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Sonographic Manifestation of Urinary Bilharziasis in School Children in Rahad, Sudan

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Abstract **Background**: Urinary bilharziasis is endemic to more than 70 countries, mostly in sub-saharan Africa, including Sudan. It poses a significant burden in terms of morbidity, economic and public health consequences. The disease is usually diagnosed clinically and by urine examination. Imaging plays an important role in demonstrating morbid anatomy and complications. Rahad town is located near a small fresh-water lake and is known for high prevalence of the disease. **Objective**: The aim of this study was to investigate the sonographic manifestations of urinary bilharziasis among school children in Rahad town in North Kordofan state, Sudan. **Methods:** Seventy-five school children, who complain of burning micturition, red urine and/or urgency were included in the study. At least 10 ml urine were collected from each child in a sterile, tightly closed container. Ultrasound scanning of the abdomen was carried out by a radiologist, using a 3.5 MHz abdominal probe and a portable ultrasound scanner. The liver, spleen, kidneys, ureters and urinary bladder were scanned and documented. The urine was examined by a senior pathologist, who recorded the finding of microscopic hematuria and/or bilharzial ova in each sample. Data were analyzed using a statistical package (PSPP) to calculate frequencies and mean values. **Results:** The study included 75 children in classes 1-4. Mean age was 9.36 years, range 7-14 years. Males were 59 (78.67%). More than one quarter (n= 20, 26.7%) have positive urine for *S. hematobium ova*. More than half (n= 42, 56%) have positive sonographic findings in the urinary bladder, including a third (n= 27, 36%) with bladder mucosal polyps. Only one child (1.3%) had dilated ureter and renal collecting system. **Conclusion:** Sonographic manifestations of urinary bilharziasis among school children in Rahad are mainly found in the urinary bladder, seen as wall thickening and irregularity, polyp formation and occasionally, calcification. Ultrasound could be used for mass screening and further follow up of urinary bilharziasis in children, as it can detect lesions even in patients with negative urine test for schistosomal ova.

Keywords: *urinary bilharziasis, ultrasound, schistosomiasis*

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1. Introduction

Urinary bilharziasis (UB), caused by the trematode *Schistosoma hematobium*, is endemic to 78 countries, mostly in sub-saharan Africa [1], including Sudan. At least 206 million people are affected. It is the most important tropical disease after malaria, posing a significant burden in terms of morbidity, economic and public health consequences [2]. The disease is usually diagnosed by urine examination to detect the ova (eggs) of the worm, in addition to clinical manifestations such as hematuria and burning micturition. Imaging plays an important role in demonstrating morbid anatomy and complications such as hydronephrosis, bladder wall changes and ureteric calcification and fibrosis [3,4]. UB is associated with open water bodies, such as canals and lakes. The intermediate host is a fresh-water snail of the genius *Bulinus*, endemic in many parts of Sudan. Rahad town is located near a small lake (*Turda*) and is known for high prevalence of the disease [5]. The aim of this study is to investigate the sonographic manifestations of UB in school children in Rahad town in North Kordofan state, Sudan.

2. Methods

The largest basic school in Rahad with 860 children, about 1 km from the shore of the lake, was selected. Children in classes 1-4 who complain of burning micturition, red urine (hematuria) and/or urgency (n= 75) were invited to participate in the study. After obtaining ethical clearance from the Research Ethics Committee of the university of Kordofan, and obtaining written consent of the local education authorities, verbal consent of school teachers and headmaster, and the parents of children, urine samples were collected. During a 3-days period in February 2018, at least 10 ml urine was collected from

each child in a sterile, tightly closed container. Ultrasound scanning of the abdomen was carried out by a radiologist, using a 3.5 MHz abdominal probe and a portable ultrasound machine (Mindray DP-10, Nanshan, Shenzhen, China). The liver, spleen, kidneys, ureters and urinary bladder were scanned and documented. The urine was examined by the sedimentation technique 6-10 hours later. A senior pathologist recorded the finding of microscopic hematuria and/or bilharzial ova in each sample. Data were entered and analyzed using an open-source, freely available statistical package (PSPP, GNU.org).

3. Results

Of the 860 children in the school, 157 (18.3%) have urinary complains ranging from burning micturition to frank hematuria. Of those with such complains, 75 children were in classes 1-4 (study population). Mean age was 9.36 years (+ - 1.64) range 7-14 years. Males were 59 (78.67%) and 16 (21.33%) were females. More than one quarter (26.7%) have positive urine for *S. hematobium ova*. More than half (56%) have positive sonographic findings in the urinary bladder. Table 1 shows the clinical, urine microscopic and sonographic findings.

