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Prevalence of Intestinal and Urinary Schistosomaisis in Five Localities in Gezira State, Sudan.

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Abstract

Background: Schistosomiasis is a neglected parasitic disease caused by *S. mansoni* and *S. haematobium* in Sudan. It is causing a chronic inflammatory process affecting the intestine and urinary bladder leading to a serious and fatal complications.

Mehods: A total of 690 participants from five localities in Gezira State in Sudan were enrolled between March and August, 2016 in this study. Data on socio-demographic and risk factors were obtained using structured questionnaires. Clean containers with corresponding labels were used for samples collection. After processing stool and urine sample were microscopically examined for the ova of *S. mansoni* and *S. haematobium* respectively.

Results: From the 690 participants enrolled in this study 396(57.4%) were male and 294(42.6%) were female, aged between 5 – 55 years, with the mean age ±SD (17.3 ± 3.7). This study revealed that the prevalence of *S. mansoni* was 6.7% (46/690) and *S. haematobium* was 7.5% (46/690), and overall prevalence of Schistosomiasis in the five localities was 14.2%. *S. haematobium* (11,9%, 1.7%) and *S. mansoni* (9.3%, 3.1%) were infected males more than females respectively.

Conclusion: There is still a high prevalence of schistosomiasis in the study area. Safe water supply, provision of sanitation facilities, health education and sustainable rounds of mass chemotherapeutic intervention with Praziquantel are highly recommended to reduce the prevalence of this disease.

Keywords: Schistosomaiasis prevalence, Gezira State, Sudan

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Introduction

Schistosomiasis is an old water borne disease that constitute a major public health problem in many developing countries (WHO, 2002). About 85% of infected people live in Africa. The disease affects many people in endemic areas including Sudan and are commonly seen in school age children and young adults (WHO, 2010 and 2013).

In countries neighboring Sudan, In Republic of South Sudan, either *S. mansoni* or *S. haematobium* or both species were endemic throughout Unity State and occurred in foci in Central and Eastern Equatoria. (Finn TP *et al* 2012) and in Upper Nile region the prevalence of *S. hematobium* infection was 73% and *S. mansoni* infection was 70%. (Roberto Deganello *et al.* 2007)

In Central African Republic, Schistosomiasis endemic throughout the country with 9.8% prevalence in 2010 (Rollinson, D . *et al* 2013), and data from Chad reveals that the prevalence of schistosomiasis estimated to be 42.7% and no control programs existed (Rollinson,D . *et al* .2013). The prevalence of urinary Schistosomiasis in Libya were documented to be 5.3% among children(Abdul Hafeez Khan *et al* 2014), while in Egypt the prevalence of *S. mansoni* reported to be 0.8 % among children of Elmenoufia district (Bahbah MH *et al* 2014). In countries neighbouring Sudan from the east, the prevalence of *S. mansoni* was estimated to be 27.6%, and 73.9%, in South West and North of Ethiopia respectively (Bajiro M *et al* 2017 , Nigus Abebe *et al* 2014), and less than 10% prevalence of Schistosomiasis was reported in Eritrea (Lai, Y. S. *et al* 2015) .

In Sudan, recent surveys showed that the disease is prevalent in all regions over the country with varying intensity and the infection rate was high among males more than females, and both *S. mansoni* and *S. haematobium* are present (Malik EM *et al* 2016).

In White Nile State recent published research indicated that the prevalence of *S. mansoni* was 25.6% in a new sugar irrigated scheme and it was among males more than the females (Tamomh AG, *et al*. 2018) , and the prevalence of *S. haematobium* in Umhani village in Kosti Locality was 18.4%, and it was especially high among male in the school age children (Abdelrhman A.G *et al* 2017).

