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COFACTORS INFLUENCING PREVALENCE AND INTENSITY OF *Schistosoma haematobium* INFECTION IN SEDENTARY FULANI SETTLEMENTS OF DUMBI, IGABI LGA, KADUNA STATE, NIGERIA.

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ABSTRACT
An epidemiological study of sedentary Fulani settlements in Dumbi, Igabi Local Government Area of Kaduna State was undertaken to determine cofactors of *Schistosoma haematobium* prevalence and intensity of infection. Consenting individuals were recruited after sensitization from six settlements and administered a structured questionnaire to obtain demographic and risk factors data. Urine samples were collected from 657 individuals and analyzed by centrifugation, and the number of ova was determined by microscopy. The population had an overall intensity of 73.93±17.4 with the highest value of 100.9±31.3 recorded in Dumbin Ladan while Angwan Sarki and Angwan Majima had lower intensities of 4.00 ± 0.00 and 15.0 ± 0.00 respectively. Differences in intensity between males (73.44± 17.04) and females (77.82±48.96) were not significant (P>0.05). Although the correlation between age and intensity of infection was negative (r=–0.81), the infection was significantly associated with the age group 11-20 years. There was significant association between risk factors; such as occupation, activities at the ponds, source of domestic water supply and distance of hamlets to ponds and the prevalence of the disease. Cattle rearing (OR=9.01; CI=4.00-20.75; P=0.00) and farming (OR=3.14; CI=1.82-5.43; P=0.00) showed significant association with the prevalence and intensity of the disease. Based on activities at the water bodies, people who fished and washed had the highest prevalence rate of 63.53%, while the highest mean intensity of the infection was observed in individuals that wash, fish, bath and water their cattle in the water bodies (OR=13.41; CI=8.64-20.8; P<0.05). Similarly, other activities such as bathing (OR=3.32; CI=1.76-6.27; P<0.05) and washing (OR=2.17; CI=0.59-7.72; P<0.05) were significantly associated with the intensity of the infection. Pond water as a major source of water supply showed significant association with the intensity of the disease (OR=61.63; CI=29.37-133.7; P<0.05). The study has revealed that urinary schistosomiasis is endemic in the settlements based on the intensity and human activities in the ponds that are the major source of water. The integrated control is recommended for the control of the disease in this area.

Key words: Urinary schistosomiasis, prevalence, Dumbin Dutse, centrifugation, epidemiological, sedentary

INTRODUCTION
Urinary schistosomiasis is endemic in sub-tropical areas of the world and is regarded as one of the neglected tropical diseases (NTDs) by the world health organization. It is caused by the blood-dwelling fluke worm called *Schistosoma haematobium* (WHO, 2007). It is one of the most widespread of all human parasitic diseases, ranking second only to malaria in terms of its socioeconomic and public health importance in tropical and subtropical areas (Okoli & Odaibo, 1999; Ibidapo *et al*., 2005). It is also the most prevalent of the waterborne diseases and constitutes a serious health risks in rural areas of developing countries. As a rural, often occupational disease, urinary schistosomiasis principally affects people who are unable to avoid contact with water, either because of their profession (agriculture, fishing) or because of a lack of a reliable source of safe water for drinking, washing and bathing (WHO, 1993).

One factor responsible for the spread of the disease is mobility (WHO, 1993). Schistosomiasis is endemic in 74 tropical developing countries where some 600 million people are at risk of becoming infected and 200 million people already infected (WHO, 1993; Chitsulo *et al*., 2000; Gibodat, 2000). The disease is common in the Niger basin and is found in every country within the West African sub-region (& Wright, 1985). The disease is also endemic in Nigeria (Okafor, 1990; Okpala *et al.,* 2004; Ibidapo *et al.,* 2005; Okoli *et al.,* 2006). Nigeria is one of the most severely affected countries in Africa with an estimated 101.28 million people at risk of infection and 25.83 million already infected with *Schistosoma haematobium, Schistosoma mansoni* and *Schistosoma intercalatum* (Chitsulo *et al*., 2000).

MATERIALS AND METHODS
Study area: Dumbi is located in Igabi Local Government Area of Kaduna State between Latitude 10º56'N and Longitude 7º37'E. It is made-up of six hamlets; Dumbin Ladan, Angwan Sarki, Angwan Majima, Angwan Kastinawa, Sabon Gida and Angwan Sullubawa. Figure 1 shows the spatial distribution of the hamlets around ponds and streams in the area, based on proximity to the ponds. Dumbin Ladan was divided into two: Dumbin Ladan 1 and Dumbin Ladan 2.

