WULFENIA JOURNAL KLAGENFURT, AUSTRIA ISSN:1561-882X

Vol 22, No. 7;Jul 2015

Ultrasonographic Study of Patients with Positive Schistosomiasis Infection in Shikan Region-Sudan

Mudawi Bakheit Gabraldar[1], Elsafi Ahmed Abdallh[2], M.E.M Garelnabi[2], Bushra Hussien Ahmed[3] , Abdelmoneim Saeed[4] and Caroline Edward Ayad[2]

[1]Department of Ultrasound, Elobied hospital North kordofan – Sudan
[2]College of Medical Radiologic Science, Sudan University of Sciences and Technology Khartoum-Sudan
[3]College of Radiological Technology, The National Ribat University Khartoum-Sudan
[4]Department of Radiology, National University, Khartoum-Sudan

(Corresponding author): Caroline Edward Ayad
Sudan University Of Science and Technology, College Of Medical Radiological Science
P.O. box 1908, Khartoum-Sudan
Tel: 0922044764 E-mail: carolineayad@yahoo.com

Abstract

Schistosomiasis (Bilharziasis) is one of the most prevalent tropical diseases. Sonography is among the most valuable diagnostic tools for Schistosomiasis-related organ lesions. This study delineates typical findings in patients who were infected by Schistosomiasis. This study was conducted in Shikan in North Kordofan State in Elobied Teaching Hospital. Ultrasound scans were done using Fukuda 4100 machine fitted with convex probe 3.5 MHz.

The sample size was 108 patients 97(89.8%) were males and 11(10.2%) were females, their ages ranged between <10years >40 years old with mean age of 14.80±8.438years old.

The results of the study showed that patients' demographics including age, gender and occupation were significantly correlated with gastrointestinal manifestations of Schistosomiasis at $p<0.000$.

The prevalence of urinary bladder manifestation was found to be: (17.6%) have localized urinary bladder wall thickness and (82 %) have general thickness. Other bladder lesions including polyps and calcification were seen in (20%) while (80%) showed no lesion. The renal pelvicalyceal system and lower ureteric end were found to be normal in the majority of patients constituted (94%) and (96%) respectively.

Keywords: Schistosomiasis, haematobium, Bladder, Ultrasound.

1. Introduction

Schistosomiasis was firstly described by Theodor Bilharz in 1852 and it is caused by infection with parasitic blood flukes known as *schistosomes*. There are three major species (*S mansoni, S japonicum* and *S haematobium*) that produce infection in humans, and tend to occur in restricted geographic patterns; for example, *Schistosoma mansoni* is more prevalent in Africa, the Middle East, South America and the Caribbean. In the endemic areas, the infection is usually acquired in childhood and the chronic complications including intestinal, hepatic, urinary neurologic and pulmonary, are more common. [1, 2]

More than 207 million people, 85% of who live in Africa, are infected with Schistosomiasis[3] and an estimated 700 million people are at risk of infection in 76 countries where the disease is considered endemic, as their agricultural work, domestic chores, and recreational activities expose them to infested water.[3,4] Globally, 200,000 deaths are attributed to Schistosomiasis annually.[5] Transmission is interrupted in some countries.[4]

At present, Schistosomiasis control programs are targeted at morbidity reduction in the populations. Diagnosis is still based on parasitology and serology, and ultrasound has proven to be an important means to evaluate the extent of the lesions of the urinary tract, [6,7]and lesions in the other internal organs.[8]

Several studies have demonstrated that ultrasound is useful in the detection of morbidity induced by Schistosomiasis on an individual basis and at the community level.[9,10,11] Schistosomiasis remained an important public health problem in sub-Saharan Africa.[12] The aim of this study was to evaluate the ultrasound findings among Sudanese who were positive Schistosomiasis Infection in Shikan region, North Kordofan State ,Sudan.