Table 1. Clinical, urinary and sonographic findings

Finding	Number	Percent
History:		
Burning micturition	68	90.67%
Frequency / urgency	48	64%
hematuria	54	72%
Duration: acute (less than 2 weeks)	23	30.27%
Duration: chronic (more than 2 weeks)	52	69.33 %
History of treatment with Praziquantel	6	8%
Clinical examination:		
Clinical hepato-splenomegaly	8	10.67%
Urine microscopic examination:		
Microscopic hematuria	15	20 %
Positive *S. hematobium* Ova	20	26.67%
Sonographic findings:		
Bladder wall thickening and/or irregularity	42	56%
Bladder polyposis	27	36%
Bladder wall calcification	4	5.33%
Hydronephrosis	1	1.33 %
Splenomegaly	7	9.33 %

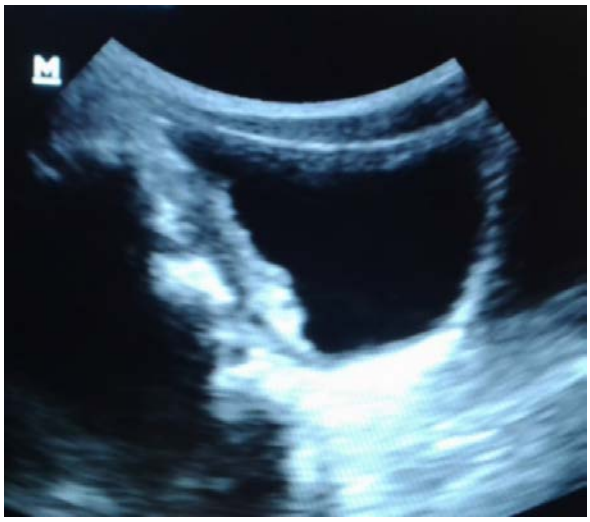

Figure 1. Bladder wall thickening

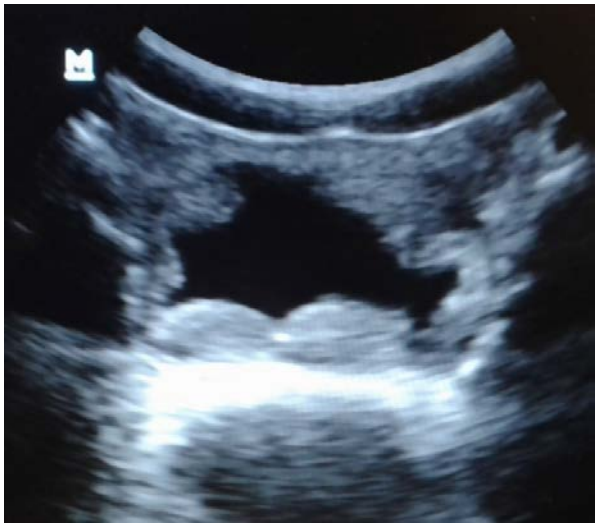

Figure 2. Bladder wall thickening

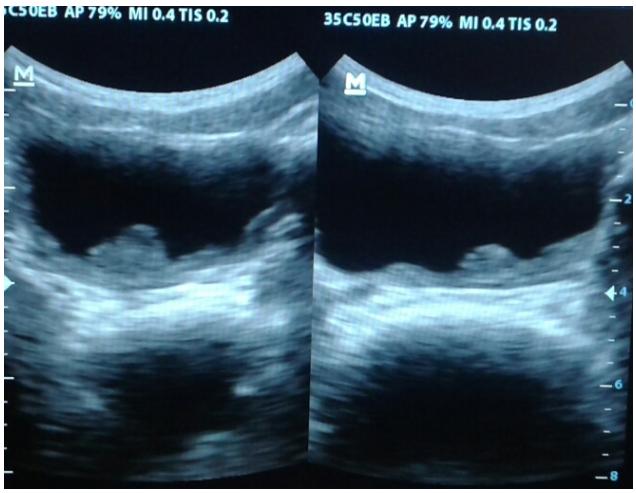

Figure 3. Bladder wall polyposis

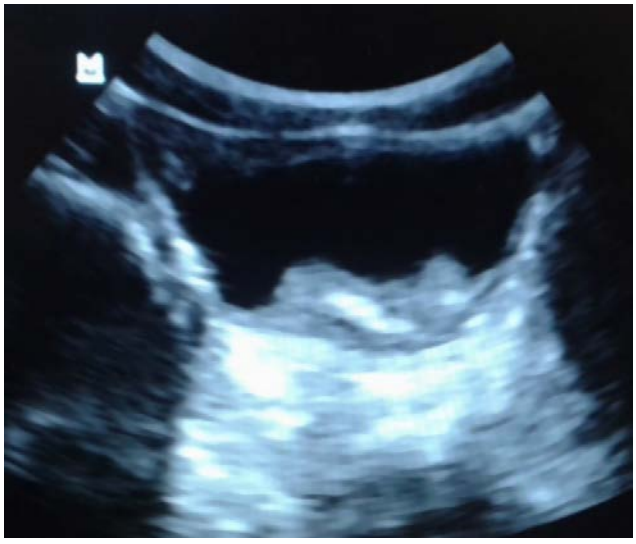

Figure 4. Bladder wall calcification

4. Discussion

This study showed that the sonographic manifestations of UB in Rahad school-children are mostly found in the urinary bladder. This is similar to reports by many other studies in Sudan and abroad [6,7,8,9]. The lesions seen in the bladder are mucosal thickening and irregularity, polyposis and calcification. These are caused by the host immune reaction to the presence of the worm ova, deposited in the wall of the bladder [10]. Although most of the patients had chronic complains (69.3%), some lasting more than 2 years, no lesions were seen in the ureters or kidneys, except a single case (1.3%) of unilateral hydronephrosis. This indicates a mostly localized disease in the bladder and might indicate a better prognosis. Bladder lesions are mostly reversible by medical treatment [11,12], unlike ureteric fibrosis and calcification. The findings in this study are in contrast with findings by Elmadani and colleagues in Gezira, Sudan [6] where 52% had ureteric dilatation and 26.3 had hydronephrosis. A study in Yemen found that 54% had upper urinary tract abnormalities [13]. However, these findings are similar to those reported in a Nigerian study [14] where only 1.7 % had moderate dilatation of the renal pelvis.

The sonographic findings in this population were more conspicuous than the presence of bilharzial ova in urine samples. Sonographic manifestations were seen in more than twice the number of positive urine samples (56% versus 26.7%). Some researchers, however, suggested that sonography may be less sensitive than urine examination in the early stages of disease and may overlook minor pathology [15]. Ultrasonography could be an inexpensive, sensitive means of screening for S. *hematobium* in children living in endemic areas [16]. Granuloma of the urinary bladder has particularly higher prevalence in children less than 15 years [17]. Ultrasound is a painless, quick and reproducible examination, making it an essential tool in the investigation of urinary schistosomiasis and large-scale interventions [10,18]. The WHO has developed a protocol for such use of sonography in assessing morbidity in S. hematobium [19].

