

EVALUATION OF CAUDATE AND RIGHT HEPATIC LOBES RATIO IN PATIENTS WITH *Schistosoma mansoni* USING ULTRASOUND IN AL-FAO AREA

ELSAFI AHMED ABDALLA BALLA^a, MOHAMMED ABDALLA ABDO^b
AND CAROLINE .E.AYAD^{c1}

^aCollege of Medical Radiological Science, Sudan University of Science and Technology Khartoum, Sudan
E-mail : dr.elsafi@gmail.com

^bAl-Fao Hospital, Ultrasound Department, Khartoum, Sudan
E-mail : mohammedabd@hotmail.com

^cCollege of Medical Radiological Science, Sudan University of Science and Technology Khartoum, Sudan
E-mail: carolineayad@yahoo.com

ABSTRACT

Caudate-right lobe ratio is used to assess the liver, usually in the setting of cirrhosis, caused by chronic liver disease, in which there is atrophy of the right lobe with hypertrophy of the caudate lobe. The study was done to assess the caudate to right hepatic lobe ratios in diagnosing cases with schistosomiasis. It was carried on 50 adult patients of known cases of schistosomiasis in Al-Fao area and 20 adult volunteers from the same area as control group, all were surveyed by ultrasound .Abdominal scanning was carried out; measurements were done for liver caudate right lobe ratio, portal vein wall thickness, portal vein caliber and spleen size following the international guide line for measurement, scanning and protocol. The study showed that the male were affected more than female with incidences 62%, 38% respectively. It also showed that the most affected patients were farmer worker with high incidence 64 %. The study noticed the most affected patient were those in the age ranging between (31 -50) years with incidence 58 %. The study concluded that Caudate /right lobe ratio has ability to detected change in the liver size, texture and complication caused by schistosomiasis, the ratio has proportional relation to the portal vein wall thickness, the portal vein caliber and the spleen size and has reversal relation to the liver size. The Caudate /right lobe ratio in coarse liver is more than 0.64 and in complication is more than 0.7. Measuring the caudate and right hepatic lobes ratio using ultrasound appear to have a great value in diagnosis patients with *Schistosoma mansoni*.

KEYWORDS : Schistosomiasis, Ultrasound, Liver

Schistosomiasis is a common parasitic disease and is endemic in the tropical areas; (Ripert, 2000; Andrade et al., 1998; Ross et al.,2002).it is a chronic disease that can produce portal hypertension and occasionally death.(Idle et al., 2000).

The geographical distribution of the various *Schistosoma* species depends on the availability of a suitable snail host.

Al Fao in Al Qadarif state is located in Sudan; roughly 156 m (or 251 km) South-East of Khartoum, the Sudanese capital. (<http://www.tripmondo.com/sudan/al-qadarif/al-faw/>) With distance 91 km from Wad Madani the Gezera State of 3,500 population most of them worked in agriculture as high endemic areas .(<http://www.tiptopglobe.com>).

Most epidemiologic studies regarding schistosomiasis in Sudan have been carried out in the Gezira area and in other central or Northern areas of economic importance, Data from annual reports of the Sudan Medical service indicated that *S. mansoni* and *S. hematobium* were found in 1.9% and 2.5% of specimens in the Upper Nile

region and in 4.9% and 0.25% of specimens in the Bahr El Ghazal region (close to the Northern Sudan border); in the West Equatoria region, the prevalence of *S. Mansonipositive* specimens has been reported as high as 44.3%.(Ayad 1956, Ministry of Health of Sudan, 1948). Considerable difference have been noted between ethnic groups in Gezera Managil area, the rate of infection with *S.Mansoni* were higher than those for *S. hematobium* .The nomads and the migrants from the regions in the west suffered little from urinary schistosomiasis by 2.3%,5% respectively, the Fallata population, on the other hand, had infection rates of 30% for *S. heamatobium* and 50% for *S. mansoni* (Amin and Kardaman, 1980).