2. Materials and Methods

2.1. Selection and Description of Participants

This descriptive cross-sectional study was conducted in Shikan, North Kordofan State-Sudan at the ultrasound department of Elobied teaching hospital, from August 2013 to October 2014. Prior scan, a formal approval was obtained from the Ethics and Scientific Committee of the medical center. After the nature of the procedure was fully explained, informed consents were obtained from participants. The criteria for inclusion was patients with positive Schistosomiasis .The patients were scanned by Fukuda (4100) ultrasound machine fitted with convex probe (3.5) MHz .Techniques of scanning the patients were examined in supine position. The Urinary tract, liver and spleen examinations were achieved sonographically. The patients were asked to drink water prior ~~to~~ the scan to fill their urinary bladder. Both the lower urinary tract (bladder) and the upper urinary tract (kidneys and ureters) were evaluated. The following changes were considered as pathological lesions in the lower urinary tract: bladder wall thicker than 5 mm and presence of bladder polyp(s) or wall nodularity.

2.2. Scanning protocols

2.2.1Renal Scanning Technique

The examination was done with the patient in the supine position. Scans were performed in the sagittal and transverse planes. Lateral decubitus and lateral oblique positions for the right and left kidney were used. Coronal longitudinal and transverse scans were obtained for evaluating the renal pelvis and proximal ureter. The bladder wall thickness, lower ureters and lesion thickness was measured in (mm) using caliper

2.2.2Liver Scanning Technique

The patients were positioned in supine, left posterior oblique and left lateral decubitus. Scans were done in longitudinal, transverse and transverse-oblique planes. Liver size, portal vein and splenic vein diameters were measured in (mm) using caliper.

2.2.3Spleen Scanning Technique

The patients were scanned in the right lateral decubitus position .Scanning was done in the left coronal plane to achieve a long axis scan and by turning the transducer ninety degrees, a short axis scan achieved. Spleen size cranio-caudally was measured in (mm) using caliper.

2.3 Statistical analyses

Data were initially summarized as mean ± SD in a form of comparison tables and graphs. Statistical analysis was performed using the standard Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 16 for windows. T- test was used. Correlations ~~are~~ considered significant at $p<0.005$.

3. Results.

In this study the sample size was 108 patients 97(89.8%) were males and 11(10.2%) were females, their ages ranged between <10years >40 years old with mean age of 14.80±8.438years old. The result of this study showed the occurrence of bladder wall thickening in all patient population, 19 out of 108 case(17.6%) had localized urinary bladder thickness and 89 out of 108 (82 %) with general thickness. Other bladder lesions including polyps and calcification were seen in 22 patients (20%) while 86 patients (80%) showed no lesion. The renal pelvicalyceal system (PCS) was found to be normal in the majority of patients (94%) where 6% were prominent as well as the lower ureteric end (LUE) was found to be normal in96% and abnormal in 4%

4. Discussion

The value of ultrasound in diagnosing urinary Schistosomiasis is acknowledged, it can detect alterations include those of the fibrotic bladder wall and dilatation of the upper urinary tract .[13-18] Developing guidelines for the standardization of the ultrasound findings in patients with urinary Schistosomiasis was convened by WHO in order to facilitate international comparison of morbidity data.[19]

Table (1) reflect that the most affected ages in Shikan were ages between 11-20 years old with less intensity in the ages more than forty. This was similar to other published data that mentioned the intensity and prevalence of infection rises with age and peaks usually between ages 15 and 20 years. In older adults, the parasite burden or the intensity decreases. [20, 21, 22] Students occupied 74.1% of the studied population who were affected with Schistosomiasis as noticed in table (2)

Table (3) presented the measurement of the variables (mean ±SD), maximum and minimum values for the sample with schistosomal infections which were identified ultrasonographically. One study had mentioned that stratification of events by gender and age is required for optimal use of these markers for predicting *S. haematobium* infection.[23] Therefore our study classified changes in urinary system and GIT system according to age , gender and occupation(Tables 4and 5).Studies had mentioned that the prevalence and severity of schistosomal infections vary with age. Children and adolescents are infected most often and are infested most heavily. Infection rates and severity may vary with gender-specific activity at all ages. [24, 25]

Patients' demographics and gastrointestinal manifestations of Schistosomiasis were correlated significantly at $p<0.000$, table (4). liver size, portal vein diameter spleen size, splenic vein diameters for the infected patients were increased significantly with age .As the age increases the blow of the infection was also increased, male gender has greater changes than the females. The justification of the results; males have a history of exposure to canal water, and the lower socioeconomic status among those who live in Shikan who are more likely to be employed in agriculture and have less convenient access to medical care and treatment for schistosomiasis, since the rural health centers are placed in the larger villages. Some risk factors confound each other and their actual contribution cannot be reliably estimated without performing variant analysis, a statistical method too complicated to use during this descriptive presentation of the data without the knowledge about the laboratory findings including stool egg counts, duration of disease, immunologic status and genetic background of patients should be further evaluated. The correlation between alcohol abuse and the intensity of periportal thickening has not been stated in patients with Schistosomiasis, because alcohol consumption and Schistosomiasis may produce conflicting results.

