

The role of *Schistosoma Haematobium* in alteration of serum lipid profile among Sudanese school children

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Abstract

Background: Parasitic protozoa and helminthes are responsible for some of the most devastating and prevalent diseases of humans, threatening the lives of nearly one-third of the worldwide human population leading to more than 2 million deaths annually.

Objective: determine serum total cholesterol [T.C], triglycerides [TG], high-density lipoprotein cholesterol [HDL-C] and low-density lipoprotein cholesterol [LDL-C] in patients infected with *Schistosoma haematobium*.

Materials: A cross-sectional study was conducted in Sudan between August, 2011 and January, 2013. The study included 250 infected subjects with *Schistosoma haematobium*[males and females] and 100 volunteers apparently healthy as control. All participants aged 7 - 12 years.

Methods: The concentration of Total Cholesterol, Triglyceride LDL and HDL were measured using direct kit methods, and detection of urinary *schistosoma haematobium* eggs was carried by microscopy.

Results: The mean concentration of triglyceride, total cholesterol, high density lipoprotein cholesterol [HDL-C] and low density lipoprotein cholesterol [LDL-C] were significantly lower among *S. haematobium*-infected subjects than in controls irrespective of the age and sex Triglyceride and Cholesterol was significantly low when the concentrations of ova in urine was high [>50], and only the cholesterol was significantly low in female patients compared to males.

Conclusion: This study showed that schistosoma infection made significant alteration in plasma lipid levels with a corresponding increase in parasitemia levels in urine.

Keywords: *Schistosoma haematobium*, cholesterol, triglycerides, HDL-C, LDL-C

1.Introduction

Schistosomiasis, the second most common parasitic infection of humans after malaria, and it is a tropical parasitic disease endemic in many developing countries. Over worldwide there are 200 million people are infected with *schistosoma* and about 90% of them are found in sub-Saharan Africa[1], where more than 200,000 deaths are attributed to *schistosomiasis* annually[2]. This parasitic infection is endemic in many less developed countries in tropical and subtropical regions. These countries are distributed in Africa, South America, the eastern Mediterranean regions and the Caribbean Sea[1]. The World Health Organization [WHO]

estimated that the number of countries considered as endemic for *schistosomiasis* was 78 in 2011, including 111 million school-age children, of which 226 million are in Africa[2]. However, only ~28 million people received treatment, which is only 10.2% coverage of the global requirement for *schistosomiasis* treatment[2].

Different species of the genus *Schistosoma* were known to cause human illness, such as *schistosoma mansoni*, *schistosoma haematobium*, *schistosoma japonicum*, and *schistosoma intercalatum*[3]. The highest rates of schistosomal infections are commonly found among children and

young adults and in recognition of these schoolchildren are the main targets of *schistosomiasis* control programs[4]. In 2007, the World Health Organization estimated 235 million cases of *schistosomiasis* all over the world, and there are about 732 million people at risk of infection in endemic areas[5]. Children, women, fishermen, and farmers in irrigation channels in these areas, are often infected with *Schistosoma*.

In Sudan the risk for *S. haematobium* is widespread in the different regions especially in the major irrigation systems in the Gezira area between the Blue and White Nile Rivers - high prevalence of *S. mansoni* infection in some areas in the West Equatoria region and both *S. mansoni* and *S. haematobium* are highly endemic in the Upper Nile region. In 2007, there were 5 million people infected by *schistosomiasis* in Sudan[6], and schoolchildren were predominant groups[7]. Due to many factors such as Climate changes, higher rates of water activities and immunological factors, schoolchildren are the group at highest risk of contracting *S. haematobium* infection[8].

The WHO estimated that over 150,000 deaths and a burden of 5.5 million disability-adjusted life years can be attributed to climate change and variability each year [9]. Among the children, the females had relatively lower infection than their male counterparts. This could be due to difference in exposure status[10].

The aim of the present study was to measure the affection of *schistosoma haematobium* infection on serum levels of total cholesterol [T.C], triglycerides [TG], high-density lipoprotein cholesterol [HDL-C] and low-density lipoprotein cholesterol [LDL-C].

2. Materials and methods

2.1 Study Area and Subjects

A descriptive cross-sectional study was conducted from August, 2011 to January, 2013 at Al-Jazira state, central of Sudan, which is a highly active research center for endemic diseases such as malaria and bilharziasis. Urine and blood samples were collected from 250 schoolchildren with age groups from 7 to 12 years old, who had evidence of *Schistosomiasis*, chosen among male and female school students from the rural area in Al-Jazira state, Sudan. The control group comprised hundred individuals with an epidemiological history incompatible with *schistosomiasis* and was drawn from the same age group [7–12 years] and socioeconomic background, as judged by a standardized questionnaire that enabled family

budget, education level and lifestyle to be matched with those of the patients. Subjects were excluded from the study if there was any evidence of parasitic infections; also obese, and/or underweight were excluded from the study. Individuals who had taken lipid-lowering drugs at anytime within the previous year were also excluded.