In Southern Kordofan State the prevalence of *S. haematobium* was 23.7% (Alaa H Abou-Zeid *et al*, 2013). In Khartoum State the overall prevalence was 39.9%. Snail hosts of both *S. mansoni* (*Biomphalaria spp*) and *S .haematobium* (*Bulinus spp*) were reported in irrigation canals and along the shores of the white Nile (Amin M. *et al* 2016) In Sennar State the prevalence of *S. mansoni* found to be 21 % (Abdelbasit M I. *et al* 2014), and in River Nile State the prevalence of urinary Schistosomiasis among pupils was 32.5% (Mosab N M H et al 2017) . In Blue Nile State, *Schistosoma haematobium* infection rate was 19.8% (Hassan A. *et al*. 2016) and in Kassala State, the prevalence of the intestinal schistosomiasis among the school children was 54.6% (Mudathir AbdElRahman *et al*. 2010). In Geddarif State the prevalence of urinary schistosomiasis was 9.4% among all age groups (Salah ET and Elmadhoun WMY, 2014) , and in Darfur, *S. hematobium* is endemic in South Darfur with a high prevalence of infection among older children with more than 39% (Deribe *et al*. 2011).

Vol. 2, No. 03; 2018

ISSN: 2581-3366

The spread of the disease in the study sites started with the Gezira irrigated Scheme and the flow of migrant laborers in the country. This great scheme makes micro-environment of schistosoma breeding sites and others water borne diseases. This scheme has the high number of infected people in Sudan due to endemicity of Schisosoma in the water of this area (Denganello R and Cruciani M, 2007). In Gezira State in the study localities, the prevalence of combined *S. mansoni* and *S. haematobium* was reported to be 12.3 % (Abdelhafiz H. Abdalla *et al* 2012) and state schistosomiasis control program launched a mass chemotherapeutic treatment with praziquantel in 2012 (personal communication). The aim of this study was to determine the current prevalence of combined *S. haematobium and S. mansoni* among population in Gezira State in Sudan after four years of implementation of mass chemotherapy with praziquantel.

Materials and Methods

Study area

This study was carried out in Gezira state which lies between latitudes (13-32 and 15-30) North and longitudes (22-32 and 20-34) East (Figure 1). It is bordered by Khartoum State to the North, Sinnar State to the South, Gadarif State to the East and White Nile State to the West, its area estimated to be 27,549 km². Total population is 2,796,330 in the census performed in 2008 . Gezira state was inhabited by a mixture of ethnic groups from inside and outside Sudan. The Gezira is a well-populated area suitable for agriculture. The region has benefited from the Gezira Scheme, a program to foster cotton farming begun in 1925. At that time the Sinnar Dam and numerous irrigation canals were built. The Gezira became the Sudan's major agricultural region with more than 2.5 million acres (10,000 km^2) under cultivation (Sudan.gov.sd, 2012).

