

Acute intestinal schistosomiasis among school-aged children presented to King Abdullah Hospital, Bisha province, Saudi Arabia: A Case Series

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Abstract. Acute intestinal schistosomiasis is one of the clinical manifestations of infection with *S. mansoni* fluke. School aged-children are most at risk for this infection. To present cases of acute intestinal schistosomiasis among school-aged children attending the pediatric unit at King Abdullah Hospital, Bisha province, southwest of Saudi Arabia. This was a retrospective case study of nine school aged-children who were diagnosed with intestinal schistosomiasis in 2015. Data regarding clinical presentation, development of infections, diagnosis and management were recorded. Direct microscopical examination of stool sample for detection of *S. mansoni* egg's had been applied as a diagnostic tool. Laboratory findings were obtained to assess the severity of the infection. Nine children (7 boys and 2 girls) having acute intestinal schistosomiasis were reviewed. The age of the children were between six to 13 years old [mean 8.8 ± 2.17 years (SD)]. The duration of signs and symptoms prior to admission ranged from three to 21 days [mean 9.0 ± 5.8 days (SD)]. Most of the patients ($n=7$) presented with fever associated with abdominal pain followed by vomiting and cough. Four patients have a family history of intestinal schistosomiasis. Children had history of water contact for playing and swimming purposes. Infected children were treated with praziquantel (PZQ) oral dose of 20 mg/kg every eight hours for a day. None of the children presented late complications of schistosomiasis after three months follow up. The existence of intestinal schistosomiasis among school aged-children in Bisha suburb is alarming. The severity of the clinical manifestations of acute intestinal schistosomiasis were non-specific and varied that need of high expectation of physicians to diagnosis such disease. Obtaining of patients travelling history to endemic areas and visiting of infested water resources are necessary for detection of schistosomiasis cases.

INTRODUCTION

Intestinal schistosomiasis is a waterborne parasitic disease which, caused by *Schistosoma mansoni* fluke and disturbs a hundred millions of people worldwide (Aytaç and Sehitoğlu, 2012; Assaré *et al.*, 2016). Schistosomiasis is a neglected tropical

disease exerts a substantial public health problem in 54 tropical and subtropical countries, mainly in Africa and the eastern Mediterranean region (Enk *et al.*, 2008). Acute intestinal schistosomiasis or Katayama syndrome is one of the clinical manifestations of infection with *S. mansoni* (Jauréguiberry *et al.*, 2010). It occurs several

weeks after the cercariae penetrate human skin and presents a wide range of clinical signs and symptoms with varying intensities in the patients (Enk *et al.*, 2008; Jauréguiberry *et al.*, 2010).

The common factors contributing to intestinal schistosomiasis related to individuals contact with the parasite-contaminated water in their daily water related activities (WHO, 2016). School aged-children is one of the most risk groups of schistosomiasis, due to their lifestyle and certain play habits, such as swimming and fishing in infested water (Assefa *et al.*, 2013). Several studies have been documented that poor personal and environmental hygiene together with frequent water contact behaviors of schoolchildren render them more susceptible to schistosomiasis (Assefa *et al.*, 2013; Siza *et al.*, 2015). In school-aged group, the disease usually presents with generalized, non-specific signs and symptoms, makes it difficult to estimate the specific disease burden. Much of disease burden may progress from subtle manifestations such as anemia, abdominal pain and poor school performance to more severe, debilitating, and irreversible conditions such as growth stunting, reduction of physical fitness, impaired cognitive development, and increased susceptibility to co-infection, decreased quality of life, infertility, portal hypertension and liver failure (Samuels *et al.*, 2012).

In Saudi Arabia, the annual Saudi health reports recorded a significant decrease in the incidence of schistosomiasis, during a period of 2006 to 2011 because of sustainable control efforts (Al-Zanbagi *et al.*, 2015). Nevertheless, the incidence rate of schistosomiasis increased in the Bisha province from 0.148 in 2006 to 0.184 in 2011 (Al-Zanbagi *et al.*, 2015). Here, we presented a case series of acute intestinal schistosomiasis among school-aged children attending the pediatric units at King Abdullah Hospital, Bisha province, southwest of Saudi Arabia, complaining of various clinical manifestations.