Bladder lesions due to UB may be precancerous [20,21,22,23] in chronic infections. Sonography could play an important role in detecting such lesions and in the follow up after antibilharzial medical treatment and into the adult life. Vesico-urinary sonography is simple to learn and could be used by non-radiologist in field studies and mass screening [24].

Studies utilizing sonographic imaging to determine the morbidity associated with bilharziasis were previously conducted in Sudan, both for S. hematobium as S. mansoni [6,25]. But, to our knowledge, no mass screening of school children was conducted using ultrasound scanning.

This study was limited in the scope and number of patients examined. However, in endemic areas, the efforts to control UB have to be continued for decades or perhaps indefinitely [26]. Such control programs need to exploit all possible means to study the problem and follow up with the results and outcomes of the preventive and the therapeutic interventions. Larger, more comprehensive studies are needed to better map the problem of UB in this area.

5. Conclusion

Sonographic manifestations of UB in school children in Rahad are mainly found in the urinary bladder, seen as wall thickening and irregularity, polyp formation and occasionally, calcification. Ultrasound could be used for mass screening and further follow up of UB in children, as it can detect lesions even in patients with negative urine test for schistosomal ova.

References

[1] Global Health Estimates 2015: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2015. Geneva, World Health Organization; 2016. http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html.

[2] Fenwick A, Webster JP, Bosque-Oliva E, Blair L. The Schistosomiasis Control Initiative (SCI): rationale, development and implementation from 2002-2008. *Parasitology* 2009; 136(13): 1719-1730.

[3] Prevention and control of schistosomiasis and soil-transmitted helminthiasis http://apps.who.int/iris/bitstream/10665/42588/1/WHO_TRS_912.pdf. Geneva, World Health Organization: 2002. Accessed June 23, 2018.

[4] Bruun B, Aagaard-Hansen J. The social context of schistosomiasis and its control: an introduction and annotated bibliography. UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. WHO 2008. ISBN 978 92 4 159718 0.

[5] Prevalence of Urinary Bilharziasis in North Kordofan. Unpublished report by the Ministry of Health, North Kordofan State, Sudan. 2012.

[6] Elmadani AE, Hamdoun AO, Monis A, Karamino NE, Gasmelseed N. Ultrasound findings in urinary shistosomaisis infection in school children in the Gezira State Central Sudan. *Saudi J Kidney Dis Transpl*. 2013; 24(1): 162-7.

