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# Assessment of diagnostic methods for urinary schistosomiasis, Assalya, White Nile State, Sudan

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**Abstract:**

***Background:*** *Schistosomiasis is a parasitic disease caused by blood flukes (trematodes) of the genus Schistosoma. It is the third most devastating tropical disease in the world, being a major source of morbidity and mortality for developing countries. The study aim to compare macrohaematuria and urine dipstick against intensity of urinary schistosomiasis and calculate sensitivity and specificity of macrohaematuria and urine dipstick in samples collected from children who attended Assalaya medical center.*

***Methods:*** *This cross sectional study conducted in Assalaya, White Nile State, Sudan. Four hundred and twenty participants were included, 246 (58.6%) were males and 174 (41.4%) were females. The*

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*age ranged between (9-17 years). Urine samples were collected and examined for Schistosoma haematobium by using macrohaematuria,dipsticks for proteinuria and microhaematuria, filtration method as gold standard method.*

***Results:*** *Macrohaematuria, microhaematuria and proteinuria showed a sensitivity of 100%, 100% and 100% with specificity of 19.8%, 14.56% and 9.84% respectively. Association of intensity of infection with macrohaematuria, microhaematuria and proteinuria was significant. P < 0.05.*

***Conclusion:*** *The study concluded that urine dipstick strip and macrohaematuria are highly sensitive with low specificity in detection of S. haematobium in urine samples. In addition, they have potential value to reflect the intensity of infection.*

**Key words:** urinary schistosomiasis - urine dipstick strips -Sudan

## INTRODUCTION

Schistosomiasis is a parasitic disease caused by blood flukes (trematodes) of the genus *Schistosoma.* After malaria and intestinal helminthiasis, schistosomiasis is the third most devastating tropical disease in the world, being a major source of morbidity and mortality for developing countries in Africa.[1] *S. haematobium* affects both the urinary and reproductive tract systems.[2] *S. haematobium* infection causes haematuria, dysuria, lesions of the bladder, kidney failure, bladder cancer.[3] Infection also interferes with nutrient uptake and can lead to undernutrition, growth and cognitive development retardation, and pose a serious threat to children's health, education and productivity.[4] As the transmission of many other parasitic diseases, the transmission of schistosomiasis is a complex process governed by natural, socio-economic factors and human life style.[5, 6] Disease transmission occurs in ecosystems that support both the snails that serve as the obligate intermediate host for the parasite and the parasite itself. Humans become

infect through contaminated freshwater when free-swimming cercariae, which are release from the snail host, penetrate the skin. humans must have contact with contaminated freshwater in order to acquire *Schistosoma* infection.[6] The prevalence of schistosomosis increases when new facilitates for either irrigation canals or construction of dams creates the vector (snail). [7] Introduced as early as 1909 in Dongola and Southeastern Sudan. The highest infectivity was reached following the implementation of Gezira cotton irrigation scheme. [8] The objective of this study to compare the intensity as measure through macrohaematuria and urine dipstick and evaluate the sensitivity and specificity of the two techniques in samples collected from children who attended Assalaya medical Centre.

## MATERIALS AND METHODS

### Type of study
Descriptive cross sectional study.

### Study area
Assalaya campus is located at Assalaya administrative unit, Rabak Locality, White Nile State. The source of water supply for sugar cane farms is White Nile from which cannel enable irrigation. The main occupation of population is farming in Sugar Cane farms.

### Study population
School age children referred to Assalaya, White Nile State medical Centre.

### Study period
The study commenced in June and ended in October 2014

**Sample collection**

Four hundred and twenty urine samples collected in clean and labelled containers. Minimum of fifteen ml of urine collected for each sample.

## METHODOLOGY

**Macrohaematuria**

Macroscopic examination done for detection of visible haematuria (macrohaematuria) by naked eye

**Diagnostic dipstick strip method:**

**Microhaematuria**

In the laboratory, a reagent strip (*Mission® Expert* Urinalysis Strips) carefully dipped into urine sample and allowed to stand for 5seconds. Moreover, the colour matched with the standard colour by the side of the container as recommended by the manufacturer to estimate the amount of blood in the urine

**Urine Protein Analysis (proteinuria)**

The protein excretion in the urine was determined using simple reagent strips (*Mission® Expert* Urinalysis Strips). Urinary protein results categorized as positive or negative according to the manufacturer's instruction provided in the kit inserts.

**Filtration method**

Urine samples examined with the urine filtration method for the presence of *S. haematobium* eggs. In brief, urine samples were vigorously shaken, and 10 ml of each sample were pressed through a 13-mm diameter small-meshed filter (20 µm pores dimeter) for detection of *S. haematobium* eggs, and infections categorised as light (≤ 50 eggs) and heavy (≥50 eggs). Each filter placed on a microscope slide labelled with the child's identifier

### Statistical Analysis

The data from the findings were analyzed using SPSS statistic version 20. Relationship of proteinuria, microhaematuria and macrohaematuria were tested using Chi square and Fisher's Exact test. P-value < 0.05 considered significant. The results of the analysis presented in figures and tables

The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) was calculated using filtration method as the gold standard.

## RESULTS

Total 420 children 246 (58.6%) were males 210 (85%) of these were infected and 174 (41.4%) were females 97(56%) of these were infected. The age ranged between (9-17 years). Different diagnostic methods used to detect intensity of *S. haematobium*. Filtration method used to assess the intensity of infection and categorized into two groups, heavy (egg count 50 and more eggs/10 ml) and light (egg count less than 50 eggs/10 ml), while macrohaematuria, microhaematuria and proteinuria recorded as Present or absent.