MATERIALS AND METHODS

Setting

The study was carried out in Bisha province, located in the northern part of the Aseer region at south-west of Saudi Arabia. The climate in Bisha is a hot desert and temperatures typically range from 10 to 39°C. Approximately 240 villages extent out on both sides of the Bisha valley, the longest valley in the country, and there are about 58 urban centers for gatherings. The valley runs from Aseer heights on the south towards the north, crossing Bisha governorate along 250 kilometers, where a number of tributaries flow into it (Alhamid, 2004; Bisha, 2016). Season rainfall rate at the upper part of the valley is 600 mm and decreases to 270 mm in the middle of the valley and does not exceed 120 mm in Bisha area. King Fahad's Dam on Bisha valley, at a distance of 40 kilometers south of Bisha governorate is the largest dam in the country, constructed to support agricultural activities; flood control, water supply and groundwater recharge (Alhamid, 2004).

Study design and population

This was a retrospective case series of nine patients with intestinal schistosomiasis during a year of 2015. Schoolchildren those who attended to the pediatric unit at King Abdulla Hospital, in Bisha, were reviewed. All the patients are live in a suburb of Bisha city, namely AL-Aataf village, which situated 27 kilometers north of Bisha governorate.

Clinical and laboratory examinations

Data regarding clinical presentation, development of infections, diagnosis and management were reviewed. Direct microscopical examination of stool sample for detection of *S. mansoni* egg's had been applied as a standard diagnostic tool for intestinal schistosomiasis as previously described (WHO, 1991). Then biochemical and hematological investigations were obtained to assess the severity of schistosomae infection. In addition, culture of stool examined for possible enteropathogenic bacteria.

RESULTS

Nine Saudi children (7 boys and 2 girls) admitted to King Abdullah Hospital were reviewed. All the patients were living in Bisha suburb. The ages of the children were between six to 13 years [mean 8.8±2.17 years (SD)]. The duration of signs and symptoms prior admission ranged from three to 21 days [mean 9.0 ± 5.8 days (SD)].

Table 1 showed the frequency of different clinical manifestations associated with acute intestinal schistosomiasis. Most of the patients (n=7) presented with fever associated with abdominal pain, followed by the vomiting and cough complains.

Table 2 summarized the clinical and laboratory features of nine cases with acute intestinal schistosomiasis. As shown in Table 2, four patients (case 4,5,6 & 9) had a family history of intestinal schistosomiasis. All the children were reported history of water contact for playing and swimming purposes. *S. mansoni* eggs had detected in all stool samples of the patients via direct microscopical examination. Most of the cases reported high White Blood Count (WBC) (Normal reference: WBC <10,800 mm³) with hyper-eosinophilia (Normal reference 0.0–6.0%).

Each schistosomiasis case was treated with standard dose of oral praziquantel (PZQ) tabs according to our hospital policy as followed: 20 mg/kg of body weight, every eight hours for one day. All the children have been followed up every one or two weeks until three months. Stool samples were examined microscopically for the presence of infection during each visit. After three months of follow up, none of the children presented symptoms or complication of the disease and they received another single oral dose of PZQ tabs (20 mg/kg of body weight) as to improve treatment outcomes.