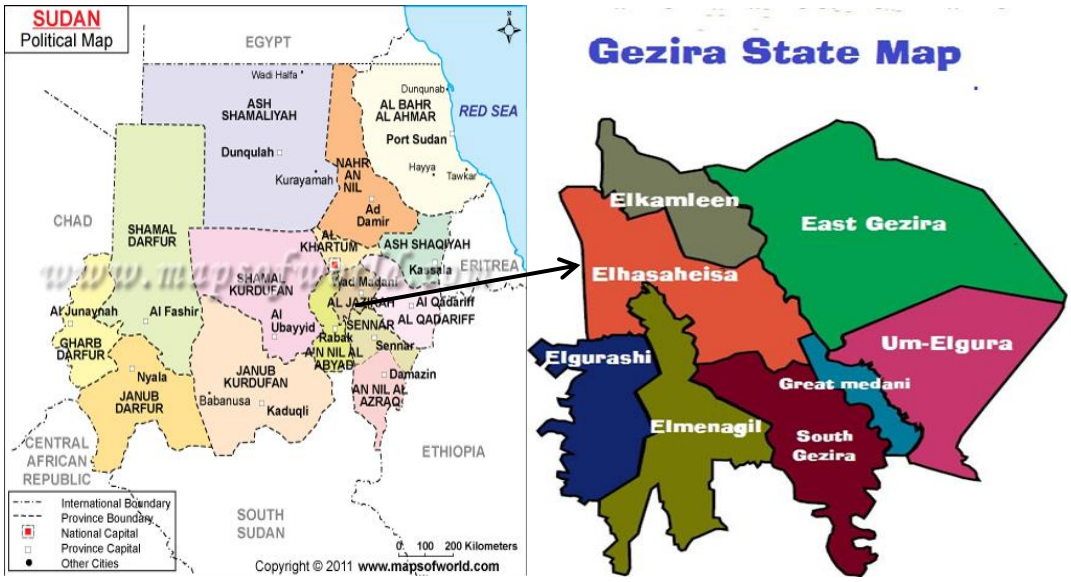

Figure (1): Map of the study site

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Study design and duration:

This cross-sectional, laboratory based study was carried out between March and August, 2016. It was designed to target a total number of 690 of population residence in Wad Medani Greater, Alhassahesa, Almanagil, Um Elgura and Southern Gezira localities in Gezira State

Sample collection and procedures:

Collection of Urine samples:

Ten ml of terminal urine were collected in clean, screw-capped, labelled and wide mouth bottles. Ethanol 70% was used for preservation (Two volumes to one volume of urine sample). Samples were collected between the hours of 10 am and 2 pm. (Robyn ,2007).

Collection of stool samples:

Tea spoon from stool were collected into a plastic wide mouth container with applicator stick. Samples were preserved in formal water 10% (1 gram with three ml of formal water and mixed well. (D. Rollinson *et.al* ,2007).

Procedures of tests:

About 5 ml of each urine sample was measured into test-tube and centrifuged at 2000 rpm for 5 minutes using Roche Scientific Centrifuge. The supernatant fluid was decanted off while the sediment was examined under light microscope. A micro-pipette was used to introduce about 10 µl of each sample onto a clean, grease free glass slide and covered at an angle with a glass slip to avoid bubble formation. Microscopic examination of *S. haematobium* was carried out using 10 × objective of Light Microscope (Olympus- Japan).

Wet preparation for stool

By using normal saline and logos iodine, small amount of stools were emulsified, then cover with cover slip and examined for eggs of *S. mansoni* by low and high power field lenses of Light Microscope (Olympus- Japan). (Paniker,2013).

Concentration (sedimentation) method:

One gram (pea-size) of faeces were emulsified in about 4 ml of 10% Formal water contained in a tube, then further 3-4 ml of 10% v/v formal water were added and mixed well by shaking, then the emulsified faeces was sieved in a beaker, then this suspension transferred to a conical centrifuge tube. 3–4 ml of ethyl acetate were added and mixed for 1 minute. After that the suspension was centrifuged immediately at 750–1000 rpm for 1 minute. From the sedimentation a wet preparation were made and examined for *S. mansoni* ova under the microscope (Monica ,2009).

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Centrifugation method for urine:
Ten ml of urine were poured on centrifuge tube and centrifuged in low speed for five minutes, then the supernatant were discarded and the sediment were examined on clear slide after covered with cover slip and searched for eggs of *S. haematobium* by low and high power field of light microscope, (WHO,1991); (Monica ,2014).

Ethical considerations
The Ethical approval obtained from the ethical committee of the Blue Nile National for Communicable Diseases, and permission obtained from Gezira State Ministry of Health Authorities and informed consent obtained from the participants.

Data analysis
Data were entered into the computer using SPSS for windows version 16.0 (SPSS Inc., Chicago, Illinois, USA) and Chi-square test was used to compare the differences in the prevalence of infection

Results
A total number of 690 participants from Gezira State were enrolled in this study. 396(57.4%) were male and 294(42.6%) were female, aged between 5 – 55 years, with the mean age ±SD (17.3 ± 3.7). As indicated in table (1). The high infections of Schistosomiasis was found in Wad Medani Greater locality (*S. mansoni* (8%) and *S. haematobium* (40%), in South Gezira locality reported 8% and 6% for *S. haematobium* and *S. mansoni* respectively. In Alhssahisa locality the prevalence of *S. mansoni* was 6.7% and *S. haematobium* was 2% . While in Um Elgura and Elmanagil localities the prevalence of *S. mansoni* was 5.6% and 5.5% respectively and no cases of *S. haematobium* found in both localities. The prevalence of Schistosomiasis in the study localities in Gezira state, estimated to be 6.7% (46/690) for *S. mansoni* and 7.5% (46/690) for *S. haematobium* with 14.2% overall prevalence of Schistosomiasis in the study localities. In table (2) revealed that both *S. haematobium* and *S. mansoni* were 21.2%(84/396) infected males more than 4.8%(14/294) that infected females.

