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Risk of Renal Dysfunction in *Schistosoma haematobium* Infected Patients

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Abstract

Schistosoma haematobium is a parasitic infection considered by World Health Organization (WHO) as a significant public health problem, second to malaria among parasitic diseases that occurs frequently in Africa and Middle East. This study was aimed at assessing the risk of renal dysfunction in patients infected with Schistosoma haematobium in Yenagoa, Nigeria. Blood specimens were collected from thirty subjects infected with Schistosoma haematobium and another thirty subjects with no evidence of Schistosoma haematobium infection (control) into non anticoagulated (plain) bottles, these specimens were allowed to clot, spun and the serum obtained used for the quantitative measurement of the following biochemical parameters using spectrophotometer S23A model: creatinine, urea, protein and uric acid. The results showed higher statistical significant differences ($p<0.05$) of creatinine and urea with mean values of 1.83mg/dl and 86.68mg/dl respectively in the Schistosoma haematobium infected subjects as against the mean values of 0.80mg/dl and 20.20mg/dl respectively in the control subjects while protein showed lower statistical significant differences ($p<0.05$) with a mean value of 48.27g/l in the Schistosoma haematobium infected subjects as against a mean value of 71.53 g/l in the control subjects. However, the uric acid mean value of 247.25µmol/l in the Schistosoma haematobium infected subjects was not statistically different ($p>0.05$) from the mean value of 247.20µmol/l in the control subjects. In conclusion, the significant differences of the mean values of these biochemical parameters in the Schistosoma haematobium infected subjects as compared with that of the control subjects show that they are at risk of renal dysfunction. The estimation of these serum biochemical parameters in all cases of Schistosoma haematobium infection is therefore recommended.

Keywords: *Schistosoma haematobium* Infection, Renal dysfunction, Risk, Yenagoa, Nigeria.

Introduction

Renal dysfunction is defined as a medical condition in which the kidneys are unable to filter waste products effectively from the blood due to severe infection, urinary obstruction, or trauma and other conditions[1,2].

Schistosomiasis is a disease of parasitic origin which is caused by trematodes from the genus schistosoma. This disease which is also referred to as bilharzia has the following species which mainly infect humans: *Schistosoma mansoni, Schistosoma japonicum, Schistosoma mekongi* and *Schistosoma haematobium* with the *Schistosoma haematobium* being the only specie associated with urinary schistosomiasis while the other species are associated with intestinal schistosomiasis.

In fresh water the eggs are eliminated from the host via micturition and hatch to miracidia which swim freely and penetrate into the intermediate snail host known as Bulinus specie e.g. Bulinus globosus, Bulinus forskalii, Bulinus nyassanus and Bulinus truncatus where their epithelia are shed and developed into mother sporocysts which in turn form daughter sporocysts after two weeks. Approximately four weeks after the onset of the miracidia penetraion into the snail, furcocercous cercariae are released [3] with the free swimming infective larval cercariae gaining entry into the skin of humans whenever it comes into contact with contaminated water and thereafter, move to the blood stream where they travel to the liver and mature into adult flukes which have the ability to cover themselves with the antigens of their host in order to avoid been detected by their immune system[3].

Urinary schistosomiasis is known to be infectious to humans for at least 4000 years and was denoted as a dripping penis by ancient Egyptians. In 1851, a German Pathologist known as Theodor Bilharz, while working at Kasr El-Eini hospital in Cairo discovered the parasite hence bilharzia was named after him while the intermediate snail host was discovered in 1915 by an English Scientist known as Lieper[4].

Schistosoma haematobium infection is a significant public health problem in most Africa and Middle East, which is considered to be second to malaria among the diseases of parasitic origin, thus continuous researches are needed to

effectively reduce its burden on humans hence this study which was aimed at the risk of renal dysfunction in patients infected with this parasite.

Materials and Methods

A total of thirty *Schistosoma haematobium* infected subjects aged 20-30years as well as another thirty subjects aged 20-30years with no evidence of *Schistosoma haematobium* infection (control) who reside in Yenagoa Bayelsa state of Nigeria and were referred from some private hospitals within Yenagoa metropolis to Quality Medical Diagnostic Center Yenagoa, Bayelsa state of Nigeria for urine microscopy in order to confirm the presence or absence of *Schistosoma haematobium* infection were recruited as the study population for this research work.

Early morning midstream urine specimens were collected from these subjects who were not on any medications before and during the course of this research into clean, sterile universal bottles. These specimens were spun and the sediments were examined microscopically for the confirmation of ova (3+) of *Schistosoma haematobium* using ×40 objective.

After seeking the consents and approval from these subjects; a standard venipuncture technique was used to collect 5ml of their respective blood specimens into non anticoagulated (plain) bottles. These specimens were allowed to clot, carefully retracted, spun and the obtained sera used for the quantitative measurement of the following biochemical parameters with the specified methods using spectrophotometer S23A model: creatinine, Jaffe reaction method as described in the 27th March, 2006 revised edition of Randox Laboratory kit manual, Ardmore, United Kingdom[5], urea, Urease-Berthelot method as described in the 7th of January, 2011 revised edition of Randox Laboratory kit manual, 55 Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom[6], protein, Biuret method as described in Randox Laboratory kit manual, Ardmore, United Kingdom[7,8] and uric acid, Enzymatic colorimetric method as described in the 20th October 2009 revised edition of Randox Laboratory kit manual, 55 Diamond Road, Crumlin, County Antrim, BT294QY, United Kingdom[9].