Case 1

A six year-old girl presented to the pediatric emergency unit of King Abdullah Hospital with a history of fever for the last 9 days. The fever associated with mild cough, abdominal pain, loose motion, vomiting and bloody diarrhea with mucus. On examinations, the child looked unwell, febrile, but well hydrated, not in distress and no jaundice or pallor observed. Systemic examinations of the child revealed that there were no abnormality on the abdomen, chest and cardiovascular system (CVS). Hematological investigations were normal with hyper-eosinophilia (27%). Liver enzymes markedly

Table 1. The frequency of common clinical manifestations associated with acute intestinal schistosomiasis among school-aged children (n=9) attending King Abdullah Hospital, Bisha, KSA

Sign and symptoms	Schistosomiasis cases (n=9)
	Number (%)
Fever	7 (78)
Abdominal pain	7 (78)
Vomiting	4 (44)
Cough	3 (33)
Diarrhea with blood and mucus	3 (33)
Loose motion	2 (22)
Distended abdomen	2 (22)
Watery diarrhea	1 (11)
micturition	1 (11)
Liver tender	1 (11)

Table 2. Summary of clinical and laboratory features of nine cases diagnosed with acute intestinal schistosomiasis admitted to King Abdullah Hospital, Bisha, KSA

Parameter	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
Gender	Girl	Boy	Girl	Boy	Boy	Boy	Boy	Boy	Boy
Age	6 years	9 years	8 years	9 years	8 years	13 years	10 years	10 years	6 years
Weight	17.5 kg	21.0 kg	17.9 kg	22.5 kg	22.5 kg	36.0 kg	37.5 kg	30.0 kg	16.0 kg
Symptoms	Fever (38.6°C), abdominal pain, vomiting, bloody diarrhea, cough	Fever (39.6°C), abdominal pain, dry cough	Fever (38.3°C), abdominal pain, diarrhea with mucus and blood	Fever (39.5°C) & micturition, distended abdomen and liver 4-6 cm tender,	Fever (38.6°C), abdominal pain	Fever (38.9°C), central abdominal pain, cough	Fever (37.6°C) Loose motion with mucus and blood, vomiting and tenesmus	Abdominal pain, (37.3°C) bloody diarrhea with mucus	Fever (38.9°C), abdominal pain
Duration	9 days	7 days	10 days	3 days	3 days	21 days	10 days	4 days	14 days
Family History of Schistosomiasis	No	No	No	Yes	Yes	Yes	No	No	Yes
History of Water contact	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hematological Examinations									
WBC X 10	8.2	24.3	6.26	16.4	11.6	14.1	16.4	11.5	34.6
Eosinophil	27%	65%	7.7%	6.0%	20%	45%	45%	35%	18%
ESR	47	110	56	85	43	85	50	55	135
Platelets	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Biochemical Tests									
ALT	125	216	29	39	113	67	54	32	139
AST	66	179	31	55	53	30	35	21	156
Other parasitic infections	-	-	-	-	<i>E. histolytica</i>	-	<i>E. histolytica</i>	-	-
Culture for entero-pathogens	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative

increased with the following figures: alanine aminotransferase (ALT) of 125 IU/L, aspartate aminotransferase (AST) of 66 IU/L. The child treated initially during admission as bacterial gastroenteritis started with intravenous fluid (IVF) (potassium chloride), omeprazole, metronidazole and third generation cephalosporin. Direct microscopic examination of stool revealed ovum's of *S. mansoni* confirming diagnosis of intestinal schistosomiasis. Then an oral PZQ dose was administered as 350 mg, every eight hours for a day. Following completion of the administered treatments, the child feeling well and the symptoms was disappeared. He had been followed up in the pediatric clinic after one week with no complains. Microscopical examination of stool sample was free from ova of *S. mansoni*.

Case 2

A nine year-old boy presented to our pediatric emergency unit of King Abdullah Hospital complaining of fever associated with a dry cough and abdominal pain for one week. The child was referred from the primary health care center where he was diagnosed with *S. mansoni* infection. On examination, he looked unwell, febrile but not jaundiced or cyanosed. The child reported a positive family history of intestinal schistosomiasis. There were no significant findings found on systemic examinations. Laboratory investigations showed marked increasing in WBCs count (24,300 mm³), eosinophil (65%), ESR was 110 mm/hr and elevated values of liver enzymes (ALT, 216 IU/L; AST, 179 IU/L). His stool examination detected the presence of *S. mansoni* eggs, therefore, the child was treated with PZQ tabs; 420 mg/every 8 hours for one day. He was discharged from the hospital after two days feeling well. The child was followed up in the pediatric clinic after two weeks complaint of mild abdominal pain, but microscopical examination of stool samples were free from any parasitic infections.

