderances were possibly due to the high prevalence of *S. haematobium* infection. Furthermore, Mostafa *et al*.[22] documented the association of bladder cancer with schistosomiasis which they considered to be related to the endemicity of the parasite. In another study, the value of ultrasound in diagnosis of bladder neoplasm was performed on 34 consecutively registered patients with bladder tumors, and the findings showed that sonography can differentiate muscle-infiltrating and superficial neoplasms of the urinary bladder Caruso *et al*.[23]

Conclusion

Abnormal bladder sonographic findings are common in patients evaluated for sign and symptoms of urinary schistosomiasis in North-Western Nigeria, with a prevalence of 94.4% in this current study. Urinary bladder stone and wall thickening followed by bladder wall thickening and internal echoes were the most common findings accounting for 58% of the findings. These sonographic abnormalities should raise the suspicion of urinary schistosomiasis in an endemic region.

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Conflicts of interest

There are no conflicts of interest.

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