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The validity of haematuria in the community diagnosis of urinary schistosomiasis infections

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Abstract

The validity and reliability of haematuria when used as screening criteria in community diagnosis of urinary schistosomiasis is presented. Between May and July, 1998, 1173 persons were screened for haematuria and examined for the presence of eggs of *Schistosoma haematobium* in their urine from all participating households in the Ozitem area of Bende Local Government Area, Abia State, Nigeria. Haematuria showed a sensitivity rate of 41.0% and specificity of 82.0% when used to identify cases of urinary schistosomiasis. Some factors that influenced the validity of haematuria as a diagnostic criterion are discussed. The use of haematuria amongst subjects in the first twenty years of their life is recommended.

Introduction

Urinary schistosomiasis is a major debilitating disease characterized by blood in the urine. It is caused by *Schistosoma haematobium* and about 38 million people are infected in 16 African countries (WHO, 1985). Nigeria is one of the highly endemic countries where the disease has been unsystematically reported and large areas remain where the disease status is unknown. Recent efforts to control urinary schistosomiasis have rekindled the debate and controversy over the significance and potential diagnostic utility of haematuria due to urinary schistosomiasis infections. Most experts agree that for efforts at controlling the menace of schistosomiasis through mass distribution of the 'drug of choice' to be cost effective, communities that have the highest prevalence of this disease have to receive priority attention (Anosike *et al.*, 1992).

Urine filtration for detection of eggs of *S. haematobium* is considered one of the most conclusive diagnostic criteria for urinary schistosomiasis. Unfortunately, this procedure is expensive, cumbersome and too technical for lay use. Several ongoing research efforts are aimed at developing rapid indicators for assessing endemicity of urinary schistosomiasis in communities. Haematuria is one of the most striking and common manifestations of urinary schistosomiasis in endemic regions of Africa (Savioli & Mott, 1989; Lengeler *et al.*, 1991). However, the validity of and reliability of haematuria when used for screening in hyperendemic communities has not been fully elucidated in south-eastern Nigeria.

This paper reports the assessment of specificity and sensitivity, both of which are indicators of validity in the use of haematuria for screening urinary schistosomiasis.

Materials and methods

One thousand one hundred and seventy-three persons from all participating households in seven communities of the Ozitem area of Bende Local Government Area of Abia State were examined. They were screened for haematuria and examined for the presence of eggs of *S. haematobium* in their urine using urine filtration techniques to determine the infection rate. In each visit to any village, midday, midstream urine samples were collected once from each individual in a wide mouthed, screw cap, plastic bottle. These were sent to the laboratory within 6 h of collection, where each specimen was thoroughly agitated (Anya & Okafor 1986–1987). Ten millilitres of urine were removed with a disposable syringe and transferred into a centrifuge tube and centrifuged for 5 min at 5000 rpm. After discarding the supernatant, the sediment was re-suspended in the remaining urine and poured into a Petri dish for examination of eggs of *S. haematobium* under a binocular microscope. The eggs

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Table 1. Total haematuria (macroscopic+microscopic) in communities in Bende Local Government Area of Abia State, Nigeria.

Community	No. of persons examined	Infection with haematuria	Infection without haematuria
Isiegbu	285	78 (27.4%)	42 (14.7%)
Elubehu	384	60 (15.6%)	162 (42.2%)
Umuokube	63	6 (9.5%)	18 (28.6%)
Amaeke	129	18 (14.0%)	45 (35.0%)
Umuamari	150	39 (26.0%)	39 (26.0%)
Elumana	93	30 (32.3%)	24 (25.8%)
Elunta	69	9 (13.0%)	15 (21.7%)
Total	1173	240 (20.5%)	345 (29.4%)

were counted and recorded and, in addition, haematuria was screened with chemical strips (Mott *et al.*, 1983). The chemical strips (Medi-Test Combi-9) registered urinary blood as negatives or positives (+, ++, +++).

Results

Table 1 depicts the status of urinary schistosomiasis in the Ozitem area of Bende Local Government Area, Abia State, Nigeria. The persons examined during the study were classified on the basis of the presence or absence of total haematuria and whether they were positive for eggs of *S. haematobium* (infected) or negative (uninfected). Of 1173 persons screened, 585 (49.9%) were infected. Three hundred and forty five (29.4%) of the sample population were positive for *S. haematobium* infection without haematuria, whereas 240 persons (20.5%) had haematuria.