Table(1).Distribution of *S. mansoni* and *S. haematobium* among population in the five localities

Localities	**No of samples**		***S. mansoni***		***S. haematobium***		***Over all prevalence***
	Stool	urine	Positive	Negative	positive	Negative	
Greater Wad Medani	100	100	8 (8%)	92 (92%)	40 (40%)	60 (60%)	48%nm
Alhassahisa	150	150	10 (6.7%)	140(93.3%)	3 (2%)	147(98%)	8.7%
Almanagil	200	200	11 (5.5%)	189 (94.5%)	0	200 (100%)	5.5%
Um Elgura	90	90	5 (5.6%)	85 (94.4%)	0	90 (100%)	5.6%
South Gezira	150	150	12 (8%)	138 (92%)	9 (6%)	141 (94%)	14%
Total	690	690	46 (6.7%)	644 (93.3%)	52 (7.5%)	638(92.5%)	14.2%

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Table(2).Distribution of *S. mansoni* and *S. haematobium* among population in the five localities according to the gender

Locality	No of samples		*S. mansoni*		*S. haematobium*	
	stool	Urine	Males (396)	Females (294)	Males (396)	Females (294)
Greater Wad Medani	100	100	8(8%)	0	36	4
Alhassahisa	150	150	7(4.7%)	3	3	0
Almanagil	200	200	11(5.5%)	0	0	0
Um Elgura	90	90	2 (2.2%)	3	0	0
South Gezira	150	150	9(6%)	3	8	1
Total	690	690	37(9.3%)	9(3.1%)	47(11.9%)	5(1.7%)

(*P. value* = 0.0001)

Discussion

In this cross-sectional survey, the most important results obtained was that the prevalence of *S. haematobium* in Gezira state was 7.5% and for *S. mansoni* was 6.7% and the overall prevalence of schistosomiasis among population in the five localities in Gezira state was 14.2%,. The high prevalence of *S. hematobium* that recorded in Wad Medani Greater locality it represented 40% and this when compared with that published studies, it was less than 52.6% that reported in Fatick region of Senegal (Senghor B *et al.* 2014) and less than 52.8 % reported in north-eastern region of Zimbabwe (Nausch N *et al*., 2014). Also it was less than 90-100% that recorded among children in in Meanwhile the highly endemic foci of Malawi (Mtethiwa *et al*., 2015),

The prevalence of Schistosomiasis revealed by this study when compared with that reported from the countries neighboring Sudan it was higher than that published from Egypt (0.8%), Libya (5.3%), Central Republic of Africa (9.8%) and in Eritrea(< 10%) by Bahbah MH *et al* 2014, Abdul Hafeez Khan *et al* 2014,

Rollinson, D . *et al* 2013 and Lai, Y. S. *et al* 2015 respectively. While it was less than that reported from Ethiopia (27.6%, and 73.9%), Chad (42.7%) and South Sudan (70% and 73%) by Bajiro M *et al* 2017 - Nigus Abebe *et al* 2014, Rollinson, D . *et al* 2013 and Roberto Deganello *et al*. 2007 respectively.

