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RESEARCH ARTICLE

PREVALENCE OF SCHISTOSOMIASIS *MANSONI* AMONG SCHOOL CHILDREN IN KAFR EL SHEIKH GOVERNORATE (KAFR EL SHEIKH DISTRICT)

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ABSTRACT

Objective: This studyis aimed to estimate the rate of schistosomiasis *mansoni* among basic school children in Kafr Elsheikh governorate (Kafr Elsheikh district) to determine the magnitude of the problem for prevention and control programs.

Background: The study area was in Kafr Elsheikh Governorate, uppermost part of the Nile Delta 120 - 210 km north of Cairo. Kafr Elsheikh district is a model for rural Egypt depending on the water of the Nile for its agricultural output. Kafr Elsheikh Governorate has the highest schistosomiasis prevalence in Egypt.

Patients and methods: In this study, a multistage random sample of one thousand children at school age (6-15 years) was selected randomly from three primary and three preparatory schools in the study area Kafr Elsheikh district. Data was collected about name, age and sex. General examination was done for them, urine and stool samples were collected for microscopic examination for schistosomiasis. Weight, height, body mass index, hemoglobin and IQ assessment were done for positive cases only.

Results: The rate of schistosomiasis between children in Kafr El Sheikh District is 0.4%. All positive cases were *Schistosoma mansoni.* A highly significant positive correlation between male sex and increasing the prevalence of schistosomiasis (-P value =0.02-). Positive correlation between primary school age and rural residence and increasing the prevalence of schistosomiasis (-P value= 0.03-) for primary school age and (-P value = 0.04-) for rural residence. 100% of the positive cases were male, within primary school age and with rural residence.

Conclusion: The rate of schistosomiasis between children in Kafr Elsheikh Governorate, Kafr Elsheikh district is high rising an alarm that schitosomiasis remains one of the most public health problems between children in rural Egypt. There was predominance of *Schistosoma mansoni*, males-, primary school age group and rural residence among positive cases.

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INTRODUCTION

Schistosomiasis is a primarily tropical parasitic disease caused by trematode from the genus *Schistosoma* (Toure *et al*., 2008). The worm was discovered in 1851 in The Kasr El AIni hospital, cairo, Egypt by Theodor Bilharz from him the disease took its original name bilharziasis (WHO 1985). Schisosomiasis is the second most common parasitic infection of humans after malaria worldwide, approximately 200 million people are infected globally in 76 countries and about 600 million are exposed to infection in tropical and subtropical regions of Africa, Asia, America and The Caribbean. The causative agent is a blood fluke of the genus *Schistosoma*.

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There are five species capable of parasitizing humans : *Schistosoma haematobium, Schistosoma mansoni, Schistosoma, japonicum, Schistosoma mekongi and Schistosoma intercalatum* (Davis, 2009; Gryseels *et al*., 2006).

In Egypt, the two species of bilharziasis are *Schistosoma mansoni* and *Schistosoma haematobium* whose intermediate hosts are fresh snails *Biomphalari alexandra*, and *Bulinus trancatus* respectively (WHO 1985). In 1937, Scott reported on the prevalence of schistosomiasis in 100 Egyptian Villages. At that time, *Schistosoma haematobium* infestations were common, while *Schistosoma mansoni* infestations were rare in the Nile delta (Scott, 1937). Since 1977 this pattern of schistosomiasis in Egypt changed as the prevalence of *Schistosoma mansoni* infestation increased and of *Schistosoma haematobium* decreased. This change has important public

health implications, because the hepatosplenic schistosomiasis caused by *Schistosoma mansoni* is more difficult to trace and is associated with more morbidity and mortality that the urinary schistosomiasis caused by *Schistosoma haematobium*. That striking change in the geographical distribution of the two species of *Schistosoma* has been since the construction of Aswan High Dam (Abdel-Wahab *et al*., 1980; Abdel-Wahab *et al*., 1979).

A person can become infected by prolonged contact with freshwater containing free swimming cercariae, the infective stage of the parasite that then enters the subcutaneous tissues, then the blood stream, migrates to the lungs, then to the liver, and finally to the mesenteric and perivesical venous plexuses. The parasite is excreted from the body via urine and faeces into freshwater and the miracidia eventually infects its intermediate hosts, the freshwater snails, where they develop into cercariae and the unfortunate cycle restarts again (Paul *et al*., 2002).