In general, the prevalence of schistosomiasis increases in areas where development in agriculture and industry depends on construction of dams which provide a suitable habitat for the snail intermediate host Infection with *Schistosoma mansoni* may give rise to hepato splenic disease (Chen and Mott, 1988).

The disease is mostly due to eggs deposited in host tissues, Oviposition has been detected in the wall of the

¹Corresponding author

organs, including liver, spleen, intestinal wall, as well as other sites (Ripert, 2000; Andrade et al., 1998) which induce inflammatory and fibrotic lesions in host organs. The main lesion in hepatosplenic schistosomiasis is fibrosis in the portal tracts of the liver. (Burchard, 1998).

Ultrasonography can demonstrate hepatic fibrosis. The characteristic finding is periportal fibrosis, hypertrophy of the left lobe with atrophy of the right lobe and thickening of the gall bladder wall (Arafa et al., 1983; Doehring-Schwerdtfeger and Kardorff 1995).

A lot of researches efforts has been directed to study the *Shistosoma mansoni* in different Sudanese areas but to our knowledge, no study was taken place in Al fao area in the open literature, so this study was done to highlight the role of ultrasound in the detection of early hepatic fibrosis in schistosomiasis for Sudanese population living at that endemic area.

MATERIALS AND METHODS

This study was done in Al-Fao Teaching Hospital. Khartoum Sudan during the period from September 2010 to March 2011.

Real time Ultrasound machine Toshiba model SSA-320A, fitted with 3-4 MHz transducer was used for the study.

A total of 50 Sudanese patients from Al-fao Region, who were diagnosed clinically and laboratory as *Schistosoma Mansoni* with or without complications, and 20 control volunteers from the same area were involved in this study.

Patients with other types of *Schistosoma* e.g. *Hematobium*, *Japanium*, *Mekongi*, *Intercalatum*, children, patients from other areas, were excluded.

Sonographic technique and liver measurement Examination was done for patients in supine position; subjects were instructed to raise the right hands behind their head, thus increasing intercostals space and the distance from the lower costal margin to the iliac crest. The examination was carried out during deep inspiration and with a relaxed abdominal wall .The patient was fasting for 4 hours before the examination to reduce the amount of gasses and fecal masses. The whole liver was measured by caudal cranial technique .The caudate and right lobes were

measured by antero- posterior technique and then calculated caudate/ right lobe ratio. The portal vein (P.V) and spleen were examined, then measuring (P.V) caliber, (P.V) wall thickness, spleen size.

RESULTS

Result obtained in table 1, 2, 3 and figure 1, 2, 3, 4, 5 and 6. The 50 known cases of *Schistosoma mansoni* studied; consist of 19(38%) female and 31(62%) male. All were from Al-Fao area and 20 volunteers from the same area as control group, 10 were males (50%) and 10 were Females (50%).

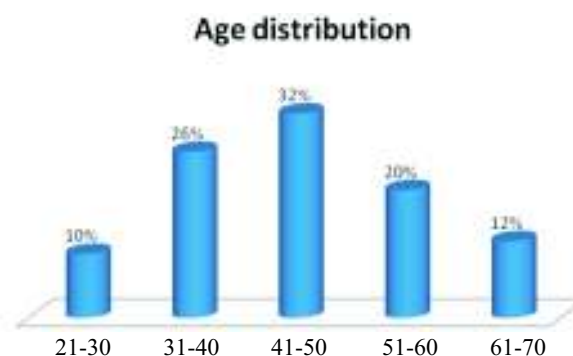


Figure 1: Graph Shows Patients Age Distribution And Percentage

DISCUSSION

The data in this study were collected from fifty patients and twenty volunteers from Al-Fao area, the investigation was carried out at Al-Fao Teaching Hospital in ultrasound department. This study was taken to assess change of liver size and echogenicity in *Schistosoma Mansoni* infection; by calculating the ratio between caudate and right hepatic lobe and to correlate between the caudate-



