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# Prevalence and Risk Factors of *Schistosoma heamatobium* Infection among Children in Tungar Amma Kware Local Government Area, Sokoto State

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**Abstract**
Schistosomiasis remains one of the most prevalent parasitic worm infections and has significant economic and public health consequences. The study was conducted to determine the prevalence and risk factors of Schistosoma heamatobium infections among children in Tungar Amma Village of Kware local government Area of Sokoto, State, Nigeria. A total of 100 samples were collected and processed according to standard parasitological techniques. Out of 100 urine samples 23(23%) had infection with statistically significant difference in infection rates among males (26.7%) and female (17.5%). Children between ages 12 - 14 years had a higher prevalence of 26.7% compared with children between the ages 6 - 8 years (13.3%). Based on associated risk factors, those whose father's occupation is farming were more exposed to the infection with a prevalence of (24.6%) followed by those that is fishing with (17.2%) The lower prevalence reported by the present study could be attributed to the integrated and cost-effective approaches implemented by the Federal Ministry of Health to eliminate Schistosomiasis. Effective measures and health education are required in the study area so as to prevent the further spread of the disease.

***Keywords:*** Prevalence, Risk factors, Schistosoma heamatobium and Children

## Introduction

Schistosoma haematobium (urinary blood fluke) is a species of digenetic trematode, belonging to a group (genus) of blood flukes (Schistosoma) (Berry et al., 2017). It is found in Africa and the Middle East. It is the major agent of schistosomiasis, the most prevalent parasitic infection in humans (Antoni et al., 2017). It is the only blood fluke that infects the urinary tract, causing urinary schistosomiasis and is the leading cause of bladder cancer (only next to tobacco smoking) (Van Tong et al., 2017). The diseases are caused by the eggs (Muhammad et al., 2018). Globally, an estimated 239 million people are currently infected, with burden estimated at more than 3.5 million disability-adjusted life years (WHO, 2015). Adults are found in the venous plexuses around the urinary bladder and the released eggs travel to the wall of the urine bladder causing haematuria and fibrosis of the bladder (Ross et al., 2017).

The bladder becomes calcified, and there is increased pressure on ureters and kidneys otherwise known as hydronephrosis. (Van tong et al., 2017). Schistosoma haematobium eggs often end up in the urinary and reproductive organs causing inflammation and lesions (Schur et al., 2012). When the eggs lodge in the genital tract they cause a form of the disease called genital schistosomiasis (Babamale el al., 2018). Schistosomiasis is a snail-borne parasitic disease of great concern worldwide, occurring mainly in Africa, Asia, and to a lesser degree in South America and the Middle East. In non-endemic areas, there is a growing number of people potentially infected, given the increasing number of immigrants, foreign workers, and travelers (Guegan et al., 2019).

Urinary schistosomiasis is a common neglected tropical disease in many rural communities in African countries, with patches of infection in

the Eastern Mediterranean Region (WHO, 2015). In many endemic areas, severely infected individuals may suffer fibrosis of the bladder, kidney damage, bladder cancer, and death if untreated (Abdulkadir et al., 2017). Schistosoma haematobium was the first blood fluke discovered. Theodor Bilharz, a German surgeon working in Cairo, identified the parasite as a causative agent of urinary infection in 1851. (Tan and Ahana, 2007) After the discovery, the infection (generally including all Schistosome infections) was called bilharzia or bilharziasis (Barakat 2013). Adult Schistosoma haematobium worms inhabit blood vessels surrounding the urinary bladder and female genital tract and lay eggs that migrate through tissue of proximate organs, causing chronic to granulomatous inflammation most commonly in the urinary bladder, ureters, cervix, and vagina (Khalaf et al., 2011).