[7] Nmorsi OP, Ukwandu NC, Ogoinja S, Blackie HO, Odike MA. Urinary tract pathology in Schistosoma haematobium infected rural Nigerians. *Southeast Asian J Trop Med Public Health*. 2007; 38(1): 32-7.

[8] Salas-Coronas J1, Vázquez-Villegas J, Villarejo-Ordóñez A, et al. Radiological findings in patients with imported schistosomiasis. *Enferm Infecc Microbiol Clin*. 2013; 31(4): 205-9.

[9] Hatz CFR. The use of ultrasound in schistosomiasis. *Advances in Parasitology*. 2001; 48: 225-284.

[10] King CL, Malhotra I, Peter Mungai P, et al. Schistosoma haematobium–Induced Urinary Tract Morbidity Correlates with Increased Tumor Necrosis Factor–α and Diminished Interleukin-10 Production. *The Journal of Infectious Diseases* 2001; 184(9): 1176-1182.

[11] Strahan R, McAdam D, Schneider ME. Sonographic response in the liver and urinary bladder of children 14 months after treatment for schistosomiasis. *Trop Doct*. 2013; 43(2): 71-4.

[12] Richter J. Evolution of schistosomiasis-induced pathology after therapy and interruption of exposure to schistosomes: a review of ultrasonographic studies. *Acta Tropica* 2000; 77(1): 111-131.

[13] Salah MA, Böszörményi-Nagy G, Al Absi M, et al. Ultrasonographic urinary tract abnormalities in Schistosoma haematobium infection. *Int Urol Nephrol*. 1999; 31(2): 163-72.

[14] Ekwunife CA, Okafor FC, Nwaorgu OC. Ultrasonographic screening of urinary schistosomiasis infected patients in Agulu community, Anambra state, southeast Nigeria. *International Archives of Medicine* 2009; 2:34.

[15] Leutscher PD, Reimert CM, Vennervald BJ, et al. Morbidity assessment in urinary schistosomiasis infection through ultrasonography and measurement of eosinophil cationic protein (ECP) in urine. *Trop Med Int Health*. 2000; 5(2): 88-93.

[16] Brouwer KC, Munatsi A, Ndhlovu PD, et al. Urinary schistosomiasis in Zimbabwean school children: predictors of morbidity. *Afr Health Sci*. 2004; 4(2): 115-8.

[17] King CH, Keating CE, Muruka JF, et al. Urinary tract morbidity in schistosomiasis haematobia: associations with age and intensity of infection in an endemic area of Coast Province, Kenya. *Am J Trop Med Hyg*. 1988; 39(4): 361-8.

[18] Koukounari A, Sacko M, Keita AD, et al. Assessment of ultrasound morbidity indicators of schistosomiasis in the context of large-scale programs illustrated with experience from Malian children. *Am J Trop Med Hyg*. 2006; 75(6): 1042-1052.

[19] Akpata R, Neumayr A, Holtfreter MC, et al. The WHO ultrasonography protocol for assessing morbidity due to Schistosoma haematobium. Acceptance and evolution over 14 years. A systematic review. *Parasitology Research* 2015; 114(4): 1279-1289.

[20] Honeycutt J, Hammam O, Fu CL, Hsieh MH. Controversies and challenges in research on urogenital schistosomiasis-associated bladder cancer. *Trends Parasitol*. 2014; 30(7): 324-32.

[21] Honeycutt J, Hammam O, Hsieh MH. Schistosoma haematobium egg-induced bladder urothelial abnormalities dependent on p53 are modulated by host sex. *Exp Parasitol*. 2015; 158: 55-60.

[22] Dematei A, Fernandes R, Soares R, et al. Angiogenesis in Schistosoma haematobium-associated urinary bladder cancer. *APMIS*. 2017; 125(12): 1056-1062.

[23] Rollison D. A wake up call for urinary schistosomiasis: reconciling research effort with public health importance. *Parasitology* 2009; 136(12): 1593-1610.

[24] Bonnard P, Boutouaba S, Diakhate I, Seck M, Dompnier JP, Riveau G. Learning curve of vesico-urinary ultrasonography in Schistosoma haematobium infection with WHO practical guide: a "simple to learn" examination. *Am J Trop Med Hyg*. 2011; 85(6): 1071-4.

[25] Homeida M, Ahmed S, Dafalla A, et al. Morbidity Associated with Schistosoma Mansoni Infection as Determined by Ultrasound: A Study in Gezira, Sudan. *Am J Trop Med Hyg 1988; 39(2):* 196-201.

[26] King CH. Toward the Elimination of Schistosomiasis. *N Engl J Med* 2009; 360: 106-109.