On cross tabulation of haematuria (infection with haematuria) with that of urine filtration alone (i.e. infection without haematuria), it was found (see table 2) that the proportion of all persons examined who were correctly identified by haematuria observations as having urinary schistosomiasis (true positives) was 20.5%. Similarly, the proportion who were correctly identified as not being infected on the basis of absence of haematuria (true negatives) was 41.1%. Conversely, 9.0% of the subjects were found to be devoid of eggs of *S. haematobium* in their urine although they demonstrated haematuria (false positive). Almost a third (29.4%) of the subjects were positive for eggs of *S. haematobium*, although they showed no signs of haematuria. To assess the validity of haematuria observations in establishing urinary schistosomiasis infection in any given community, the sensitivity and specificity of haematuria were calculated. As observed in the present study, the ability of haematuria to accurately identify all those with disease (sensitivity) was calculated to be 41.0%, while its ability to correctly differentiate all those without the disease was 82.0%. There was a close association between haematuria and the presence of eggs of *S. haematobium* in the urine.

Table 2. Contingency cross tabulation of the presence of *Schistosoma haematobium* eggs in the urine with haematuria, using the filtration method.

Eggs+ve	Eggs−ve
Haematuria+ve 240 (20.5%)	106 (9.0%)
Haematuria−ve 345 (29.4%)	482 (41.1%)
Total 585 (49.9%)	588 (50.1%)=1173 (100%)

True positive rate=20.5%
True negative rate=41.1%
False positive rate=9.0%
False negative rate=29.4%
Sensitivity rate=41.0%
Specificity rate=82.0%

Discussion

The findings of this study demonstrate that haematuria has much potential as a screening criterion in the community diagnosis of urinary schistosomiasis in endemic areas. This could be used, although with caution, for endemicity mapping of urinary schistosomiasis in south-eastern Nigeria prior to mass treatment of the human population. However, the relative low sensitivity rate of 41.0% should be of concern to all those who insist on thorough identifications of cases. While the public health significance of the sensitivity rate is of little consequence in areas of high endemicity where control drugs must be given to almost every eligible person, it nevertheless becomes important in communities with very low to moderate levels of endemicity where the community health action plan may strictly call for a selective distribution of drugs.

The low sensitivity rate of haematuria as an indicator of urinary schistosomiasis in a community demonstrates the significance of haematuria in the prognosis of the disease. As has been highlighted in the literature (Okpala, 1961; Pugh *et al.*, 1980; Anya & Okafor, 1986–1987; Lengeler *et al.*, 1991; Anosike *et al.*, 1992) haematuria is one of the major manifestations of urinary schistosomiasis. In old, chronic cases, examination of urine is unreliable since so many eggs become encapsulated in the tissues and do not escape regularly. Eggs which do escape (Chandler & Read, 1961) are often dead, blackened, or surrounded by a fuzzy coat of cells. This, in part, could account for the low sensitivity rate.

In the present study, the lack of haematuria is a more valid indicator of the absence of urinary schistosomiasis. This is reflected in the high specificity rate obtained which shows that in 82 out of 100 cases, the absence of

haematuria accurately identifies the absence of urinary schistosomiasis.

We also observed a close association between haematuria and the presence of *S. haematobium* eggs in the urine ($C = 0.88$ $P < 0.01$) similar to the reports of Mott *et al.* (1983), Mafiana *et al.* (1997) and Luka *et al.* (1997) who recorded values of coefficient of associations as 0.87 $P < 0.01$, 0.86 $P < 0.01$ and 0.88 $P < 0.01$ respectively, in other endemic areas. The close relationship between haematuria and presence of eggs in the urine could be exploited for the assessment of urinary schistosomiasis in communities. Consequently, the collection of urine specimens and their examination may not be necessary in the classification of communities according to the level of endemicity of urinary schistosomiasis.

The present study recommends a cautious approach to the widespread use of haematuria in the community diagnosis of urinary schistosomiasis. However, haematuria shows some age dependence bias as it decreased with age, (Akogun & Obadiah, 1996) and this was attributed by Weir, 1986 to be due to the waning of egg hypersensitivity with age. Perhaps one way to validate the use of haematuria as an indicator of urinary schistosomiasis infection is to use it only on persons within the first 20 years of their life as they represent the majority of patients with haematuria (Anya & Okafor, 1987; Nduka *et al.*, 1995). In south-eastern Nigeria and most other areas, villagers associate blood in the urine with schistosomiasis (Jordan & Webbe, 1982; Anosike *et al.*, 1992). The rationale of looking for minute amounts of blood in urine is therefore easily understood by lay persons. The use of haematuria as a diagnostic procedure for screening endemic communities for urinary schistosomiasis is indeed simple, cheap and rapid, as large areas could be covered within a relatively short period of time. Moreover, this approach does not require any biochemical skills. Besides, the approach has a high predictive value and can be used to identify with certainty communities which fall within the second quartile of schistosomiasis endemicity. The only requirement of this approach is the development of detailed guidelines with which field officers/school teachers can collect the desired information.

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