In Nigeria, urinary schistosomiasis is a serious health problem with about 29 million infected cases and 101 million people at risk of infection (Tan and Ahana 2007) previous reports showed unabated increase of infection in all the geographical zones of the country, particularly among the school children (Babatunde et al., 2013). Epidemiological studies in many endemic communities have attributed sustained infection to many factors including routine agricultural practices, human behaviour, and failed water projects to meet the needs of people (Babamale et al., 2018). In Sokoto and its neighbouring States, urinary schistosomiasis has been reported in several communities (Aminu et al., 2014). Although highly preventable, the disease ranks second only to malaria in terms of prevalence and socio-economic importance of parasitic diseases. Urinary schistosomiasis reported among school children 60.8% prevalence in Sokoto metropolis, Sokoto state (Singh and Muddasiru, 2014). Moreover, most districts in Sokoto State do not have their local estimates to guide planning and implementation of control interventions at local government level (Aminu et al., 2014).

## Materials and Methods

### Sample and Data Collection

One hundred specimens (urine) were collected from the population of male and female children aged 6-16 years residing in Tungar amma village in Kware local government area of Sokoto state, after a verbal and written consent of the children and their relatives obtained. Each pupil was given a 30-ml sterile wide mouth, screw-capped plastic container carrying their identification number and instructed on how to collect the urine sample. About 20ml of urine was collected from each of the enrolled children using labelled universal bottles. Samples were collected between 10:00am - 14: 00pm hours of the day when Schistosome excretions are known to be highest and were then preserved in the cooler using ice pack and transported to the laboratory within 30 minutes. At the point of collection of sample questionnaire were given to obtain information on bio data (age, gender, and occupation of parents.), source of water supply, frequency of water contact, and other risk-related factors of schistosomiasis, and also knowledge about the disease, and previous praziquantel treatment. The data was recorded on a collection form that kept confidential hereafter, all collected urine samples was be transported to the medical microbiology laboratory, school of medical laboratory science Usmanu Danfodiyo university Sokoto, for parasitological analysis.

### Administration of Questionnaire

A questionnaire titled 'Investigation of risk factors associated with the transmission of urinary schistosomiasis in Tungar amma village Community was administered verbally to each participant, parent, or guardian by the research assistants with the generous support of school tutors, who will help in communicating effectively in the local dialect. The questionnaire included age, residence, source(s) of water for domestic use, water contact activities, history of diseases with symptoms of haematuria, access to healthcare facilities, and the occupation of parents or guardian, amongst others.

### Parasitological Examination

A clean universal container was labelled with the participant's identity and given to each participant for the collection of urine samples. The terminal urine sample was collected at the time usually 10am-14pm, which has the high

concentrated amount of parasite in the sample. The specimen containers were then placed in the cooler using ice pack to preserve and prevent the ova of S. haematobium from hatching during transportation to the laboratory When the sample is collected it was processed immediately in medical microbiology laboratory, school of medical laboratory science UDUS.

**Examination of Urine**

**Macroscopy**

The sample was examined macroscopically for colour, turbidity, volume, odour and microscopically for presence of parasites.

**Microscopy**

The urine samples were prepared for examination using the sedimentation method described in (Cheesbrough, 2009). About 10ml of the well mixed urine were poured into a centrifuge tube, and centrifuged at 3000 revolutions per minute for 3 minutes. The supernatant was decanted gently without disturbing the sediment. A drop of the sediment was transferred on to a clean glass slide, covered with a clean cover slip and examine microscopically under X10 and X40 objective with the condenser iris closed sufficiently to give good contrast. The number of Schistosoma haematobium eggs will be counted and record (Cheesbrough, 2009).

**Urine Analysis**

A combi nine strip was removed from container and dipped in urine sample, the strip was removed and blotted then compared on colour chart and result was observed and recorded within sixty seconds (Cheesbrough 2009).