Case 3

An eight year-old girl presented to the pediatric emergency unit with a history of

fever for 10 days. The fever associated with abdominal pain and diarrhea containing blood without mucus. There was no previous history of admission or similar condition for such medical illness. On physical examinations, the child looked well, febrile, well hydrated and not jaundiced or cyanosed. Systemic examination showed normal signs of the abdomen, CVS and chest. Blood biochemistry and hematological examinations did not reveal any increasing values of the investigated items. In direct stool microscopy, ova of *S. mansoni* were detected. Intestinal schistosomiasis appropriately treated with three therapeutic doses of oral PZQ (360/8hrs/a day). The child was hospitalized for two days and then discharged in a good condition. After two weeks, he was being followed up in pediatric clinic feeling well and repeated stool analysis was free of *S. mansoni* eggs.

Case 4

A nine year-old boy was admitted to King Abdulla Hospital and had been diagnosed and managed as an intestinal schistosomiasis case. After five days, the child was presented to our pediatric clinic complaining of persistent mild fever associated with burning micturition since the previous last three days. Upon admission, he started to develop abdominal pain, and vomiting of blood. On examination, the child was found to be febrile, looked unwell, slightly pale, but not dehydrated and not jaundiced or cyanosed. Systemic examinations revealed distended abdomen and liver 4-6 cm tender, while chest clear, CVS and central nervous system were normal. Hematological findings reported decreased value of haemoglobin concentration (Hb, 9.8 gm/dl) with elevated counts of WBC, while other figures were normal. Repeated stool sample confirmed the presence of *S. mansoni* eggs. The child was admitted to the hospital for three days to continue his medication with repeated oral doses of PZQ tabs (20 mg/kg of weight/3 times per a day). He discharged from the hospital feeling well and all the symptoms disappeared. After two weeks, stool analysis was free from the infection and patient completely cured.

Case 5

An eight year-old boy was admitted to the hospital with a three-day history of fever associated with abdominal pain and diarrhea with blood and mucus. The boy had a family history of intestinal schistosomiasis. On examination, the patient looked febrile, but well hydrated and not jaundiced or cyanosed. Systemic examination showed no abnormality signs on CVS, chest and abdomen. Laboratory findings revealed the following figures: Hb of 12.0 gm/dl; WBC of 11,600 mm³; eosinophil of 20% for blood count. Biochemical examinations showed high values of ALT (113 IU/L) and AST (53 IU/L). Microscopical examination of stool revealed two types of parasites; ova of *S. mansoni* and *Entamoeba histolytica* cysts and trophozoites. On the admission, the patient was treated with PZQ at divided three oral doses of 20 mg/kg of weight body for one day. Signs and symptoms of the disease resolved after three days of hospitalization. The child was discharged from the hospital to continue his medication with metronidazole 500 mg taken three times a day for one week and the patient complications were completely disappearing at follow up.

Case 6

A 13 year-old boy was referred from a primary health care center to King Abdullah Hospital complaining of febrile illness for 21 days. The fever associated with a dry cough and central abdominal pain. The boy has reported a positive family history of intestinal schistosomiasis. On examinations, the child looked fit, well hydrated and not jaundiced or cyanosed. Systemic examination of chest, CVS, abdomen and the CNS were normal. Laboratory findings revealed a high count of WBC (14,100 mm³) with eosinophilia (45%), Hb was 11.7 gm/dl, ESR was elevated (85 mm/h), whereas liver enzymes were within the normal ranges. Routine stool analysis showed ova of *S. mansoni*. The child received during his admission oral PZQ tabs (20 mg/kg of body weight) in a single day divided into three doses. He discharged from the hospital feeling well and to be continued with similar doses of PZQ for one

day. At follow up, all symptoms of the disease were disappeared from the child and his physical and laboratory examinations were normal.