Schistosomiasis is asymptomatic in up to 80% of those infected, with tiredness being the most common symptom. Disease syndromes associated with schistosomiasis include cercarial dermatitis, larval pneumonitis, acute schistosomiasis (Katayama fever), chronic schistosomiasis and ectopic schistosomiasis (Bierman *et al*., 2005; Bica *et al*., 2000). In 90% of infected individuals, the egg associated inflammation recedes, resulting in intestinal schistosomiasis. In contrast, 10% of infected individuals present with severe hepatic and periportal fibrosis, portal hypertension). Bleeding from gastro-oesophageal varices is the most serious, commonly fatal, complication of fibrotic hepatic schistosomiasis (Henderson *et al*., 1993; Gryseels *et al*., 2006). Its specific diagnosis can be made by microscopic examination of urine and stool for viable eggs, also by ELISA IgG tesing and histopathology of the colon, bladder, lung for *Schistosoma* eggs (Chisel *et al*., 2004).

There have been great advances in chemotherapy of schistosomiasis during the past 2 decades. Compared to antimonials, which were the only available chemotherapeutic agents for schistosomiasis from the 1920s to the 1960s, new drugs are more consistently effective, less toxic and applicable to oral rather than parenteral administration, thereby making field trials of mass chemotherapy feasible. The major antischistosomal drugs that have been or still are in use against infestation with schistosomes are metrifonate, oxamniquine and praziquantel and all three are included in the World Health Organization list of essential drugs (Cioli *et al*., 1993).

The complexity of the schistosome and the life cycle of this parasite may, at least partly, contribute to the difficulties associated with vaccine development (Bergquist, 1995; Capron *et al*., 2002). Egypt which depends on the water of the Nile for nearly all of its agricultural output, has the highest aschistosomisis rates in the world its prevalence in Egypt was 0.6% (Farley and Bilharzia, 1991; MOHP 2009).

Patients and Methods

In this study, a multistage random sample of 1000 child of school age (6-15 years) was selected randomly from three primary and three preparatory schools (in a rural area Kafr El Sheikh District). Data were collected through a predesigned questionnaire including data of name, age and sex and school performance. Urine and stool samples were collected for laboratory investigation for schistosomiasis by microscopic examination.

Rapid general examination including abdominal, cardiac and chest was done for all the children, also weight, height and body mass index were assessed for the positive cases.

Urine and stool examination were done for all the children also, hemoglobin and IQ (Raiford *et al*., 2005) were assessed for the positive cases.

Laboratory diagnosis by microscopic examination

The laboratory diagnosis of schistosomiasis was based mainly on the detection of parasite eggs in stool samples through the Kato-Katz (KK) technique, in low endemic areas we would need to increase sensitivity, we would conduct further slide readings from the same stool sample using the parasitological method associated with a serological test. We would use the KK method (three slides) and the IgG anti-*Schistosoma mansoni*–enzyme-linked immunosorbent assay (ELISA) technique to diagnose schistosomiasis (Carneiro *et al*., 2012). The Kato technique is now most commonly used for detecting schistosome eggs (Cheesbrough, 1998). Both urine and stool samples were taken to the laboratory, processed, and examined immediately for *Schistosoma* eggs, as it is rapid, easy, cheap, available and accepted test (Gray *et al*., 2011).

Urinary examination of schistosomiasis

The specimens were collected when the chance of finding eggs was the highest (between 10 a.m. and 2 p.m.). We used two main methods for the detection of *Schistosoma haematobium* eggs (Bahbah and El Shikhsalem, 2014)

1. Sedimentation: We allowed the fresh urine sample to sediment for 1 h, then centrifugation for not more than 2 min at 2000g.-was performed, and then the sediment was examined for the presence of ova.
2. Filtration: We placed a polycarbonate or a nylon fiber filter (12-20 mm pore size) in a filter holder, agitated the urine, and filled a syringe (10-20 ml). The filter holder was attached and the urine was expelled. The filter was removed with forceps on a microscopic slide. The entire filter was examined for eggs after staining with Lugol's iodine.

We used the Kato Katz technique for the detection of *Schistosoma mansoni* eggs in stool (Gray *et al*., 2011).

Materials

1. Kato set (template with hole, screen, plastic spatula).
2. Microscopic slides.
3. Cellophane as a cover strip, soaked in a glycerol-malachite green solution.
4. Fresh stool.
5. Gloves.

