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Research Article

Lipid profile of schoolchildren with Giardiasis in Bashiar Hospital (Khartoum- Sudan)

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ABSTRACT:

Giardia Lamblia is a flagellated protozoan parasite, which is the most common intestinal pathogen in schoolchildren in underdeveloped countries. It has been suggested that most lipids and fatty acids are taken up by *Giardia* for energy production. The objective of this study is to assess the association of lipids and lipoproteins concentration in Sudanese schoolchildren with giardiasis, at Bashiar Teaching Hospital, in Khartoum- Sudan. The study was done between January to June 2014; included 106 subjects, of them 71 were schoolchildren from schools near by the hospital, while 35 were age and sex matched controls. Macroscopic and microscopic diagnosis of the giardia was done by finding the trophozoites or cyst in stools of the subjects. After overnight fasting; serum lipid profile was done using automated chemical analyzer. The mean age of the children with giardiasis was (10.6 ±4.1years), versus (13.0±5.6years) in control subjects. The mean serum cholesterol level in the children with giardiasis was (158.6±34.4mg/dl), versus (165.7±38.9mg/dl) in healthy control children; triglycerides (117.2±27.3/dl), versus (97.9±28.2mg/dl); HDL (44.5±11.5mg/dl), versus (48.9±17.8mg/dl) and LDL (90.4±32.2mg/dl), versus (55.4±17.7mg/dl) respectively.

In schoolchildren with giardiasis; serum cholesterol and HDL significantly decrease, while triglycerides and LDL significantly increase. *Giardialamblia* have ability to keep low serum cholesterol, and high LDL by possessing low density lipoprotein receptor (LDLR), that implicates the binding and internalization of lipoproteins.

Key words: *Giardia lamblia*, serum, lipid profile, Bashair Hospital, Khartoum, Suadan.

INTRODUCTION

Giardia was first seen by Leeuwenhoek in (1681) while examining his own stool. Lambl (1859) and Alexei (1914) are also associated with its discovery.

Giardia is one of mucosal parasites in human;it has a unique metabolic pathway that allows it to survive and multiply by scavenging nutrients from the host[1,2].

Giardiasis is associated with contaminated water serves as one of the main sources of infection[3,4]. *Giardia* exists in two morphologic forms: trophozoites and cysts. *Giardia lambliaexcystation* is accomplished in two steps first by limiting the acidic conditions present in the stomach and secondly by the protease-rich and slightly alkaline small intestine[5]. Membrane biogenesis in *Giardia* requires cholesterol, because *Giardia* is unable to synthesize cholesterol de novo[6], so it obtains its requirements from the upper small intestine, which is rich in biliary and dietary cholesterol[7]. In humans, *Giardia* infection can be symptomatic or asymptomatic. Symptomatic giardiasis can present with fatty diarrhoea, abdominal discomfort, vomiting, malabsorption and/or weight loss[8]. Giardiasis causes malabsorptive diarrhea[9]. In some cases, giardiasis resolves rapidly, but in other cases, it can result in chronic infection[10]. Therefore the infected people especially children, may lack the important caloric source and lipid soluble vitamins (K, A, D, E). Lower level of hemoglobin concentration, and iron-deficiency anemia associated with giardiasis were observed[11]. It has been suggested that most lipids and fatty acids are taken up by endocytic and non-endocytic pathways and are used by *Giardia* for energy production and membrane/organelle biosynthesis[12]. *Giardia* induces a loss of epithelial barrier function and functional injuries of the enterocyte by mechanisms that remain unknown[13].

METHODS MATERIALS

The objective of the present study is to assess the association of lipids and lipoproteins concentration in Sudanese schoolchildren with giardiasis, at Bashiar Teaching Hospital, which is a tertiary care hospital, in Khartoum- Sudan. The study was done between January to June 2014 included 106 subjects, of them 71 were schoolchildren from school near by the hospital, while 35 were age and sex matched controls. Bashiar Hospital is located in the south peripheries of Khartoum city with poor sanitary system. Ethical clearance was taken from the authorities, while written consent was taken from all subjects. Macroscopic and microscopic diagnosis of the giardia was done by finding the trophozoites or cysts in stool of the subjects attending the hospital. Patients with giardiasis and their controls were given oral instructions to fast overnight for 12-14 hours before collecting the venous blood samples. Serum was separated after centrifugation at 3000 RPM for 10 minutes, and then stored at -20Ċ, till the time of biochemical analysis using automated chemical analyzer (TOSOH AIA -360). Total cholesterol, triglycerides, low density lipoprotein (LDL) and high density lipoprotein (HDL) were measured parallel with control samples from Biosystem Company (Spain).

RESULTS

Data were analyzed using IBM SPSS Statistic version 20. A comparison of the means was performed using the Independent-Samples Student's *t*-test from the SPSS Statistic program, (P=0.05) was considered significant.