Schistosomisis is prevalent in all countries neighboring Sudan and daily cross borders movement of immigrants and population between Sudan and these countries is common either due to security conflicts or trading purposes, but most of them coming as seasonal workers in the farms in irrigated areas and in the mechanized agriculture schemes or in any other places. However, this uncontrolled immigrants and population movement can contribute to the disease transmission continuation and possible to infesting new areas not before infected and this agreed with that reported by Denganello R and Cruciani M, 2007 . As showed by figure 2 people who

Vol. 2, No. 03; 2018

ISSN: 2581-3366

came to Gezira irrigated scheme usually build their houses near the canals in a bad sanitation atmosphere. Their daily activities, food preparation, water drinking, house utensils cleaning, clothes washing and bathing are depending on these canals, beside that their children and teenagers usually are swimming, bathing, fishing and drinking water from these canals which are usually a good habitat for the breeding of the vectors intermediate host of schistosoma as indicated in the minor canal in figure 2. So, all people here are commonly in contact with water and are at risk of contracting Schistosomiasis infection and possible reinfection that leads to the morbidity and complication.

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Figure(2): Temporary huts from the local woods and straw constructed on the beds of the canals and in empty surfaces among the farms in Gezira Irrigated Scheme (South Gezira Locality, Gezira State, Sudan.

The 14.2% prevalence of schistosomiasis documented by this study when compared with other published results from other Sudan States, it was less than 45.0% , 25.6%, 18.4% prevalence in White Nile River that reported by by Hassan A.H.*et al* 2014, Tamomh AG, *et al*. 2018 and Abdelrhman A.G *et al* 2017 respectively. Also our finding was less than 23.7% which reported in South Kordofan State by Alaa H Abou-Zeid *et al*, 2013 and it was less than 39% that recorded by Deribe *et al*. 2011 in South Darfur. While it was less than 21% in Sennar State, 19.8%, in Blue Nile State, 32.5% in River Nile State and 54.6% in Kassala State by Abdelbasit M I. *et al* 2014, Hassan A *et al*. 2016, Mosab N M H *et al* 2017 and Mudathir AbdElRahman *et al*. 2010 respectively, and it was higher than 9.4% that found in Geddarif State by Salah ET and Elmadhoun WMY, 2014 ,

As indicated in table 3, in the study area our finding 14.2% schistosomiasis prevalence was more than 12.3% which reported by Abdelhafiz *et al* 2012 in the same localities, and this was attributed to the high prevalence of *S. hematobium* in Wad Medani Greater locality where the overall prevalence(7.0%) equal to that detected in the four localities (7.2%), also could be due to the presence of aquatic snails Bullinus for *S. haematobium* intermediate host as found in canals around Wad Medani city namely Barakat canals (Arwa Osman, MSc dissertation, 2012), beside

that there was more than eight unregistered villages (cambo) existed in Wad Medani Greater locality that lacking adequate health facilities.

As conveyed in table 3, there was no record of *S. haematobium* among the population in Almanagil and Um Elgura Localities, this discrepancies may due to the unequal distribution of intermediate host for *S. haematobium* and *S. mansoni*.

Table (3) :Comparison between the prevalence of Schistosomiasis in the study area in 2012 and 2016

Localities	*S.mansoni* Prevalence (2012)	*S.haematobium* prevalence (2012)	Schistosomiasis prevalence (2012)	*S.mansoni* Prevalence(current study 2o16)	*S.haematobium* prevalence(current study,2016)	Schistosomiasis prevalence(current study 2016)
Greater Wad Medani	1.1%	2.1%	3.2%	8%	40%	48%nm
Alhssahisa	14.4%	1.4%	15.8%	6.7%	2%	8.7%
Almanagil	18.7%	2.4%	21.1%	5.5%	0 %	5.5%
Um Elgura	3.5%	1.0%	4.5%	5.6%	0 %	5.6%
South Gezira	12.6%	4.1%	16.7%	8%	6%	14%
Overall prevalence	10.1%	2.2%	**12.3%**	6.7%	7.5%	**14.2%**

(*P. value* < .0.05)

In table 2, Schistosomiasis was more prevalent in males than females (21.2%, 4.2%) respectively. The higher prevalence rate recorded among males is suggestive of more water contact activities as mentioned above, and was similar to the study done in the study area by Abdelhafiz *et al* 2012, and that found in different Sudan regions in South Kordofan, South Darfur, Blue Nile, White Nile, River Nile, and Kassala States by Alaa H Abou-Zeid *et al*, 2013, Deribe *et al*. 2011, Ahmed. M. *et al*. 2016, Tamomh AG, *et al*. 2018 and Abdelrhman A.G *et al* 2017, Mosab N M H *et al* 2017 and Mudathir AbdElRahman *et al*. 2010 respectively.