***Statistical Analysis*:** The results were expressed as the mean and standard deviation while the differences between the subjects were assessed using the student's "t" tests. The results were considered statistically significant at $p < 0.05$

Results and Discussion

In this study, the mean serum concentrations of the biochemical parameters measured in the *Schistosoma haematobium* infected subjects were compared with that of the control subjects as shown in Table-1.

The results showed that the mean serum concentrations of creatinine and urea were significantly higher ($p<0.05$) in the *Schistosoma haematobium* infected subjects as compared with that of the control subjects while that of total protein were significantly lower ($p<0.05$) in the *Schistosoma haematobium* infected subjects as compared with that of the control subjects. However, the mean serum concentration of uric acid showed no statistical significant differences ($p>0.05$) in the *Schistosoma haematobium* infected subjects as compared with that of the control subject.

Table-1
Laboratory data of *Schistosoma haematobium* infected subjects and non *Schistosoma haematobium* infected (control) subjects

Parameters	Control (n=30)	Infected (n=30)	Remark
Creatinine (mg/dl)	0.80 ± 0.32	1.83 ± 0.77	S
Urea (mg/dl)	20.20± 1.83	86.68 ± 3.04	S
Protein (g/l)	71.53±4.75	48.27± 3.20	S
Uric acid (µmol/l)	247.20± 2.47	247.25± 2.50	NS

Values are mean and S.D. of duplicate determination at $p<0.05$, NS represents not significant, S represents significant, n represents number of subjects

Creatinine is a waste chemical molecule that is generated from the metabolism of muscle and disposed into the urine by the kidneys after being transported through the bloodstream and subsequently filtered.

The mean serum creatinine concentration of 1.83mg/dl was significantly higher ($p<0.05$) in the *Schistosoma haematobium* infected subjects as compared with that of 0.80mg/dl in the control subjects, this finding which is confirmed in this present study may be associated with the inability of kidneys of the infected subjects to filter and clear the creatinine effectively from the blood, this however, may be due to the impaired nature of their kidneys which would have been due to the invasive infection caused by *Schistosoma haematobium*; a situation which is thus considered to put subjects infected with this parasite i.e. *Schistosoma haematobium* at the risk of renal dysfunction since non renal causes of elevated serum creatinine concentrations are very rare thus making serum creatinine estimation a more specific test for renal dysfunction as reported by Tilkian, et al.1979, Tilton, et al. 1992 and Mayne, D.P.[10-12].

Urea is a normal waste product in the blood that is produced as a result of the breakdown of the proteinous food we eat as well as from the body metabolism, under normal condition it is excreted from the blood via the kidneys, however, whenever the function of the kidney is impaired its concentration increases in the blood. The mean serum concentration of 86.68mg/dl urea in the *Schistosoma haematobium* infected subjects showed higher

statistical significant difference ($p<0.05$) as compared with 20.20mg/dl of the control subjects, this finding as confirmed in this present study may be suggestive of the poor performance of the kidneys of the infected subjects to effectively clear the urea from the blood and this may be due to the severe invasion of these subjects with *Schistosoma haematobium* which had hindered the ability of their kidneys to effectively clear the urea from the blood. This finding which may be reflective of renal dysfunction is suggestive to put *Schistosoma haematobium* infected subjects at the risk of renal dysfunction.

The mean serum total protein concentration of 48.27g/l showed lower statistical significant difference ($p<0.05$) in the *Schistosoma haematobium* infected subjects as compared with the mean serum total protein concentration of 71.53g/l in the control subjects, this finding which is also confirmed in this present study may be due to damage to the nephrons which possibly would have been caused by the severe invasion of these subjects with this parasite, a situation which subsequently would have led to leakage of protein into the urine thus resulting into low serum protein concentration, this finding suggests that *Schistosoma haematobium* infected subjects may be at the risk of renal dysfunction.

The mean serum uric acid concentration of 247.25µmol/l in the *Schistosoma haematobium* infected subjects as compared with that of 247.20µmol/l in the control subjects showed no statistical significant difference ($p>0.05$). This finding as confirmed in this present study is in agreement with that of Elagba et al.[13] who in their previous research work of biochemical and haematological morbidity in school children infected with *Schistosoma haematobium* in Sudan reported no differences statistically in the *Schistosoma haematobium* infected subjects and the control subjects.

Conclusion

In conclusion, subjects infected with ova of *Schistosoma haematobium* (3+) are at risks of renal dysfunction taking into consideration the significant differences in the concentrations of these biochemical parameters in the *Schistosoma haematobium* infected subjects as compared with that of the control subjects.

Recommendation: It is therefore recommended that: The serum concentrations of creatinine, urea and protein should be measured in all patients infected with ova of *Schistosoma haematobium* (3+) and these concentrations should be brought to normal levels during treatment upon the findings of any significant elevations.

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