The inhabitants of Dumbi hamlets are mostly nomadic Fulani who have permanent settlements. Their occupation is mainly cattle rearing, farming and fishing in the ponds. Their major source of water is the ponds and streams (Fig. 1).

Sample collection
Ethical consideration: Ethical clearance was obtained from the Kaduna State Ministry of Health. The permission of the traditional village head of each settlement was obtained, who conscientiously allowed the use of the community to carry out the research work and asked for the cooperation of his subjects. The people were first educated on the importance of the study and only consenting individuals were recruited for the study.

Urine collection: Urine samples were collected from the consenting individuals between 10:00 am and 14:00 pm, into wide mouthed specimen bottles. Samples were collected from both males and females of all ages, who have been instructed on how to collect the urine into the sample bottles. The specimen bottles were labeled with an identification number which corresponded to the individual that was administered the questionnaire. The specimens were transported in a cold box containing ice blocks to laboratory where they were analyzed by centrifugation followed by urine microscopy.

Urine analysis: 10mls of each urine sample was measured into the tube and centrifuged at 5000 rpm for 5 minutes. The supernatant was discarded and the all the sediments was examined at ×40 objective under the microscope. The eggs were detected and identified according to the shape and terminal spine characteristic of *S. haematobium* (Feldmeier *et al*., 1993). Positive samples eggs were counted and recorded as number of egg per 10 ml urine.

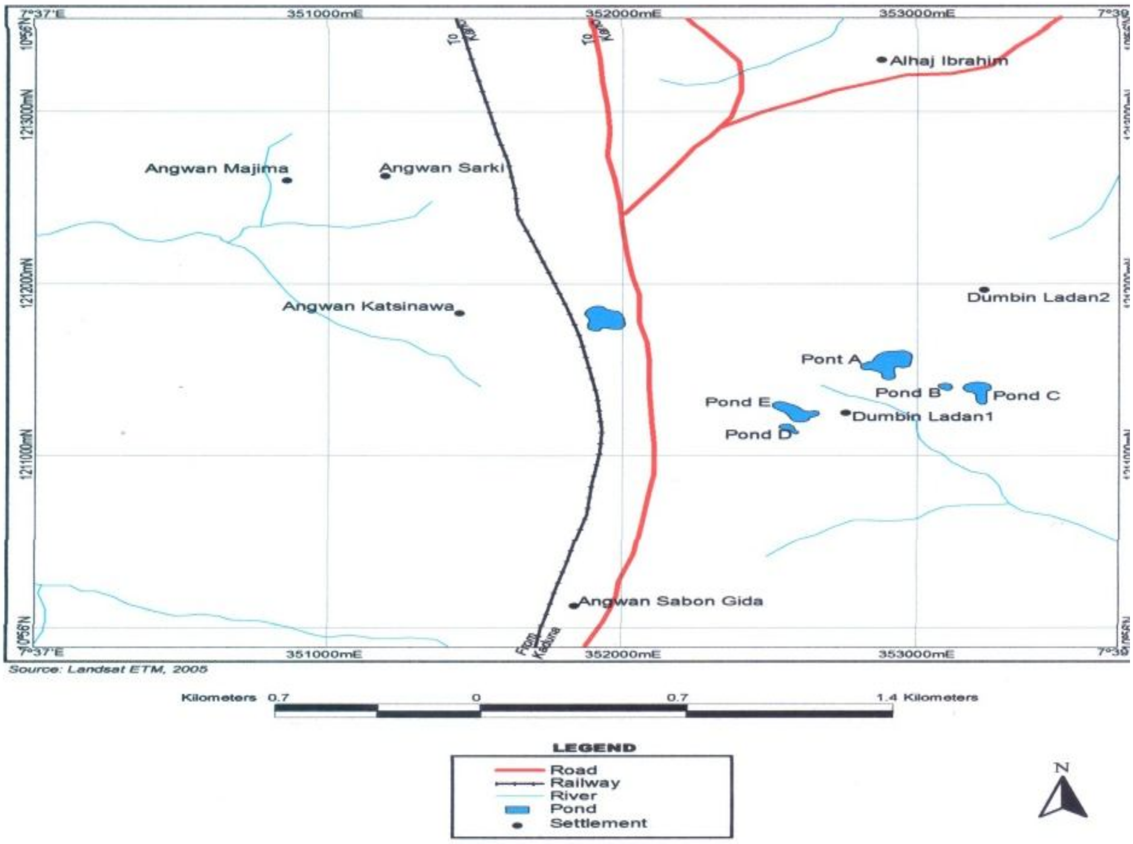

FIG. 1. SPATIAL DISTRIBUTION OF DUMBI HAMLETS.