Also the affected of males more than females recorded by this study agreed with that reported in Ethiopia by Bajiro M *et al* 2017 - Nigus Abebe *et al* 2014 while disagreed with that reported by Roberto Deganello *et al* 2007 whom found that the females affected more than males in Republic of South Sudan..

Irrespective the high prevalence reported in Wad Greater locality, the control measures implemented in Gezira State were effective and had a positive impact in reducing the frequency of Schistosomiasis in the study areas

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Conclusion:
Still Schistosomiasis is prevalent in the study area. Annual survey in small scales to monitor the diseases prevalence, sustaining periodically the round of mass chemotherapeutic with Peaziqualtel and mobilizing the other control interventions are recommended to reduce the disease burden.

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Competing Interests:

The authors declare that they have no competing interests.

References

Abdelbasit Mohamed Ibrahim and Mutasim Elhadi Ibrahim. Evaluation of microscopical and serological techniques in the diagnosis of Schistosoma mansoni infection at Sennar State, Central Sudan Asian Pac J Trop Dis 2014; 4(1): 8-13

Abdelhafiz H. Abdalla, Elfatih M. Malik, Ali O. Babiker, Mutasim Eltayib, Adil Ibrahim Mohamed and I. Adam. Geographical Distribution and Prevalence of Schistosomiasis in Gezira State, Sudan; *Health and Development Journal*, volume I/ No I / June 2012

Abdelrahman A; Ali M; Elbashir H; Samira A & Nour (2017). Assessment of Schistosoma haematobium prevalence among pupils in Um Hani village at Kosti locality _White Nile State _ Sudan (2011-2012).; *Advance Research Journal of Multidisciplinary Discoveries*. 16.0,C-9 (2017):57-60, ISSN-2456-1045. http://www.journalresearchijf.come;

Abdul Hafeez Khan, Ibrahim Shnaf Ali, Omran M.Abdulrahman and Mohammed Y Elkhalifa. Urinary Schistosomiasis in Sebha, Libya. *Sebha Medical Journal*, Vol. 6(1), 2007

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Ahmed. M. Hussein, Dawria Adam, Abbas.A.Abdelmaboud, Mohieldin Ali and Belal Abdallah A. Risk Factors of Schistosomiasis among Basic School Pupils at Geissan Locality, Blue Nile State. *World Journal of Pharmaceutical and Medical Research*, 2016; www.wjpmr.com. 2016

Alaa H Abou-Zeid, Tigani A Abkar and Rashid O Mohamed. Schistosomiasis infection among primary school students in a war zone, Southern Kordofan State, Sudan: a cross-sectional study; *BMC Public Health*, 201313:643

Amin M, Kardaman M, Mounkaila N, Abubaker H, Algali M, Humeida M (2016) The Transmission Patterns of Shistosomiasis in Khartoum State, Sudan. *Ann Clin Pathol* 4(6): 1088.

Arwa Osman. Snails Population Dynamics and their parasitic Infections in Barakat Canal, Gezira Scheme 2011, MSc Dissertation 2012, BNNICG, University of Gezira, Wad Medani, Sudan.

Bahbah MH, El Shikhsalem WA. Study of schistosomiasis among school children in Berket El Sab district, Menoufia Governorate. *Menoufia Med J* 2014;27:239-43

Bajiro M, Tesfaye S (2017) Schistosoma mansoni Infection Prevalence and Associated Determinant Factors among School Children in Mana District, Jimma Zone, Oromia Region, South West Ethiopia. *J Bacteriol Parasitol* 8: 329. doi:10.4172/2155-9597.1000329

Denganello R, Cruciani M.et.al 2007. Schistosoma.haematobium and Schistosoma .mansoni among children, southern Sudan, Gockel-Blessing.second edition.2013. *Clinical Parasitology*.