2.2 Ethical Statement

This study was approved by the ethical committee of International Africa University. Written and signed or thumb-printed informed consents were taken from parents or guardians, on behalf of their children

2.3 Sample Collection and Processing

Venous blood samples were drawn into evacuated tubes after a 12 h fasting period. Serum was separated within 2 hours by centrifugation, stored at -20°C and used for lipid analyses within 24 h. Urine samples were collected from subjects into clean universal bottles for detection of *Schistosoma haematobium* ova.

2.4 Biochemical Measurement

Plasma total cholesterol [TC], LDL-C, HDL-C and triglyceride [TG] concentrations were assayed by routine enzymatic kit methods [from Analab Diagnosis Kits, Spain] following the manufacturer procedure.

Detection of urinary *Schistosoma haematobium* eggs was carried by microscope, as described by Eppert et al[11].

2.5 Statistical Analysis

Statistical analyses were performed using SPSS [Statistical Package for Social Sciences] version 11.5. Differences in mean values between groups were evaluated by a Student's *t*-test. P-value was statistically significant at $P < 0.05$.

3. Results

Comparing to the control group, all lipid results of the study group showed significant [p value < 0.05] lower levels [Table 1].

Table [1]: lipid profile between infected group and control group

Parameters[mg/dl]	Control	Subjects	P value
Triglyceride	122	70.4	0.001
Cholesterol	119.1	92.7	0.048
HDL	48.8	34.9	0.012
LDL	58.3	42.1	0.028

According to the numbers of ova in the urine of infected patients, serum triglyceride and total cholesterol showed significant [p value < 0.05] decreasing levels in high ova concentration less than in low ova concentration [Table 2].

Table [2]: Results of infected subjects between high [>50] and low [<50] concentrations of ova in urine.

Parameters[mg/dl]	Ova <50	Ova >50	P value
Triglyceride	92.5	50.5	0.033
Cholesterol	104.4	81.1	0.019
HDL	35.6	34.2	0.907
LDL	43.4	40.8	0.400

The cholesterol level in infected male patients showed a significant [p value <0.05] increased level comparing to infected female patients [Table 3].

Table [3]: Results of infected subjects according to sex

Parameters[mg/dl]	Male	Female	P value
Cholesterol	109.8	75.6	0.036
Triglyceride	79.2	61.6	0.051
HDL	37.1	32.7	0.091
LDL	44	40.2	0.067

4. Discussion

The present study found that the levels of serum triglyceride, total cholesterol, high density lipoprotein cholesterol [HDL-C] and low density lipoprotein cholesterol [LDL-C] were significantly decreased among *S. haematobium* infected patients [$P<0.05$] much less than controls results irrespective of the age and sex. Doenhoff *et al* [12] investigated the effect of a live *Schistosoma* infection on the development of atherosclerosis in ApoE-deficient mice and reported a similar decrease in total cholesterol and LDL in the serum of infected patients. Also, the result of this study was in agreement with earlier reports of Adetunji *et al*[13] who observed a significant reduction in levels of serum lipid profile in infected subjects with *Schistosoma haematobium*. This reduction in total cholesterol level could also be contributed in reduction of the mean levels of LDL-C and HDL-C in same patient. The positive relationship between total cholesterol, LDL-C and HDL-C has been widely reported even in normal individuals[14]. The reason for the low triglyceride level in infected subjects is unclear but Sturrock *et al*[15] had demonstrated that *S. mansoni* is capable to obtain phospholipids and triglyceride from the host.

The present study also revealed that total cholesterol and triglyceride levels were decreased significantly in serum of patients with hyperparasitaemia [*Schistosoma* ova > 50] when compared to patients who had *Schistosoma* ova < 50 [$P< 0.05$]. While of LDL-C and HDL-C levels were almost similar between patients with hyperparasitaemia and patients with *Schistosoma* ova

< 50 [$P> 0.05$]. These findings were supported by La Flamme *et al*[16] who reported that the infection with *Schistosoma* induces the development of strong anti-egg [Th2] which is accordingly reduces the cholesterol and LDL levels.

According to the gender of infected patients, total cholesterol showed significant reduction in males when compared to female patients [$P<0.05$]; while the other parameters were decreased insignificantly [$P>0.05$]. Our results were disagreed with Magen *et al*[17] who reported that plasma total cholesterol was significantly lower in male subjects than females. This variation in finding can be attributed to factors such as number of patients, lifestyle, and genetic make-up.

4. Conclusion

This study showed that *Schistosoma* infection made significant alteration in plasma lipid levels with a corresponding increase in parasitemia levels in urine.

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