Figure 2: Graph Shows Patient Occupation And Percentage

Table 1: The Mean And Standard Deviation of The Variables Under Study In Patients With *Schistosoma mansoni*

	Number of Subjects	Minimum	Maximum	Mean	Std. Deviation
Age	50	22	64	43.94	11.37
Liver size	50	11	15	12.69	1.02
Right lobe size	50	9.5	14	10.59	0.87
Caudate lobe size	50	4.9	7.4	6.38	0.55
Ratio	50	0.39	0.78	0.61	0.09
Portal wall thickness	50	0.3	0.7	0.49	0.11
Portal vein caliper	50	0.9	1.6	1.15	0.19
Spleen size	50	9.7	20	12.17	2.27

Table 2: The Mean And Standard Deviation of The Variables Under Study In The Control Group

	Number of Subjects	Minimum	Maximum	Mean	Std. Deviation
Age	20	27.00	50.50	38.25	6.41
Liver size	20	10.80	15.50	12.74	1.16
Right lobe size	20	9.00	14.00	11.79	1.13
Caudate lobe size	20	4.20	6.30	5.39	0.52
Ratio	20	0.40	0.53	0.45	0.04
Portal wall thickness	20	0.10	0.30	0.21	0.08
Portal vein caliper	20	0.90	1.20	1.07	0.12
Spleen size	20	9.00	12.60	10.71	1.15

Table 3: The P-Value of The Variables Under Study Compared To The Control Group

Control group and the Sample	Liver size	Right lobe size	Caudate size	RT/Caudate Lobe Ratio	Portal wall thickness	Portal vein caliper	Spleen size
At P-Value <0.05	Decrease	Decrease	Increase	Increase	Increased	Increased	Increased

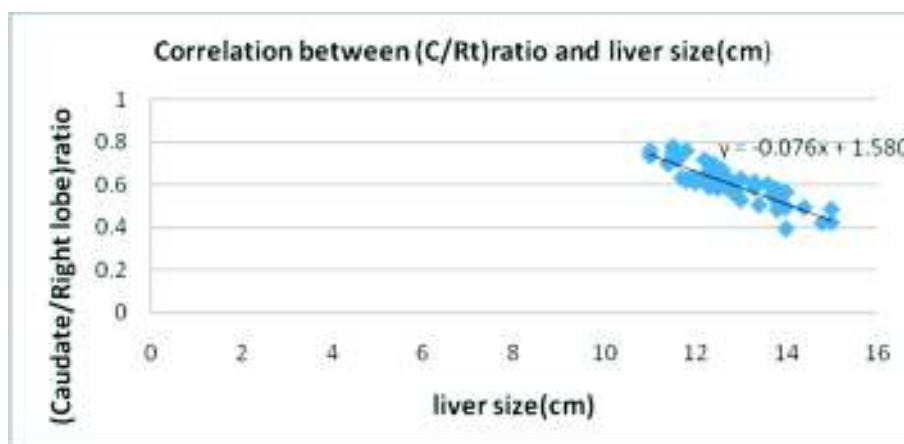


Figure 3 : Scatter Plot For Patient Show The Linear Association Between Caudate- Right Hepatic Ratio And Liver Size With A Trend Line Which Indicate Direct Linear Relationship. Caudate-Right Lobe Ratio Decrease By 0.07 Per cm

right hepatic lobe and liver size, spleen size, portal vein wall thickness and portal vein wall caliber.

The study showed that males were more affected than females, and the affected ages were 41-50 years old, the farmers (64%) were more affected than house wives and

students, this may be due to that the majority of females are not allowed to swim or have a bath in canals; this reduced their exposure to the disease.