Methods

The Kato technique is now most commonly used for detecting schistosome eggs (Cheesbrough, 1998).

1. The template with a hole was placed in the center of a microscopic slide.
2. The screen was pressed on top so that some of the feces filtered through and scraped with the flat spatula across the upper surface to collect the filtered feces.
3. The template was removed carefully.
4. The fecal material was covered with the presoaked cellophane strip.
5. The microscope slide was inverted and the fecal sample was firmly pressed against the cellophane strip on a smooth hard surface such as a tile and the material was spread evenly.
6. The smear was examined in a systematic manner and the eggs were reported (Joachim and Niklaus, 2002).

RESULTS

Among the studied group 527 child were males (52.7 %) and 473 child were females (47.3 %) Table (1). The results showed that 4 children were infected (0.4 %), all of them were infected with *Schistosoma mansoni* and no *Schistosoma haematobium* was detected among the studied group Table (2). Those infected were all males (100%) and no females (0 %) with significant difference relation between sex & *Schistosoma* infection among studied group ((P value = 0.03) Table(3). The results showed that (70.2%) of children aged (6-11) years and (29.8%) of children aged (12-15) years. Table (1), all positive cases were in (6- 11) years group thus we found that there is significant difference relation between primary and preparatory age group & shistosoma infection among studied group (P value=0.02) Table (3).

Table 1. Number & percentage distribution of age group and sex among studied group

	Studied group	
	NO	%
Age in years		
6-11	702	70.2
12-15	298	29.8
Sex		
Male	527	52.7
Female	473	47.3
Total group	1000	100

This table shows that (70.2%) of children aged (6-11) years and (29.8%) of children aged (12-15) years and shows that females represent (47.3%) of studied group where males represent (52.7%)

Table 2. Prevalence of *Schistosoma mansoni* & *Schistosoma haematobium* among studied group

Schistosoma	(stool+ve) for schistosomiasis		(stool-ve) for schistosomiasis		Total group	
	NO	%	NO	%	NO	%
Schistosoma mansoni	4	0.4	996	99.6	1000	100
Schistosoma haematobium	0	0	1000	100	1000	00

This table shows that the Prevalence of *Schistosoma mansoni* among studied group is (0.4%).

In our study children with rural and urban residence were 500 (50 %), all positive cases were having rural residence with significant difference between children with & without schistosomiasis regarding residence (P value = 0.04) Table (3). In our study for the four positive cases we found that, the four cases were males in primary school age group (6-11) years (Table 4). Cases no. (1,2 and 4) are +1 SD regarding weight, height and BMI, While case no. 2 is +2 SD regarding weight and height and +1 SD regarding BMI (Table 4).

Regarding Hemoglobin level, cases no. (1,2 and four) are less than 11 gm., while case no. 3 is 12 gm (Table 4). In their stool analysis, Cases no. (1,2 and 4) are having different positive findings as protozoal or parasitic infestations, but case no. 3 has free analysis (Table 4). Regarding IQ studing, cases no. (1 and 2) scores were between (90-105). Case 3 is beteen (105-115), while case 4 is lying between (80- 90) (Table 4). Urine analysis for all the children was negative.

Table 3. Factors affecting prevalence of schistosomiasis among studied group

Factors	(stool+ve) for schistosomiasis		(stool-ve) for schistosomiasis		Total group		X2	P-value
	NO	%	NO	%	NO	%		
1)Age group								
6-11years	4	0.6	698	99.4	702	100	7.1	0.02
12-15 years	0	0.0	298	100	298	100		
2)Sex								
Male	4	0.8	523	99,2	527	100	7.6	0.03
Female	0	0.2	473	100	473	100		
3)Residence								
Rural	4	0.8	496	98.2	500	100	4.1	0.04
Urban	0	0.0	500	100	500	100		

*= P value < 0.05 = significant , P value >0.05 = non significant

*Prevalence of schistosomiasis is significantly higher among males than females (P-value < 0.05).

*Prevalence of schistosomiasis is significantly higher among 6- 11 years group than 12- 15 years (P-value < 0.05).

*Prevalence of schistosomiasis is significantly higher among rural residence than urban residence (P-value < 0.05).