Administration of questionnaires: A structured questionnaire was administered to the consenting individuals recruited for the study in which demographic data (age, sex, marital status, occupation, knowledge of the disease and vector etc) and risk factors (such as occupation, distance to ponds, source of domestic water supply, activities at the water bodies etc) were recorded. The questionnaire was interpreted in the local dialect (Hausa language) for ease of understanding of those who cannot read or speak the English language. Each questionnaire was given an identification number which also corresponded to the individual whom urine sample was collected.

RESULTS

The overall intensity of urinary schistosomiasis per 10ml of urine is 73.93±17.4. Dumbin Ladan had the highest mean intensity of 100.9±31.3, while Sabon Gida had the lowest intensities of 1.0±00. Dumbin Ladan and Sabon Gida showed significant association with the intensity of the disease as shown in Table 1.

TABLE 1. INTENSITY OF *Schistosoma haematobium* INFECTION IN RELATION TO HAMLETS.

Hamlets	No. Sampled	No. Infected	Intensity (mean ova count/10ml urine± S.E)	Odd Ratio(95%CI)	χ2	P-value
Dumbin Ladan	143	87	100.9±31.3	8.68(5.63,13.4)	121.2	0.0000*
Angwan Sarki	168	1	4.0±00	0.01(0.00,0.08)	70.41	0.0000*
Angwan Kastinawa	122	69	45.7±6.2	5.95(3.83,9.27)	76.72	0.0000*
Angwan Majima	172	1	15.0±00	0.01(0.00,0.08)	72.81	0.0000*
Sabon Gida	33	3	1.0±00	0.29(0.07,0.99)	3.89	0.0486*
Angwan Sullubawa	19	4	8.0±3.85	0.79(0.22,2.59)	0.02	0.0040*
Total	**657**	**165**	**73.93±17.4**			

The intensity of urinary schistosomiasis was shown to be higher in females (2.89%) than in the males (2.86%) (Fig 1). Age group 11-20 years showed the highest intensity while least intensity was recorded in the 40+years age group, indicating a decrease in intensity with age (Fig. 3).

Intensity of urinary schistosomiasis was highest among the herdsmen (160.42±76.87) while the least intensity was recorded among people of other occupation (63.61±19.20) (Table 2).

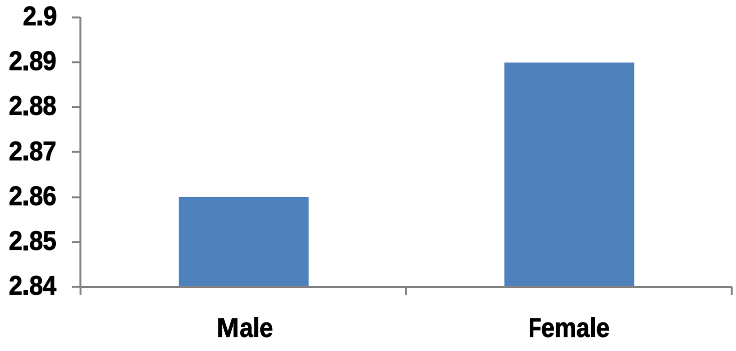

FIG. 2. MEAN INTENSITY OF URINARY SCHISTOSOMIASIS INFECTION ACCORDING TO SEX IN DUMBI.

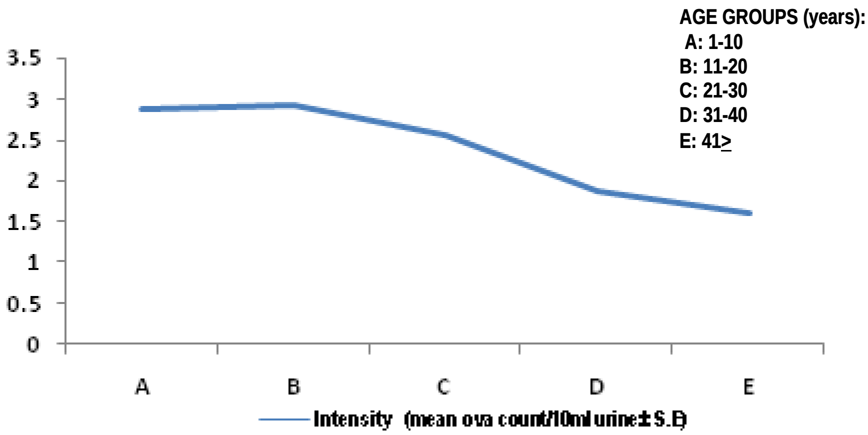

FIG. 3. MEAN INTENSITY OF URINARY SCHISTOSOMIASIS INFECTION ACCORDING AGE GROUP IN DUMBI.