When examining the patients by ultrasound, it was found that the liver size and right liver lobe were decreased

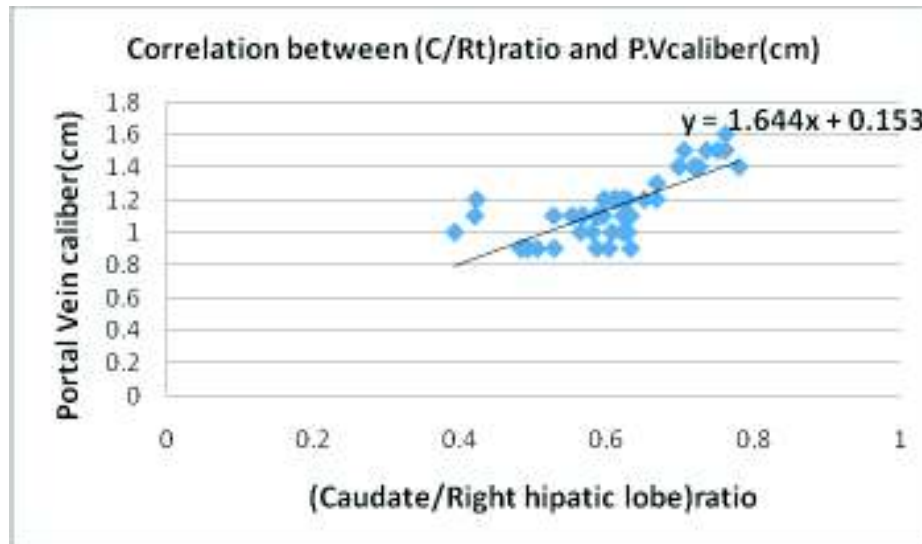


Figure 4 : Scatter Plot For Patient Show The Linear Association Between Caudate- Right Hepatic Ratio And Pv. Caliber With A Trend Line Which Indicate Direct Linear Relationship. Caudate-right Lobe Ratio Increase By 0.15 Per Cm Starting From 1.6

significantly at p-value 0.05 where the caudate lobe size, portal wall thickness, portal wall caliber and spleen size were increased. The ratio between the caudate lobes to right liver lobe size was found to be increased significantly as presented in table (1).

The justification of changes happened in the liver size and echogenicity and portal vein; is that in *Schistosoma mansoni* infection, eggs, trapped in hepatic sinusoids, which avoids toxic substances from diffusing from the eggs into the surrounding hepatic tissue (Andrade et. al., 1998). Egg-derived products released at the site of the inflammation stimulate the formation of myo fibroblasts. Fibroblasts secrete extracellular matrix proteins that deposit in the peri-portal space .leading to imbalance between fibrogenesis and fibrolysis, extended peri-portal fibrosis.

Figure (3) shows the linear association between caudate- right hepatic ratio and liver size with a trend line which indicates direct linear relationship. Caudate-right lobe ratio decrease by 0.07 per cm starting from 1.5 as the liver size increased, Ultrasonography can demonstrate hepatic fibrosis. The characteristic finding is periportal fibrosis, additional signs are hypertrophy of the left lobe with atrophy of the right lobe and thickening of the gall bladder wall (Arafa et al., 1983; Doehring-Schwerdtfeger & Kardorff, 1995).

Figure (4) shows the linear association between caudate- right hepatic ratio and PV. Caliber. Caudate-right lobe ratio increase by 0.15 per cm .A linear association between caudate- right hepatic ratio and portal wall thickness which indicates direct linear relationship. Caudate-right lobe ratio increase by 0.12 per cm was presented in figure (5).

The diameter of the portal vein correlates with the portal pressure (Abdel-Latif et al., 1981) and the risk for gastrointestinal hemorrhage (Richter et al., 1992b). Ultrasound, however, is of grand usefulness to detect early fibrosis.

Figure (6) shows the linear association between caudate- right hepatic ratio and spleen size indicates direct linear relationship. Caudate-right lobe ratio increase by 1.8 per cm. Infection with *Schistosoma mansoni* may give rise to hepato-splenic disease (Chen & Mott, 1988). The due to eggs dumped in host tissues by adult female worms which induce inflammatory and fibrotic lesions.