Case 7

A ten year-old boy was admitted to King Abdullah Hospital with ten days history of loose motion 4-5 times/day with mucus and blood which, associated with tenesmus and vomiting. The boy had a positive history of swimming stagnant pond and similar illness in his siblings. On admission, the child looked unwell febrile, mild dehydrated, but not jaundiced or cyanosed. Systemic examination revealed soft abdomen, chest is a good air entry, CVS and CNS were normal. Initially the child had been managed as a case of acute gastroenteritis. Laboratory analysis revealed a high count of WBC (16,400 mm³) with eosinophilia (54%). Stool microscopy detected trophozoites and cyst of *E. histolytica* and ova of *S. mansoni*, confirming the presence of intestinal schistosomiasis and a amoebic dysentery. During admission, the child was treated with IVF of omeprazole, metronidazole and cefotaxime. Then a course of PZQ tabs was given orally in three divided doses for a single day (20 mg/kg of body weight). After 3 days of hospitalization the child was discharged in a good condition. The child advised to continue on oral metronidazole (35 mg/kg) every 8 hours for one week and was being followed after two weeks in pediatric clinic. Upon completion of the doses the child felt well and diseases complains disappeared.

Case 8

A ten year-old boy was admitted to King Abdullah Hospital with four days history of fever and abdominal pain associated with mucoid bloody stool. The child admitted at the previous week as an intestinal schistosomiasis case and discharged after three days of hospitalization. On examinations the boy looked unwell febrile but well hydrated and not jaundiced or cyanosed. Abdomen revealed tendered epigastrium, distended abdomen, but other systems were normal. Laboratory findings showed a high WBC count (18,100 mm³) with hyper-

eosinophilia (37%). Microscopical examination of stool revealed ova of *S. monsoni* and *E. histolytica* trophozoites'. The standard divided three doses of PZQ (600 mg) for a day administered to the child. In addition, he was also treated with metronidazole (IV) and cefotaxime. The child discharged after 5 days felt well and in a good condition. In the subsequent two weeks, all the complications were resolved and repeated stool examinations were free from ova of *S. mansoni*.

Case 9

A six year-old boy presented to our pediatric clinic with a history of fever for two weeks. The fever associated with abdominal pain of mild intensity without vomiting or diarrhea. One of the child's family member was diagnosed with intestinal schistosomiasis. On examination, the child looked unwell, febrile but well hydrated and not pale or jaundiced. Clinical examinations revealed mild tenderness of the abdomen, but no sign of distention or organomegaly, chest showed good air entry bilateral, no crackles or rhonchi. Laboratory findings showed a high count of WBC (34,600 mm³), eosinophil (18%) and ESR (135 mm/hr). In addition, high values of liver enzymes. Intestinal schistosomiasis diagnosed based on the presences of *S. mansoni* egg in stool samples. The child successfully treated with PZQ 450 mg/kg per day in divided doses for 3 days and discharged in a good condition. He had been followed up after two weeks and found to be free of signs and symptoms, and routine stool examinations were normal.

DISCUSSION

Schistosomiasis is next to malaria as the most devastating parasitic disease in the tropical and subtropical parts of the world with respect to its impact on public health and socioeconomic development (Assefa *et al.*, 2013; Almeida *et al.*, 2016). The disease can cause severe damage to various organs, mostly intestine, liver, brain and spinal cord. It also, causes significant morbidity, impairs childhood development and adult