**Results**

The socio-demographic characteristics of the study participants in relation to gender are shown in Table 1. Of the 100 participants, 60.0% (60/100) were male and 40.0% (40/100) were female. The higher prevalence was found in male (26.7%). were positive and (17.5%), were positive in female. Age prevalence of schistosomiasis shown in Table 2. The age group 6-8 years recorded a prevalence of 13.3% while a prevalence of 15.4% was observed in age range 9-11. However, the prevalence of 26.7% was observed in age group 12-14 years and the highest prevalence of 41.7% was observed in age group 15-17 years.

Table 3 shows the associated risk factors and indicated that those whose father's occupation is farming were more exposed to the infection with a prevalence of (24.6%) followed by those that are fishing with (17.2%), followed by those that are artisan, and the least prevalence was recorded from those whose parents are civil servant, (33.3%).

It was observed that higher prevalence was seen in subjects whose source of water supply is from well (23.9%) and those whose water source are from borehole (12.5%). It was also observed that those who are in contact with water has the higher prevalence of (31.0%) and those who are not in contact with water (11.9%). And the result showed a higher prevalence from those with haematuria (43.3%). and those without haematuria (14.3%).

**Table 1: Prevalence of Urinary Schistosomiasis based on Gender of Subjects**

| Gender | N | N (%) Positive | N (%) Negative |
|---|---|---|---|
| Male | 60 | 16(26.7) | 44(73.3) |
| Female | 40 | 7(17.5) | 33(82.5) |
| **Total** | **100** | **23(23)** | **77(77)** |

$\chi^2$= 1.14; P- value = 0.286; N = number

**Table 2: Prevalence of Urinary Schistosomiasis based on the Age of the Subjects**

| Age (Years) | N | N (%) Positive | N (%) Negative |
|---|---|---|---|
| 6 – 8 | 30 | 4(13.3) | 26(86.7) |
| 9 – 11 | 13 | 2(15.4) | 11(84.6) |
| 12 – 14 | 45 | 12(26.7) | 33(73.3 |
| 15 – 17 | 12 | 5(41.7) | 7(58.3) |
| **Total** | **100** | **23(23)** | **77(77)** |

$\chi^2 = 4.71$; P- value = 0.194; N = number

**Tale 3: Risk Factor of Schistosomiasis based on the Occupation of the Parents, Water Source, Water Contact Activities and Haematuria.**

| Variables | N | N (%) Positive | N (%) Negative | $\chi^2$ | P= value |
|---|---|---|---|---|---|
| **Father's Occupation** | | | | 0.93 | 0.817 |
| Farming | 61 | 15(24.6) | 46(75.5) | | |
| Fishing | 29 | 5(17.2) | 24(82.8) | | |
| Artisan | 7 | 2(28.6) | 5(71.4) | | |
| Civil servant | 3 | 1(33.3) | 2(66.7) | | |
| **Water Source** | | | | 0.54 | 0.462 |
| Well | 92 | 22(23.9) | 70(76.1) | | |
| Bore hole | 8 | 1(12.5) | 7(87.5) | | |
| **Water contact activities** | | | | 5.03 | 0.025 |
| Yes | 58 | 18(31.0) | 40(69.0) | | |
| No | 42 | 5(11.9) | 37(88.1) | | |
| **Haematuria** | | | | 10.01 | 0.002 |
| Yes | 30 | 13(43.3) | 17(56.7) | | |
| No | 70 | 10(14.3) | 60(85.7) | | |
| Total | 100 | 23(23) | 77(77) | | |

$\chi^2$ = chi square n% = number

**Discussion**

The current study was conducted to determine the prevalence of *S. haematobium* infection in Tungar amma village Kware local government area of Sokoto State. The result of this study showed an overall prevalence of 23%. However, Abdullahi *et al.,* (2020) reported a low prevalence of 7.7% in Kano. The difference in prevalence could be due to differences in environmental factors that can, in turn, lead to differences in transmission intensity. The lower prevalence reported by the present study could be attributed to the integrated and cost-effective approaches implemented by the Federal Ministry of Health to eliminate multiple NTDs in Nigeria including Schistosomiasis. However, Muhammad *et al.* (2018) reported a higher prevalence of 35.5% in Sokoto, Abdulkadir *et al*. (2017) reported 34.7% in Kebbi while Aminu *et al. (*2014) reported a prevalence of 37.7% in Wurno. The difference in prevalence is due to the number of the sample size, because my sample size is lower than their own.