When characterizing the liver; it was found that Liver parenchyma echogenicity is usually preserved, The schistosomal periportal fibrosis appears like an echogenic band surrounding the portal vessels from the helium to the periphery of the liver; ultrasound is of great value in evaluating the liver surface which may develop nodules as a

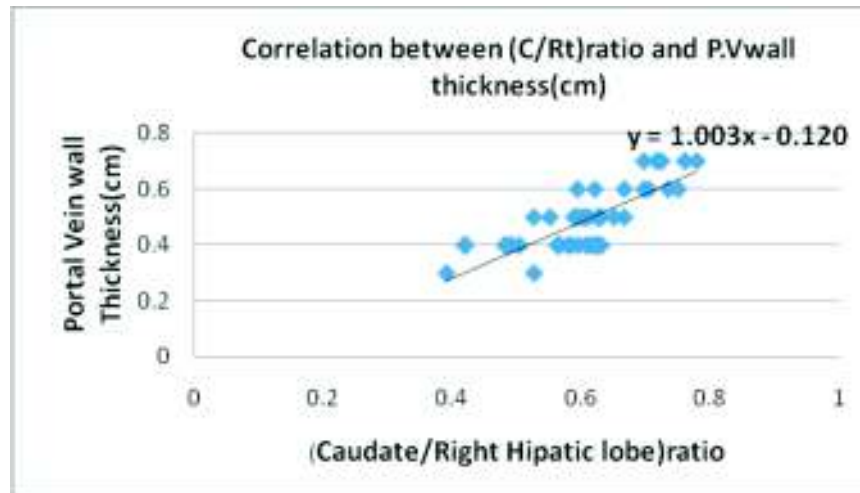


Figure 5: Scatter Plot For Patient Show The Linear Association Between Caudate- Right Hepatic Ratio And Portal Wall Thick With A Trend Line Which Indicate Direct Linear Relationship. Caudate-right Lobe Ratio Increase By 0.12 Per cm

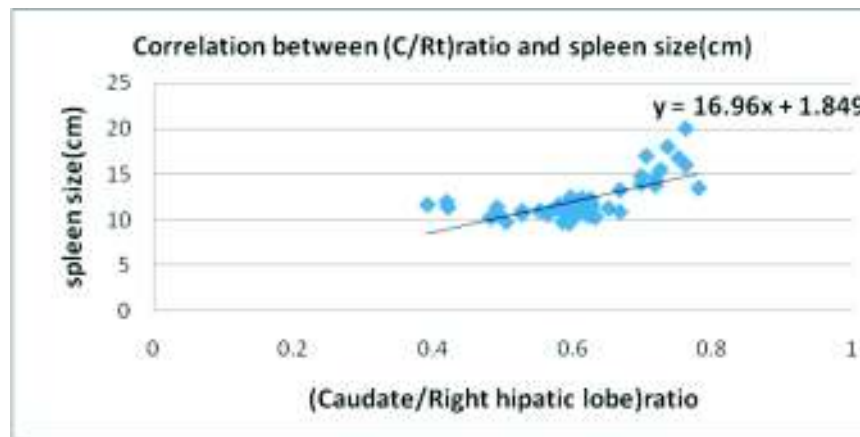


Figure 6: Scatter Plot Show The Linear Association Between Caudate- Right Hepatic Ratio And Spleen Size With A Trend Line Which Indicate Direct Linear Relationship. Caudate-Right Lobe Ratio Increase By 1.8 Per cm Starting From 16 cm

result of fibrous tissue scarring and retraction. The portal vein and its tributaries are generally dilated in such cases.

The study gave the opportunity to review the diagnosis done using the standard protocols for ultrasound examinations in schistosomiasis in highly endemic area as Alfoa. Ultrasound examination has been successfully used to show that in *S. Mansoni* infection, pathological changes can be detected by detecting changes in the Caudal/Right liver lobe ratio, periportal fibrosis, liver and spleen size.