productivity (Almeida *et al.*, 2016). We presented here a series of nine cases of acute intestinal schistosomiasis among children attending King Abdullah Hospital at Bisha province, south-west of Saudi Arabia. In medical literature, it has been noted that the acute form of schistosomiasis is a severe illness that normally associated with generalized, non-specific sign and symptoms (Siza *et al.*, 2015). This was a true as we presented here, we found that all cases were presented with various clinical manifestations (Table 1). The clinical manifestations of acute schistosomiasis can occur within 2-12 weeks of exposure to cercariae-infested water (Alam *et al.*, 2008). These may include abdominal pain, fever, chills, weakness, weight loss, headache, nausea, vomiting and diarrhea with bloody stool, elevated liver enzymes, and restrictive respiratory insufficiency (Alam *et al.*, 2008; Enk *et al.*, 2008). In advanced cases, hepatosplenomegaly is common and is repeatedly associated with ascites and other signs of portal hypertension (Sady *et al.*, 2013). The severity of clinical manifestation varies according to the cercarial burden and the individual's immune response (Enk *et al.*, 2008; Jauréguiberry *et al.*, 2010). Therefore, the diagnosis of infection strongly depends on the clinician's suspicion and awareness of the disease as a possible differential diagnosis (Aytaç and Sehitoglu, 2012). However, early diagnosis and treatment of the infection results in complete cure without any complication (Almeida *et al.*, 2016).

To the best our knowledge, this is a first a case series of intestinal schistosomiasis reported among schoolchildren in Bisha suburbs. It has been observed that the highest proportion of *S. mansoni* infections are commonly found among school-aged children's group and in recognition of these schoolchildren is the main target of schistosomiasis control programs (Ibrahim and Ibrahim, 2014). The excessive mobility of children at this age and they may become more exposed to contaminated fresh water while swimming/playing or fetching water for domestic purposes have been demonstrated as a risk factor of infection (Sady *et al.*, 2013).

Likewise, Assefa *et al.* (2013) explained that poor personal and environmental hygiene coupled with frequent water contact behaviors of school age children are reported to render them more vulnerable to schistosomiasis. Therefore, identification of factors affecting transmission of the infection is a key in controlling the disease among the children.

In our case series, the origin of the disease transmission was not clear whether acquired elsewhere or due to climate and ecological changes related to water resource development projects in Bisha area. However, water resources that colonized by *Schistosoma* snails and the notified schistosomiasis cases have been determent in different parts of the country, including Bisha area (Al-Zanbagi, 2015). Noteworthy, we observed that Saudi families were enjoying to visits water resources such as lakes, streams, springs and ponds, which w a perfect place for outing during school vacations and holidays. Moreover, a considerable travelling of families for the visit and relaxation had been noted during summer vacation to the neighboring endemic countries (Elbaz and Esmat, 2013; Sady *et al.*, 2013). In medical literature, the water point and the history of visiting the lake had been determined as significant risk factors for schistosomal infection (Ruganuza *et al.*, 2015). Aytac and Sehitoğlu, (2012) have mentioned that the disease should be suspected, especially if there was a history of a travel and movement to an endemic area and drinking or bathing in fresh water in such places. Thus, the infection should expected among those travelers who are present with non-specific signs such as fever, cough, abdominal pain, headache and urticaria (Jauréguiberry *et al.*, 2010).

In this series, four cases had reported a family history of *S. mansoni* infection. Sady *et al.* (2013) have explained that although the disease was not directly transmitted from human-to-human, but members of a same family may share their activities at water sources such as playing, swimming and washing and therefore, they have similar exposure to the source of infection. Furthermore, an infected family member may

contract the disease and then contribute to its transmission at the open water sources nearby where other family members may also use (Assefa *et al.*, 2013).

A definite diagnosis of the intestinal schistosomiasis depends on certain tools as microscopical identification of *S. mansoni* eggs, serology and radiologic findings. Other non-specific findings include eosinophilia (in relation to stage, intensity and duration of infection), thrombocytopenia (from splenic sequestration) and anemia (from chronic blood loss) (Elbaz and Esmat, 2013). It has well known that hyper-eosinophilia frequently occurs during acute stage of schistosomiasis (Enk *et al.*, 2008). A study had been documented at the onset of eosinophilia is delayed as compared with the onset of symptoms of the disease. Nevertheless, the absence of eosinophilia did not rule out the diagnosis of acute schistosomiasis (de Jesus *et al.*, 2002).