**Table 1: Distribution of age groups and sex**

| Variables | | Total |
|---|---|---|
| **Sex** | Males | 246 |
| | Females | 174 |
| **Age** | 9-11 | 184 |
| | 12-14 | 172 |
| | 15-17 | 64 |

**Table 2: Shows association of intensity of *S. haematobium* with Macrohaematuria, microhaematuria and proteinuria**

| | | *Intensity of infection* | | | *P. value* |
|---|---|---|---|---|---|
| | | **Light** | **Heavy** | **Total** | |
| *Macrohaematuria* | Present | 81 | 98 | 179 | 0.000 |
| | Absent | 20 | 0 | 20 | |
| | Total | 101 | 98 | 199 | |
| *Microhaematuria* | Present | 88 | 98 | 186 | 0.000 |
| | Absent | 15 | 0 | 15 | |
| | Total | 103 | 98 | 201 | |
| *Proteinuria* | Present | 110 | 71 | 181 | 0.003 |
| | Absent | 12 | 0 | 12 | |
| | Total | 122 | 71 | 193 | |

**Table 3: Shows sensitivity and Specificity of microhaematuria, macrohaematuria and proteinuria**

| | **SENSITIVITY (%)** | **SPECIFICITY (%)** | **PPV** | **NPV** |
|---|---|---|---|---|
| **PROTEINURIA** | **100** | **9.84** | **56** | **87** |
| **MACROHAEMATURIA** | **100** | **19.80** | **65** | **86** |
| **MICROHAEMATURIA** | **100** | **14.56** | **69** | **90** |

## DISCUSSION

The use of macrohaematuria, microhaematuria and proteinuria to estimate the intensity of urinary schistosomiasis has potential to give a clue about intensity of infection among infected children.

The association between macrohaematuria, microhaematuria and proteinuria with intensity of infection was significant.

Macrohaematuria in this study, increased with intensity of *S. haematobium* infection. As *Akyala Ishaku* represented in his study in *Nigeria* [9] and *Ugbomoiko et al* [10] **,** the presence of macrohaematuria use as prove for infection it can be a sign of tissue damage due to infection and agree with *Bogoch et al* [11] in northern Ghana, self-reporting haematuria (macrohaematuria) increased with intensity of infection.

Study in Mali**,** *Moussa Sacko* [12] reported haematuria related to intensity of infection and microhaematuria strongly related to number of S.*haematobium* eggs. The results indicate that blood in urine provides a good sound of urinary schistosomiasis.*Ugbomoiko et al* [10] confirm that any patients with heavy infection, microhaematuria detected, hence microhaematuria increased with severity of infection.

The significant association between proteinuria and intensity of infection in our study similar to that finding by *Bogoch et al* [11] in northern Ghana.

In this study, showed macrohaematuria and dipstick high sensitive and low specific to *S.haematobium* infection, high sensitivity of parameters in this result may due to other disease in urinary tract, condensation of urine, which appear dark, occult blood and sensitivity of dipstick itself but not related to *S.haematobium* infection. In the other hand children more susceptible to nutritional defect lead to presence of protein in urine in high amount , in contrast to study of *Ugbomoiko* [10] *Koukounari et al.*[13] who found haematuria dipsticks low sensitive and high specific, while specificity was high in spite of low sensitivity. *Ugbomoiko* observed sensitivity increase with intensity of infection and obviate that by combinations of them. *Bogoch et al* [11]found macrohaematuria and proteinuria are high specificity with low sensitivity, while

microhaematuria high sensitive and specific which indicate high amount of eggs in patients.

*Morenikeji* [14] macrohaematuria, microheamturia and proteinuria were low sensitivity and high specificity and *Mtasiwa D* [15] findings low sensitivity and high specificity of microhaematuria and macrohaematuria which mean morbidity in urinary tract due to *S. haematobium*. *Houmsou* [16] The sensitivity of urine colour for screening test low and high specificity which give better indicator to damage or complication occur in renal and urinary tract .

Our finding contrast with study carried in the Egypt among schoolchildren, by *Kotb MM* [17] who found that the study revealed that microhaematuria with sensitive and proteinuria with sensitivity low and specificity high. In another study carried by *Ndyomug* in Dar-es-Salaam, Tanzania [18], detected microhaematuria sensitivity lower than the sensitivity of microhaematuria detected in this study.

The use of urine dipstick strips has good offer as an indirect method in diagnosis of *S. haematobium* infection.

## CONCLUSION

Urine dipstick strip and macrohaematuria are highly sensitive with low specificity in detection of *S. haematobium* in urine samples. In addition, they have potential value to reflect the intensity of infection.

## RECOMMENDATIONS:

1- Using filtration method (gold standard) to detect intensity of *S.haematobium*.
2- Using macrohaematuria, mircrohaematuria and proteinuria urine dipstick strips is practical-cheap, fast

and easy to use in estimating intensity of *S. haematobium* infection.

3- Annual examination of school children usually conduct by the ministry of health should continue.
4- School children should be given special consideration in the health education programme, as they are always ready to listen and learn compared to other age groups.
5- Public education is very important as to the use of their home latrines and to avoid contact with canal water by constructing bridges across the canal.

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