Ultrasound can formulate a valuable contribution to the screening of control programmes in such areas, and facilitate decisions in the procedures to reduce morbidity. Criteria should be planned for the best ways of using

ultrasound to meet the terms of these needs.

REFERENCES

- Abdel-Latif Z., Abdel-Wahab M.F. and El-Kady N.M., 1981. Evaluation of portal hypertension in cases of hepatosplenic schistosomiasis using ultrasound. *Journal of Clinical Ultrasound*, **9**: 409-412.
- Amin M.A. and Kardaman M.W., 1980. Schistosomiasis Programme and abstracts. Third scientific conference. 5-6 March 1980 Khartoum, The Medical Research Council of National Council for Research.

- Andrade Filho Jde S., Lope M.S., Corgozinho Filho A.A. and Pena G.P., 1998. Ectopic coetaneous schistosomiasis. *Rev Inst Med Trop Sao Paulo*, **40**:253-257.
- Arafa N.M., Khair MHA and Abdel-Wahab M.F., 1983. Ultrasonography in hepato-splenic schistosomiasis. *Ultrasound in Medicine and Biology, Supplement*, **2**:477-484.
- Ayad A.N., 1956. Bilharziasis survey in British Somaliland, Eritrea, Ethiopia, Somalia, the Sudan and Yemen. *Bull World Health Organ*, **14**:11-17.
- Burchard G.D.F, Guissé-Sow, M. Diop, A. Ly, R. Lanuit, B. Gryseels and A. M. Gressner, 1998. *Schistosoma mansoni* infection in a recently exposed community in Senegal: lack of correlation between liver morphology in ultrasound and connective tissue metabolites in serum *Tropical Medicine and International Health*, **3**(3): 234-241 .
- Chen M.G. and Mott K.E., 1988. Progress in assessment of morbidity due to *Schistosoma mansoni* infection. A review of recent literature. *Tropical Disease Bulletin*, **85**, R1R56.
- Doehring-Schwerdtfeger E. and Kardorff R., 1995. Ultrasonography in schistosomiasis in Africa. *Memorias do Instituto Oswaldo Cruz.*, **90**:141-145.
- Idle O. Farah, Paul W. Mola, Thomas M. Kariuki, Mramba Nyindo, Ronald E. Blanton, Christopher L. King, 2000. Repeated Exposure Induces Periportal Fibrosis in *Schistosoma mansoni* Infected Baboons: Role of TGF-b and IL-41 *The Journal of Immunology*, **164**: 5337-5343.
- Ministry of Health of Sudan. Reports of the Sudan Medical Service for the years 1929-1948. Khartoum Bella.H, Marshall T.F. Omer A.H.S., Vaughan, 1980.-Migrant workers and schistosomiasis in the Gezira, Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **74**(1):36-39
- Richter J., Zwingenberger K., Ali Q.M., Lima Wde M., Dacal A.R., De Siqueira G.V., Doehring-Schwerdtfeger E., Feldmeier H., (1992b) Hepatosplenic schistosomiasis: Comparison of sonographic findings in Brazilian and Sudanese patients -correlation of sonographic findings with clinical symptoms. *Radiology*, **184**: 711-716.
- Ripert C., 2000 Laboratoire de Parasitologie médicale, Université de Bordeaux, Christian.Ripert@parasit.u-bordeaux2.fr. Other forms of schistosomiasis. *Presse Med*; Sep **30**; 29(28): 1580-1582.
- Ross A.G.P., Bartely P.B., Sleigh A.C., Olds G.R., Ly Y. and Williams G.M., 2002. Schistosomiasis. *N. Engl J Med.*, **346**: 1212-1220.
(<http://www.tiptopglobe.com>)
(<http://www.tripmondo.com/sudan/al-qadarif/al-faw/>)