Proper control of intestinal schistosomiasis can be through targeted treatment of high risk groups using PZQ combined with public education (WHO, 2016). Praziquantel is currently the drug of choice of acute schistosomiasis, considering the lower cost/treatment (Nunes *et al.*, 2013). The recommended dose is 40-60mg/kg for children up to 15 years, given in single or divided doses (Aytac and Sehitoğlu, 2012). In the routine clinical practice, PZQ treatment should be administered to the patients only when the infection proven by the presence of viable *S. mansoni* eggs in the stool (Enk *et al.*, 2008). In the cases presented here, treatment with a PZQ at divided three oral doses of 20 mg/kg of weight body for a day resulted in cure in the acute phases of intestinal schistosomiasis infection. A study showed that the usage of PZQ for acute schistosomiasis giving high healing rates of 60 to 90% in endemic areas and approximately 100% in non-endemic areas (Nunes *et al.*, 2013). Furthermore, it has been observed that PZQ course is safe and effective for chronic schistosomiasis with a single oral dose of 40–60 mg/kg bodyweight and producing cure rates ranging between 60% and 90% (Elbaz and Esmat, 2013).

In conclusion, in spite of the great effort and success of the national schistosomiasis control program in Saudi Arabia (Al-Zanbagi, 2015) the existence of intestinal schistosomiasis among school age children in Bisha suburb is alarming in this local community. The severity of acute schistosomiasis signs and symptoms are varied and nonspecific that need of high expectation and awareness of physicians to diagnose such disease. Travelling to endemic regions and visiting of infested water resources might lead to outline of schistosomiasis in our area. Therefore, it is necessary to obtain a careful travel history of suspected patients, including drinking water sources and other activities such as swimming and playing. However, educational awareness can be highly effective to control schistosomiasis.

Competing interests

The authors declared no competing interests.

REFERENCES

- Alam, K., Maheshwari, V., Jain, A., Siddiqui, F., Haq, M., Prasad, S. & Hasan, A. (2008). Schistosomiasis: A Case Series, With Review Of Literature. *The Internet Journal of Infectious Diseases* **7**: 1-7.
- Alhamid, A.A. (2004). Dams in KSA. Extracted from Achievements of the custodian of the two holy mosques in water sector, PSIPW, 2004, Riyadh, Ch 5, achievements in water resources development using dams. Available from: faculty.ksu.edu.sa/alhamid/.../DAMS%20in%20KSA-alhamid.pdf. [Assessed on 30, August 2016].
- Al-Zanbagi, N.A. (2015). Review of Bilharzia in Saudi Arabia, Health Reports and Solutions. *International Journal of Sciences: Basic and Applied Research* **22**: 414-427.
- Assaré, R.K., Tian-Bi, Y.N., Yao, P.K., N'Guessan, N.A., Ouattara, M., Yapi, A., Coulibaly, J.T., Meité, A., Hürlimann, E., Knopp, S., Utzinger, J. & N'Goran, E.K. (2016). Sustaining Control of Schistosomiasis Mansonii in Western Côte d'Ivoire: Results from a SCORE Study, One Year after Initial Praziquantel Administration. *PLOS Neglected Tropical Diseases* **10**: e0004329.
- Assefa, A., Dejenie, T. & Tomass, Z. (2013). Infection prevalence of *Schistosoma mansoni* and associated risk factors among schoolchildren in suburbs of Mekelle city, Tigray, Northern Ethiopia. *Momona Ethiopian Journal of Science* **5**: 174-188.
- Aytaç, B. & Sehitoglu, I. (2012). A rare parasitic infection in Turkey: schistosomiasis. Case report. *Turkish Journal of Pathology* **28**: 175-177.
- Bisha, World Public Library. (2016). Available from: www.worldlibrary.org/articles/bisha [Accessed January, 12 2016].
- de Jesus, A.R., Silva, A., Santana, L.B., Magalhães, A., de Jesus, A.A., de Almeida, R.P., Rêgo, M.A., Burattini, M.N., Pearce, E.J. & Carvalho, E.M. (2002). Clinical and immunologic evaluation of 31 patients with acute schistosomiasis mansoni. *The Journal of Infectious Diseases* **185**: 98-105.
- Elbaz, T. & Esmat, G. (2013). Hepatic and intestinal schistosomiasis: review. *Journal of Advanced Research* **4**: 445-52.
- Enk, M.J., Katz, N., Zech Coelho, P. M. (2008). A case of *Schistosoma mansoni* infection treated during the prepatent period. *Nature Clinical Practice Gastroenterology & Hepatology* **5**: 112-115.
- Ibrahim, A.M. & Ibrahim, M.E. (2014). Evaluation of microscopical and serological techniques in the diagnosis of *Schistosoma mansoni* infection at Sennar State, Central Sudan. *Asian Pacific Journal of Tropical Diseases* **4**: 8-13.
- Jauréguiberry, S., Paris, L. & Caumes, E. (2010). Acute schistosomiasis, a diagnostic and therapeutic challenge. *Clinical Microbiology and Infection* **16**: 225-231.