The most common complication of GI Schistosomiasis is periportal fibrosis, This leads to portal hypertension,this was noticed ultrasonographically as there were changes in the spleen, splenic vein and portal vein and lives size .Our panic is that the infection Among persons with *S mansoni*, *S japonicum*, and, possibly, *S mekongi*, may develop hepatosplenic disease as mentioned in the literature.[26]The adult worms live mainly in the venous plexus of the urinary bladder and the morbidity is caused by egg deposition in and around the urinary tract, causing inflammation and lesions. *Schistosoma haematobium*-related pathology is found mainly in the urinary bladder, the ureters and kidneys. [27]

Our study showed that there is an association between urinary bladder infections, lower urinary tract obstructive lesions with age and occupation of the sample: those living in Shikan were more at risk for infection than those living in larger communities. This may be due to commuting factory workers, and others who do less agriculture work and have less exposure to infection as well as those living in the larger communities are usually better educated, and would be more likely to avoid exposures to infectious water than those living in Shikan .This small community have less facilities, including piped water supplies, sewage disposal, health care, than the villages, which increase exposures to infection. The association of prevalence of infection with the populations' intensity of exposure has been well documented. [28]

The present study recognized that the labors and farmers were exposed to canal water which increased frequency of *S. mansoni* infection .Since females do not frequently bath in canals, they were more infected than males in the urinary tract (bladder wall thickness), however males seldom wash dishes or clothing in canals on the other hand females are doing that function daily. The higher prevalence of infection in males than in females groups including the size of bladder lesion as well as the post micturation urinary bladder findings could also be explained by their greater exposure to canal water while farming. Our findings and justifications were similar to what was mentioned in previous study. [24]

The farmers in our study attained highly changes in the urinary bladder post micturation measurements as well as the lesion size; this justification was similar to the study done previously in Egypt [23] and in Gezera in Sudan [29]. Although infected students occupied 74.1% of the studied population; their ultrasound findings were found to be of less severity than farmers in both urinary tract and GIT manifestations.

The result reveals that there is no significant impact of the Schistosomiasis on the pelvicalyceal system regarding the age, gender or occupation. Lower ureteric end affected significantly with advanced age and occupation. Gastro intestinal tract Schistosomiasis infection changes were significantly correlated with age, gender and occupation.

References

1- Gryseels B, Polman K, Clerinx J *et al*. (2006)Human schistosomiasis. *Lancet*; 368: 1106

2- Lucey DR, Maguire JH.(1993) Schistosomiasis. *Infect Dis Clin North Am*; 7: 63

3- Schistosomiasis, Fact Sheet No 115; February 2010. World Health Organization. Available at http://www.who.int/mediacentre/factsheets/fs115/en/. Accessed Oct 5, 2010

4- Weekly epidemiological record 30 April No.18,2010, 85, 157-164. World health Organization. Available at http://www.who.int/wer.

5- Chistulo L, Loverde P, Engels D. (2004) Disease Watch Schistosomiasis. *TDR Nature Reviews Microbiology*.;2:12

6- Gigase PL. (1992)Urinary bilharziasis. Acta Urol Belg;60:1-13

7- Garba A, Toure S, Dembele R, et al.(2009) Present and future schistosomiasis control activities with support from the Schistosomiasis Control Initiative in West Africa. Parasitology; 136:1731-7

8- Corachan M. (2002)Schistosomiasis and international travel. *Clin Infect Dis*. Aug 15;35(4):446-50

9- Leder K, Weller P. (2009), Epidemiology; pathogenesis; and clinical features of schistosomiasis. *UpToDate* [serial online]. 24,1-9. Available at http://www.uptodate.com.