A review of the prevalence of urinary Schistosomiasis based on gender of subjects indicated that male has the higher prevalence of 26.7% and female has lower prevalence of 17.5%. However, Abdullahi *et al*. (2020) reported higher prevalence among male 6% and female 3% in Kano. Also, Muhammad *et al.* (2018) reported a prevalence of 35.3% among male and female 32.8%, in Sokoto. Faith *et al.* (2021) reported 42.3% among male and female 31.6%. The reason for this a higher male gender prevalence could be due to the fact that males have the higher number of participants in this study and also socio-cultural factors where male are mostly engaged in water contact activities like swimming and bathing, farming, fishing, and watering cattle could lead to higher exposure among males.

The prevalence of urinary *Schistosomiasis* among the subjects based on age indicated that the age group 12 – 14 years has higher prevalence in this study with the occurrence rate 26.7% and lowest occurrence recorded among age group 6 – 8 years with 13.3%. This finding agrees with that of Muhammad *et al.* (2018). Who reported 33.5% among age group 10 – 14 years in Kwalkwalawa Wamakko local government area Sokoto State. Also, Abdullahi *et al*. (2020) reported a prevalence of 3.4% among 12 – 14 years and 1.7% 6 – 8 years in Kano. Higher prevalence among this age category could be attributed to the high rate of water contact activities by the age group and their susceptibility to infection with respect to their immune response.

Occupation of father is associated with urinary schistosomiasis where children whose fathers are farmer were more infected 24.6% followed by fishing 17.2%. This finding agreed with a previous report by Muhammad *et al.* (2018) who reported that children whose fathers are farmers were more predisposed 69.1% followed by those who fathers are involved in fishing children 48.5% while other professions accounted for 23.1%. Abdullahi *et al*. (2020) reported 3.4%,1.7%, and 1.7% for farming, fishing and other professions respectively in Kano. Children often participated in field activities with their fathers. This shows lack of awareness towards risk of urinary schistosomiasis among fathers to make their children aware of the risk of urinary schistosomiasis. A protective role of the head of the family being literate and informed on urinary schistosomiasis was reported from an earlier study in South-western Nigeria (Abou-Zeid *et al*., 2013).

High prevalence among children with the habit of swimming, fetching of water from the rivers, washing of cloth in the ponds, was observed with a significant association to urinary Schistosomiasis (p=0.005). Similar result was reported in a previous report by Muhammad *et al.* (2018). Despite the high prevalence of urinary schistosomiasis with the habit of swimming, children swimming regularly accounted for 31.0% while those swimming sometimes accounted for 11.9% of the current total prevalence of urinary schistosomiasis. This indicates that long duration of hours of water contact was considered as an important risk factor for exposure to urinary schistosomiasis rather than frequency of water contact.

There was a close association between haematuria and the presence of *S. haematobium.* Data from the previous studies indicated that people who tested positive for schistosomiasis are at greater risk of haematuria as compared to

those who tested negative. The result further indicated that haematuria may be a very useful clinical tool for the diagnosis of Schistosoma infections. This finding agrees with the reports of Muhammad *et al.* (2018) in Sokoto that had such association.

## Conclusion

The current study showed that a significant number of school children in the study area suffer from the disease. It can also be concluded that males are at higher risk of the diseases than female in the study area. Also, the lack of proper knowledge of the cause of the disease and insufficient safe water supplies coupled with inadequate health care facilities may have influenced the infection rate and distribution of the disease in the area. Appropriate intervention and health education for the community are required for the control and prevention of urinary schistosomiasis and its attendant illnesses in the area.

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