Deribe et al. High prevalence of urinary schistosomiasis in two communities in South Darfur: implication for interventions. *Parasites & Vectors* 2011, 4:14

Http//www. Sudan.gov.sd, 2012

Lai, Y.S., et al., Spatial distribution of schistosomiasis and treatment needs in sub-Saharan Africa: a systematic review and geostatistical analysis. *Lancet Infect Dis*, 2015. 15(8): p. 927-40

Malik EM, Abdalla AH, Babiker AO, et al. Teachers-Centred Distribution of Praziquantel to Control Schistosomiasis in Gezira State, Sudan. *Public Health Open J*. 2016; 1(1): 8-11. Doi

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Monica Cheesbrough,Second Edition, (2009). District Laboratory Practice in Tropical Countries, Part-1.

Monican Cheesbrough,Second Edition, (2014). District Laboratory Practice in Tropical Countries, Part-1.

Mosab N M H, Esraa A S A, HalaAlaa H O, Duaa A E E, Arwa F M, et al. Prevalence of Urinary Schistosomiasis among School Aged Children in Khelawa Village, River Nile State, Sudan, 2017. Res Med Eng Sci. 3(2). RMES.000560. 2018

Mudathir AbdElRahman, Yousif Babikir AbuGedeiri, Abd ElAziz AbdElRahim, Prevalence of intestinal schistosomiasis in New Halfa scheme, Eastern Sudan. *Khartoum Medical Journal* (2010) Vol. 03, No. 02, pp. 448 – 451

Mtethiwa AHN, Nkwengulila G, Bakuza J, Sikawa D, Kazembe A. Extent of morbidity associated with schistosomiasis infection in Malawi: a review paper. Infect Dis Poverty. 2015;4:12.

Nausch N, Dawson EM, Midzi N, Mduluza T, Mutapi F, Doenhoff MJ. Field evaluation of a new antibody-based diagnostic Schistosoma haematobium and S. mansoni at the point-of-care in northeast Zimbabwe. BMC Infect Dis. 2014;14:165.

Nigus Abebe, Berhanu Erko, Girmay Medhin and Nega Berhe. Clinico -epidemiological study of Schistosomiasis mansoni in Waja-Timuga, District of Alamata, northern Ethiopia. Parasites & Vectors , 20147:158

Roberto Deganello, Mario Cruciani,Claudio Beltramello, Otine Duncan, Vincent Oyugi and Antonio Montresor. Schistosoma hematobium and S. mansoni among children, Southern Sudan. *Emerging Infectious Diseases* . www.cdc.gov/eid • Vol. 13, No. 10, October 2007

Robyn Y. Shimizu, Parasitology,section 9; Manual of clinical microbiology, Washington, D.C. : *ASM 6 Press*, 2007.

Rollinson, D . et al . Time to set the agenda for schistosomiasis elimination. *Acta Trop*. 128 . 423–440 (2013)

Salah ET and Elmadhoun WMY. Urinary Schistosomiasis in Gedarif: An endemic New Focus in Eastern Sudan ; *Sudan JMS* Vol. 9, No.3. Sept . 2014

Senghor B, Diallo A, Sylla SN, Doucouré S, Ndiath MO, Gaayeb L, et al. Prevalence and intensity of urinary schistosomiasis among school children in the district of Niakhar, region of Fatick, Senegal. *Parasit Vectors*. 2014;7:5.

Tamomh AG, Yousfi SR, Abakar AD, Nour BYM (2018) Prevalence of Intestinal Schistosomiasis among Basic School Children in White Nile Sugar Scheme a New

Vol. 2, No. 03; 2018

ISSN: 2581-3366

Irrigated Project, White Nile State, Sudan. Biol Med (Aligarh) 10: 425. doi:10.4172/0974-8369.1000425