The study revealed that; out of the 71 patients; of 37 were males and 34 females. In the 35 control subjects; 20 of them were males, and 15 females (tabe.1). The majority of study population (83.1%vs 60%) aged between 5 to 15 years (table 2 &3). The study showed that the mean age of the children with giardiasis was (10.6 ±4.1years), while the mean age of control subjects was (13.0±5.6years). The mean serum cholesterol levels were (158.6±34.4mg/dl) in the children with giardiasis versus (165.7±38.9mg/dl) in the young subjects without giardiasis with P value 0.00. The mean serum triglycerides level was (117.2±27.3/dl) in the children with giardiasis, versus (97.9±28.2mg/dl) in the control subjects, with p value 0.00.The mean serum HDL was (44.5±11.5mg/dl) in children with giardiasis versus (48.9±17.8mg/dl) in their controls, with P value 0.00. The mean serum LDL was (90.4±32.2mg/dl) in the schoolchildren with giardiasis versus (55.4±17.7mg/dl) in the healthy control children, with P value 0.00 (Table 1 &4).

DISCUSSION

In the present study lipid profile was used to assess, if there is any association between offensive loose stool with undigested fats, and serum cholesterol, HDL, LDL & triglycerides, in the in Sudanese schoolchildren attending Bashair Teaching Hospital, in Khartoum, consulting diagnosis and medication from giardiasis. This study reveals a significantly low total serum cholesterol in the schoolchildren infected with giardiasis, these finding are in agreement with that reported by Bansal et al[1], Ma'ani N. Al-Shamari and Dhuha M[11] because *giardia lamblia* is unable to synthesize cholesterol required for its membrane biosynthesis by itself[6], hence it depends on its requirements from the host. Loss of lipids is one of giardiasis complications resulting in offensive stool associated with undigested lipids. This study also shows a low good cholesterol (HDL) levels in the giardiasis, which is consistent with that concluded by [(1)], while in disagreement with the finding of Ma'ani N. Al-Shamari and Dhuha M[11] in Iraq. LDL levels are significantly increased in this study, which is in consistent with finding of Faucher

et al[14].Even cholesterol is carried by LDL, normal LDL in giardiasis; as recorded by Bansal et al[1], Ma'ani N. Al-Shamari and Dhuha M[11] or even elevated as in this study in *giardia* infections; it's unexplainable. This may be due to compelling of Lujain[15]; who found that cholesterol starvation is necessary and sufficient for *Giardia*trophozoites to differentiate into environmentally resistant cysts; or what reported by Maria et al[6]; who said that: *giardia* trophozoites contain low density lipoprotein receptor (LDLR), that implicated in the binding and internalization of lipoproteins giving the giardia the capacity to acquire essential components from different environments. Triglycerides in turn show significant increase in this study, this finding is in disagreement with that concluded by Maani and group in 2013[11], who found normal levels of triglycerides in giardiasis patients, this may due to young subjects we selected for this study, while they did their study on adults.

In general; giardiasis disturbs lipids parameters in schoolchildren[1], including intestinal malabsorption of lipids resulting in offensive loose feces. Lowering serum cholesterol, because it's used for the parasite membrane biosynthesis. Decreases good lipoproteins (LDL) levels, associates with significantly increase in triglycerides and (LDL) levels. That may be associated with risk of coronary heart diseases[16].

CONCLUSION

Giardia lamblia have ability to keep low serum cholesterol, and high LDL by possessing low density lipoprotein receptor (LDLR), that implicates the binding and internalization of lipoproteins giving the giardia the capacity to acquire essential components from different environments.

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Table 1
Descriptive table of the gender of the children with giardiasis and their control

Subjects	Males	Females	Total
Patients	37(*52.1%)*	34(*47.9%)*	71
Control	20 (*57.1%)*	15(*42.9%)*	35
Total	57	49	106

Tabe 2
Descriptive table of the age groups in the schoolchildren with giardiasis

Age groups	Males	Females	Percentage
Less than5	3(4.2%)	1	5.6%
5-10	20(55.2%)	18	53.5%
11-15	8(29.5%)	13	29.6%
16-18	6	2	11.3%
Total	37	34	100%

Table 3
Descriptive table of age groups in the children without giardiasis (control)

Age groups	Males	Females	Percentage
Less than5	0	0	0%
5-10	6	8	40%
11-15	5	2	20%
16-18	9	5	40%
Total	20	15	100%

Table 4
Comparative study of lipid profile of schoolchildren with giardiasis and their control group

Items	Patients (No=71) (mean±std)	Control (No=35) (mean±std)	P value
Age (years)	10.6±4.1	13.0±5.6	
Cholesterol (mg/dl)	158.6±34.4	165.7±38.9	0.000
Triglyceride (mg/dl)	117.2±27.3	97.9±28.2	0.000
HDL (mg/dl)	44.5±11.5	48.9±17.8	0.000
LDL (mg/dl)	90.4±32.2	55.4±17.7	0.000

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