- Nunes, K.M., Cardoso, A.E., Pereira, Fde S., Batista, L.H. & Houly, R.L. (2013). Ectopic cutaneous schistosomiasis – case report. *Anais Brasileiros de Dermatologia* **88**: 969-972.
- Pinto-Almeida, A., Mendes, T., de Oliveira, R.N., Corrêa, Sde A., Allegretti, S.M., Belo, S., Tomás, A., Anibal, Fde F., Carrilho, E. & Afonso, A. (2016). Morphological Characteristics of *Schistosoma mansoni* PZQ-Resistant and - Susceptible Strains Are Different in Presence of Praziquantel. *Frontier in Microbiology* **7**: 594.
- Ruganuza, D.M., Mazigo, H.D., Waihenya, R., Morona, D. & Mkoji, G.M. (2015). *Schistosoma mansoni* among pre-school children in Musozi village, Ukerewe Island, North-Western-Tanzania: prevalence and associated risk factors. *Parasites & Vectors* **8**: 377.
- Sady, H., Al-Mekhlafi, H.M., Mahdy, M.A., Lim, Y.A., Mahmud, R. & Surin, J. (2013). Prevalence and associated factors of Schistosomiasis among children in Yemen: implications for an effective control programme. *PLOS Neglected Tropical Diseases* **7**: e2377.
- Samuels, A.M., Matey, E., Mwinzi, P.N., Wiegand, R.E., Muchiri, G., Ireri, E., Hyde, M., Montgomery, S.P., Karanja, D.M. & Secor, W.E. *Schistosoma mansoni* morbidity among school-aged children: a SCORE project in Kenya. *The American Journal of Tropical Medicine and Hygiene* **87**: 874-882.
- Siza, J.E., Kaatano, G.M., Chai, J.Y., Eom, K.S., Rim, H.J., Yong, T.S., Min, D.Y., Chang, S.Y., Ko, Y. & Chungalucha, J.M. (2015). Prevalence of Schistosomes and Soil-Transmitted Helminths among School-children in Lake Victoria Basin, Tanzania. *The Korean Journal of Parasitology* **53**: 515-524.
- World Health Organization (1991). Basic Laboratory Methods in Medical Parasitology. World Health Organization, Geneva.
- World Health Organization (WHO), (2016). Schistosomiasis Fact sheet. Available from: www.who.int/mediacentre/factsheets/fs115/en/. [Assessed on: 16, September, 2016].