10- Sturrock RF. (2001)The Schistosomiasis and their intermediate hosts. In: Mahmood AAF. *Schistosomiasis*. Imperial College London; 7-83.

11- Lesham E, Meltzer E, Marva E, Schwartz E. Travel-related Schistosomiasis Acquired in Laos. *Emerging Infectious Diseases* [serial online]. 15:1823. Available at http://www.cdc.gov/eid.

12- Epidemiological situation. WHO. Available at http://www.who.int/schistosomiasis/epidemiology/en. Accessed Sept. 27,2010.

13- Degremont A et al.(1985) Value of ultrasonography in investigating morbidity due to Schistosoma haematobium infection. Lancet, 1: 662-665.

14- Burki A et al. (1986)Comparison of ultrasonography, intravenous pyelography and cystoscopy in detection of urinary tract lesions due to Schistosoma haematobium. Acta tropica, , 43: 139-151.

15- Heurtier Y et al.(1986) Urinary tract lesions due to Schistosoma haematobium infection assessed by ultrasonography in a community-based study in Niger. American journal of tropical medicine and hygiene, 35: 1163-1172.

16- Dittrich M, Doehring E. (1986)Ultrasonographical aspects of urinary schistosomiasis: assessment of morphological lesions in the upper and lower urinary tract. Pediatric radiology, 16: 225-230.

17- Lamothe F et al. (1988)L'6chographie dans la bilharziose urinaire. A propos de 304 examens pratiqu6s au Niger. Annales de radiologie, 31: 297-300.

18- Hatz C et al. (1990)Ultrasound for detection of morbidity due to Schistosoma haematobium and its resolution following treatment with different doses of praziquantel. Transactions of the Royal Society of Tropical Medicine and Hygiene, 84: 84-88.

19- J. Richter, Y. Wagatsuma, M. Aryeetey, & H. (1996)Feldmeier Bulletin of the World Health Organization, Sonographic screening for urinary tract abnormalities in patients with Schistosoma haematobium infection: pitfalls in examining pregnant women,74 (2): 217-221

20- Leder K, Weller P. (2009)Epidemiology; pathogenesis; and clinical features of schistosomiasis. *Up To Date* 2009;1-9. Accessed Sept. 20, 2010. Available at http://www.uptodate.com.

21- Hagan P, Gryeels B.(1994) Schistosomiasis research and the European Community. *Trop geogr Med*.;46:256.

22- King CH, Keating CE, Muruka JF, Ouma JH, Houser H, Siongok TK.(1988) 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*.;39(4):361-8.

23- Taha El-Khoby, Nabil Galal, Alan Fenwick, Rashida Barakat, Ahmed El-Hawey, Zoheir Nooman, Mustafa Habib, Farid Abdel-Wahab, Nabil S. Gabr, Hammam M. Hammam, Mohamed H. Hussein,Nabiel N. H. Mikhail, Barnett L. Cline, And G. Thomas Strickland,(2000) The Epidemiology Of Schistosomiasis In Egypt: Summary Findings In Nine Governorates *Am. J. Trop. Med. Hyg.*, 62(2)S, Pp. 88–99

24- Nawal M. Nour. (2010)Schistosomiasis: Health Effects on Women. *Reviews in Obstetrics & Gynecology*.;3:28-32

25- Mwanakasale V, Siziya S, Mwansa J, Koukounari A, Fenwick A.(2009) Impact of iron supplementation on schistosomiasis control in Zambian school children in a highly endemic area. *Malawi Med J*. Mar;21(1):12-8.

26- Lapa M, Dias B, Jardim C, Fernandes CJ, Dourado PM, Figueiredo M. (2009)Cardiopulmonary manifestations of hepatosplenic schistosomiasis. *Circulation*.;119(11):1518-23.

27- Ekwunife CA, Okafor FC, Nwaorgu OC.(2009) Ultrasonographic screening of urinary schistosomiasis infected patients in Agulu community, Anambra state, southeast Nigeria. Int Arch Med;2:34.

28- Abdel-Wahab MF, Strickland GT, El-Sahly A, Ahmed L, Zakaria S, El Kady N, Mahmoud S, (1980). Schistosomiasis mansoni in an Egyptian village in the Nile Delta. *Am J Trop Med Hyg 29:* 868–874.

