# The experience of visible haematuria among schoolchildren in Umba, Mlola and Mlalo divisions of Lushoto district, Tanga

K Massa, P Gagnussen, A Sheshe, R Ntakamulenga, B Ndawi and A Alsen

**Abstract:**

**Objective: To determine the prevalence of *S. haematobium* infection among schoolchildren in the three lowland divisions of Lushoto district. DESIGN: A cross sectional study.**
**Setting: A rapid assessment of the presence of *S. haematobium* infection was conducted using a questionnaire survey among schoolchildren in 20 primary schools in the three divisions.**
**Subject: Nine thousand and thirty three hundred schoolchildren aged between 6 and 15 years were examined for *S. haematobium* infection using a questionnaire which asked about past (1 month) and present experience of blood in urine.**
**Results: The prevalence of reported blood in urine was calculated for each division and Umba division recorded a significantly higher prevalence of 21.6% compared to Mlola and Mlalo divisions which had prevalence of 5.9 and 2.0%, respectively. Conclusion: Urinary schistosomiasis is prevalent in Lushoto district particularly in Umba division.**

**Keywords:** *Schistosoma haematobium,* haematuria, questionnaire, prevalence, schoolchildren, Lushoto

## Introduction

Schistosomiasis is a public health important and widespread infection in large parts of the world, particularly in the poorest sections of the populations residing in the least-developed countries[1]. Tanzania is one of the most severely affected countries in Africa[2]. Infections with *S. haematobium* are prevalent in Tanzania, but are focally distributed. The occurrence of the infection has recently been documented in Pangani district[3], northwest Tanzania[4, 5] and Zanzibar[6] , but no recent information exists on the distribution of *S. haematobium* in Lushoto district, Tanga region in northeast Tanzania.

Generally, the considered 'gold standard' technique for diagnosis of *S. haematobium* involves filtering of a urine sample and counting the number of eggs under a microscope[7] Although this test is highly specific and sensitive (if repeated over several days), analysing urine specimens over several days for more accurate prevalence of infections is time consuming and requires well trained personnel, equipment and finances. The first obvious symptom of *S. haematobium* infection is blood in the urine (haematuria) of the infected person[8], and therefore, cheaper and simpler approaches to diagnosis have been developed. These include reagent-strip (dipstick) tests (which reveal the presence of micro-haematuria) and self-reported blood in urine through interviews with public health personnel or questionnaires to schoolchildren administered by schoolteachers[9].

A number of studies have also demonstrated that the prevalence of reported blood in urine can be an effective indicator for presence of urinary schistosomiasis [10, 9, 11, 12, 13,3,14]. On the basis of the evidence, the use of questionnaire to screen for *S. haematobium* is now compelling and guidelines have been developed for district health managers[15]. In this study, a questionnaire was developed according to existing guidelines[15] and administered to all primary schools in the three lowlands divisions (Umba, Mlola, Mlalo) within Lushoto district.

**Correspondence to: Khalid Massa, School of Environmental Health, P O Box 1475, Tanga, Tanzania E-mail: kmkmassa@yahoo.com**

**[1]School of Environmental Health, Tanga, Tanzania [2]DBL- Centre for Health Research and Development, Faculty of Life Sciences, University of Copenhagen, Denmark, [3]National Environment Management Council, Dar es Salaam, Tanzania, [4]Primary Health Care Institute, Iringa, Tanzania**

## Material and Methods

### Study area and population

The study was conducted in the three above mentioned lowland divisions of Lushoto district, in north-east Tanzania. Lushoto district covers an area of about 3,500 km² [16] .It has an altitude ranging from 300-2,400 metres above the sea level and experiences high rainfall ranging from 600-1,200 mm per annum, with an average annual of 1,100 mm. The long rainy period occurs from March to May, while short rains occur from October-December. Mean daily temperatures are highest in January and lowest in July. The dry season is from January to March with September also occasionally being dry[17]. The lowlands cover about 25% of the district and are characterized by hot weather with the mean annual temperature of 25-27ºC. The Umba River and seasonal streams pass through the lowlands.