Table 4. Descriptive analysis of the positive cases

	Case 1	Case 2	Case 3	Case 4
Sex	Male	Male	Male	Male
Age	6 years	6 years	7 years	8 years
Weight	21.5 kg	23 kg	26.5 kg	28 kg
SD	+1	+1	+2	+1
Height	118 cm	120 cm	128 cm	131 cm
SD	+1	+1	+2	+1
BMI	15.44	15.97	16.17	16.31
SD	+1	+1	+1	+1
Haemoglobin	10 gm	10.5 gm	12 gm	9.5 gm
IQ	93	102	110	88
IQ Classification	Average	Average	High average	Low average
Stool Analysis	Enterobius vermicularis	giardia lamblia	Negative	Ascaris&Entameba histolytica cyst

Table (4) shows the relation between the four positive cases and their age, sex, weight, height, BMI, their SD, hemoglobin, IQ, IQ classification, stool analysis.

DISCUSSION

This study is a cross-sectional study tried to give an eye on schistosomiasis in rural Egypt during the year 2014-2015 taking Kafr El Sheikh Governorate as a model aiming through the prevalence to demonstrate the dimension of that health problem in Egyptian children whom age is between (6-15) year and so we can plan a strategy to deal with it as the main technical difficulty lies in identification of remaining cases and pockets through an integrated surveillance and response system as reported.

This study rises an alarm that schitosomiasis remains one of the most public health problems between children in rural Egypt. In this study, the prevalence of schistosomiasis in the studied Group is (0.4%), while it was 39.5 % in 2000 in Kafr El Sheikh Governorate (El-Khoby *et al*., 2000). It is still higher than that reported by MOHP in 2009 which was (0.6%) in Egypt (MOHP 2009) and in 2014 it was 0.02 (MHOP 2014). In this study, the diagnosis of *Schistosoma haematobium* and *Schistosoma mansoni* was based on the microscopic detection of eggs in urine and stool samples respectively as it remains the gold standard for the diagnosis of schistosomiasis (Feldmeier and Poggensee, 1993).

Schistosoma mansoni is more predominant than *Schistosoma haematobium* in this study This is agreed with Michelson MK *et al*. who reported that in Egypt following construction of the Aswan High Dam in 1960 (Michelson *et al*., 1993). A striking change in the geographic distribution of the two species of schistosoma (*Schistosoma mansoni and Schistosoma haematobium*) occurred with an increasing prevalence of *Schistosoma mansoni* in the Nile Delta and concomitant decrease of *Schistosoma haematobium* prevalence .This change was believed to be caused by less slit and by variability in the velocity and volume of water flow with resultant shift in the relative abundance of the corresponding snail vectors (El-Khoby *et al*., 2000). In our study, there is significant positive association between male sex and increasing the prevalence of schistosomiasis as the infected males represent 100 % and infected females represent 0 % with (P value=0.03), this is in agreement with Jemal *et al*. who reported that the predominance of male sex is due to socioeconomic and cultural conditions (Michelson *et al*., 1993). And Since females do not frequently bath in canals, males seldom wash dishes or clothing in canals, and children are more likely than adults to play or swim in the water, these variables were stratified into the appropriate age and gender groups (Abdel-Wahab *et al*., 1979). In our study, we found a significant difference between children with & without schistosomiasis regarding residence (P = 0. 04) as the infected children in rural areas represents 100 %, explained that Poor and marginalized rural dwellers are more severely affected by schistosomiasis than urban areas, explained by a multitude of complex and interconnected factors.

In studing the four positive cases, we found that they were in the primary school age group (P=0.02), as they presented 100% of positive cases, as they are less projected to media and never had mass treatment in schools. While having weight, length, body mass index, their SD, haemogobin, stool analysis and IQ classification, We found that case no. 3 was high average IQ, with 12 gm (normal) in hemoglobin assessment and his stool analysis was free overweight and tall (World Health Organization, 2007). But, casces (1, 2 and 4) were within normal weight and height and (average – low average IQ) because they are having anemia as they are below 12 gm (Johanthon *et al*., 2007). Children with anemia, parasitic infestations or schistosomiasis was given medical treatment and would be examined later.

Occlusion

-in our study it was concluded that:

The prevalence of schistosomiasis between children in Kafr El Sheikh Governorate, Kafr El Sheikh District is 0.4% which is higher than that of all population covering all age group- Predominance of *Schistosoma mansoni* on *Schistosoma haematobium* as all positive cases were *Schistosoma* mansoni. - A highly significant positive correlation between male sex, rural residence and primary school age group and increasing the prevalence of schistosomiasis as all of them had (P value <0.05).

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