29- Elmadani AE, Hamdoun AO, Monis A, Karamino NE, Gasmelseed N.(2013) Ultrasound findings in urinary shistosomaisis infection in school children in the Gezira state central Sudan. Saudi J Kidney Dis Transpl ,24:162-7.

Tables:

Table 1: Distribution of Sample According to Age.

Age	Frequency	Percent (%)
<10	20	18.5
11-20	78	72.2
21-30	7	6.5
31-40	1	0.9
>40	2	1.9
Total	108	100 (%)

Table 2: Distribution of Sample According to Occupation

Occupation	Frequency	Percent (%)
Labor	24	22.2
Student	80	74.1
Employee	1	0.9
Farmer	3	2.8
Total	108	100 (%)

Table 3: Measurement of the Variables (Mean ±SD) Maximum and Minimum Values

	Age/ years	Liver size (mm)	PVD* (mm)	Spleen size (mm)	SPVD** (mm)	Bladder Thickness (mm)	bladder lesion Size (mm)	Pre Micturation (mm)	Post Micturation (mm)
N	108	108	108	108	108	108	108	108	108
Mean	14.80	116.47	8.81	83.06	6.06	8.10	43.25	67.90	5.63
Median	13.00	120.00	8.50	80.00	6.00	8.00	0.00	57.50	0.00
Std. Deviation	8.44	12.12	1.44	11.70	1.02	2.57	151.29	44.87	21.74
Minimum	7	90	6	60	4	4	0	8.00	0.00
Maximum	75	150	14	120	10	18	1225	253.20	203.97

PVD stands for portal vein diameter, SPVD** stands for spleen vein diameter.

Table 4: Patients Demographics and Gastrointestinal Manifestations of Schistosomiasis.

Demographics	Liver size (mm)		Portal vein Diameter (mm)		Spleen size (mm)		Splenic Vein Diameter (mm)	
	Mean	***P- value***	***Mean***	***P -value***	***Mean***	***P- value***	***Mean***	***P -value***
Age								
<10	102.2		7.60		74.50		5.25	
11-20	118.0		8.92		84.95		6.18	
21-30	129.5		9.86		80.00		6.14	
31-40	135.0	0.000*	10.00	0.00*	100.0	0.001*	8.00	0.00*
>40	142.5		12.00		97.50		8.00	
Gender								
Male	117.3		8.92		84.01		6.12	
Female	109.0	0.032*	7.82	0.015*	74.73	0.012*	5.45	0.039*
Occupation of the patient								
Labor	123.3		9.38		85.63		6.00	
Student	113.6		8.55		81.83		6.00	
Employee	135.0	0.000*	10.00	0.006*	100.0	0.15	8.00	0.032*
Farmer	130.0		10.67		90.00		7.33	

Table 5: Patients Demographics and Urinary Tract Manifestations of Schistosomiasis

Demographics	Bladder Thickness (mm)		Size of bladder Lesion (mm)		Pre Micturation Measurements (mm)		Post Micturation Measurements (mm)		PCS (***)	LUE (***)	Thickness Local/ Generalized
	P-value	**Mean**	**P-value**	**Mean**	**P-value**	**Mean**	**P-value**	**Mean**	**P-value**	**P-value**	**P-value**
Age											
<10		8.35		0.00		52.33		0.58			
11-20		7.86		31.36		72.48		6.18			
21-30	0.00*	9.57	0.37	142.8	0.00*	74.40	0.25	5.19	0.20	0.00*	0.011*
31-40		8.00		0.00		8.00		0.00			
>40		10.00		612.5		52.25		39.00			
Gender											
Male	0.039*	7.85	0.002*	45.32	0.67	67.20	0.63	5.82	0.780	0.580	0.310
Female		10.3		25.00		74.02		3.95			
Occupation of the patient											
Labor		9.46		43.96		83.11		3.69			
Student	0.032*	7.64	0.014*	22.39	0.00*	64.35	0.16	5.51	0.410	0.00*	0.051
Employee		8.00		0.00		8.00		0.000			
Farmer		9.67		608.3		60.70		26.00			

(***)PCS: stands for pelvicalyceal system, LUE: stands for Lower ureteric end.