Administratively, Lushoto district is divided into 8 divisions, 32 wards and 137 registered villages with a population estimated at 419,970 people among which 132,046 are estimated to be school-age children (6-15 years)[18] . The main ethnic groups in Lushoto are the Sambaa (about 70%), the Pare and the Mbugu. The majority (98%) of the population are peasants who are engaged in small-scale farming and petty trade.

### Questionnaire administration

The questionnaire was administered to schoolchildren in the 23 primary schools in the three lowland divisions in Lushoto district. Questionnaires were given to the Ward Education Officers (WEOs), who distributed them to the head teachers of the schools. The research team instructed the WEOs on how to complete the questionnaires, and the WEOs passed on the knowledge to head teachers. The head teachers distributed the questionnaires to the schoolteachers who were asked to read the simple instructions, fill in the sex and age of the children and then interview the schoolchildren individually on past (1 month) and present experience on visible haematuria.. The schoolteachers had to return the completed questionnaire to their head teachers who then sent them back to the WEOs from whom the research team finally collected them.

The questionnaire was administered by a class teacher to schoolchildren of class 1, 2 and 5 to assess past and

present experience of visible haematuria. The questionnaire was prepared in Kiswahili, the national language of Tanzania and the central symptom 'blood in urine' was hidden among other symptoms (e.g. cough, itch and headache). The interviewed schoolchildren were asked about the symptoms during the past month. The options of response to the questions were recorded by a teacher as either: "yes", "no" or "–" if the schoolchild did not remember or could not answer.

**Data analysis**

All data were carefully checked, entered and analysed by the PI into computer using STATA software. The prevalence of reported blood in urine was calculated for each division in terms of the percentage of children who reported blood in urine ("yes" response) of the total number of interviewed. Chi-square test was used to compare differences in prevalence of blood in urine between divisions and the $P<0.05$ was considered significant

**Ethical considerations**

Ethical clearance to conduct the study was obtained from the National Medical Research Coordinating Committee of the National Institute for Medical Research in Tanzania. The Danish National Committee on Biomedical Research Ethics recommended the study. The District Education Authority, WEOs and head teachers were informed about the purpose of the study before it started. All children in the participating schools were treated free of charge with praziquantel.

Permission was sought from the Lushoto District Education Officer and the research team paid a preparatory visit to see the WEOs in all wards in the three divisions to discuss the implementation of the proposed study.

**Results**

The return rate of school questionnaires was high, with 20 (86.9%) of the 23 primary schools returning 100% correctly completed questionnaires. The three schools which did not return the questionnaires explained this as lack of transport to reach the WEO. Schoolchildren who answered 'yes' to the question on presence or absence of blood in urine were defined as infected, and those who answered 'no' or '-'were considered as uninfected.

In Umba division a total of 2,867 schoolchildren were interviewed with 618 (21.6%) reported infected by the survey (Table). Among them 298 (48.2%) were females and 320 (51.8%) were males. In Mlola division a total of 2,316 schoolchildren were interviewed with 137 (5.9%) recorded infected by the survey. Among them 64 (46.7%) were females and 73 (53.3%) were males. In Mlalo division a total of 3,850 schoolchildren were interviewed with 77 (2.0%) found infected by the survey. Among them 37 (48.1%) were females and 40 (51.9%) were males. Prevalence was similar between females and males within each division ($P>0.05$, Table 1.) and within all age groups. Prevalence increased significantly with age in all three divisions. Umba division had a significantly higher prevalence of visible haematuria in all age groups compared to Mlola and Mlalo divisions ($P<0.0005$).

Table 1. Prevalence of visible haematuria among 9.033 interviewed schoolchildren in 20 primary schools by division, sex and age group

| | **Number of interviewed children by sex (%)** | | **Number of infected children by sex (%)** | | **Total infected (%)** |
|---|---|---|---|---|---|
| | Females | Males | Females | Males | All |
| Division (n) | | | | | |
| Umba (2,867) | 1,396 (48.7%) | 1,471 (51.3%) | 298 (21.3%) | 320 (21.8%) | 618 (21.6%) |
| | | | $P = 0.79$ | $X^2 = 0.0702$ | |
| < 9 years | 684 (49.1%) | 708 (50.9%) | 105 (15. 4%) | 115 (16.2%) | 220 (15.8%) |
| 9-12 years | 563 (49.0%) | 585 (51.0%) | 138 (24.5%) | 145 (24.8%) | 283 (24.7%) |
| > 12 years | 149 (45.6%) | 178 (54.4%) | 55 (36.9%) | 60 (33.7%) | 115 (35.2%) |
| | | | $P<0.0005$ | $P<0.0005$ | |
| Mlola (2,316) | 1,092 (47.2%) | 1,224 (52.8%) | 64 (5.9%) | 73 (6.0%) | 137 (5.9%) |
| | | | $P = 0.91$ | $X^2 = 0.0111$ | |
| < 9 years | 532 (47.5%) | 587 (52.5%) | 19 (3.6%) | 20 (3.4%) | 39 (3.5%) |
| 9-12 years | 434 (46.7%) | 495 (53.3%) | 33 (7.6%) | 38 (7.7%) | 71 (7.6%) |
| > 12 years | 126 (47.0%) | 142 (53.0%) | 12 (9.5%) | 15 (10.6%) | 27 (10.1%) |
| | | | $P = 0.005$ | $P = 0.001$ | |
| Mlalo (3,850) | 1,933 (50.2%) | 1,917 (49.8%) | 37 (1.9%) | 40 (2.1%) | 77 (2.0%) |
| | | | $P = 0.70$ | $X^2 = 0.1461$ | |
| < 9 years | 901 (50.6%) | 878 (49.4%) | 9 (1.0%) | 11 (1.3%) | 20 (1.1%) |
| 9-12 years | 797 (50.3%) | 789 (49.7%) | 21 (2.6%) | 20 (2.5%) | 41 (2.6%) |
| >12 years | 235 (48.5%) | 250 (51.5%) | 7 (3.0%) | 9 (3.6%) | 16 (3.3%) |
| | | | $P = 0.02$ | $P = 0.03$ | |

**Discussion**

Infections with *Schistosoma haematobium* are prevalent in Tanzania, but to date information on the occurrence in Lushoto district is lacking. The questionnaire approach was used due to its relative simplicity, low cost and fast response to determine the prevalence of *S. haematobium* infection among schoolchildren in the three lowland divisions of Lushoto district. The success of the questionnaires is explained by the fact that *S. haematobium* infections are easily perceived through the presence of blood in urine[19, 9]. A linear relationship was found when comparing questionnaire positive rate for "schistosomiasis" with prevalence of *S. haematobium* from biomedical testing[15].The questionnaire positive rate for "schistosomiasis" was approximately equal to the prevalence of *S. haematobium* from biomedical testing for rates below 40%, while rates of 80% by questionnaires correspond to egg excretion by 100% of the children[15]. Our results thus indicate that the prevalence of *S. haematobium* infection is close to the results for visible haematuria, namely 21.6, 5.9 and 2.0% in Umba, Mlola and Mlalo divisions, respectively.

## Conflicts of interest statement

The authors have no conflicts of interest concerning the work reported in this paper.

## Authors' contributions

All authors planned the study and designed the protocol. KM conducted the field study and managed and collected the data. KM carried out the analyses and interpretation of the data and prepared the first draft of the manuscript. All authors were involved in preparing subsequent drafts and read and approved the final manuscript. KM is guarantor of the paper.

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