TABLE 2. INTENSITY OF *Schistosoma haematobium* INFECTION IN RELATION TO THE OCCUPATION OF INHABITANTS.

Occupation	No. Sampled	No. Infected	Prevalence (%)	Intensity of infection/10ml urine	Odd Ratio (95%C.I)	Chi-Square (χ2)	P-value
Herdsmen	34	24	70.59	160.42±76.87	9.01(4.00,20.75)	41.23	0.0000*
Farmers	67	32	47.76	41.50±8.92	3.14(1.82,5.43)	19.03	0.0000*
Businessmen	3	1	33.33	20.0±0.00	1.49	0.11	0.7352
Others	424	106	25.47	63.61±19.20	0.98(0.67,1.44)	0	0.9976
Total	**657**	**165**	**25.11**	**73.93±17.4**			

The highest intensity of *Schistosoma haematobium* infection of 142.45±92.57 per 10 ml of urine was observed in people who fish, wash, bath and water their cattle in these water bodies and the lowest in people who only wash (31.20±10.17) as shown in Table 3.

Based on the sources of domestic water supply, the result shows that the people that depended solely on the infested ponds had the highest intensity (76.99 ±17.76) while those who have boreholes had the lowest intensity (9.50±5.50). This is presented in Table 4.

TABLE 3. INTENSITY OF *Schistosoma haematobiun* IN RELATION TO WATER CONTACT ACTIVITIES OF INHABITANTS OF DUMBI

Water Contact Activities	No. Sampled	No. Infected	Prevalence (%)	Intensity of Infection	Odds Ratio (95% C.I)	Chi Square (χ2)	P-value
Fishing	3	00	00.00	00.0	0.00(0.00,6.68)	0.11	0.4193
Washing	12	5	41.67	31.20 ±10.17	2.17 (0.59,7.72)	1.00	0.3180
Bathing	48	24	50.00	60.96±14.19	3.32 (1.76,6.27)	15.65	0.0000*
Watering cattle	4	00	00.00	00.0	0.00(0.0,4.57)	0.34	0.5595
Fish &Watering	170	108	63.53	63.45±18.80	13.41(8.64,20.8)	179.36	0.0000*
Fishing, Watering & Bathing	374	21	5.61	107.57±44.17	0.06 (0.03,0.10)	173.14	0.0000*
Fishing,Watering, Bathing & Watering cattle	46	7	15.22	142.45±92.57	0.51 (0.21,1.23)	2.04	0.1531
Total	**657**	**165**	**25.11**	**73.93±17.4**			

TABLE 4. INTENSITY OF *Schistosoma haematobium* IN RELATION TO THE SOURCE OF DOMESTIC WATER SUPPLY

Source of water	No. sampled	No. infected	Prevalence (%)	Intensity of infection	Odd Ratio (C I)	Chi-Square (χ2)	P-value
Stream	52	7	13.46	5.00±2.50	0.44 (0.18+1.04)	3.43	0.0695
Pond	265	156	58.87	76.99±17.76	61.63(29.37+133.7)	267.90	0.0000*
Borehole	340	2	0.59	9.50±5.50	0.01 (0.00+0.02)	222.69	0.0000*
Total	**657**	**165**	**25.11**	**73.93±17.4**			

DISCUSSION

The highest intensity recorded at Dumbin Ladan could be due to the presence of the infested ponds within the hamlet which serve as the major source of water for domestic purposes.Thereby predisposing them to the risk of infection. The lowest intensity was recorded in the hamlets which have boreholes. This shows the important role safe water supply plays in the control of urinary schistosomiasis (Udonsi *et al.,* 1990; Okoli *et al.,* 2006; WHO, 2007; Chigozie *et al.*, 2007).

The females had a higher mean intensity than the males, indicating a heavier worm burden in the females than in the males. This could be due to the fact that the females also, herd the cattle and carry out domestic chores at these ponds. This increases the frequency of their contact with the ponds.

The intensity of the disease showed a strong negative correlation (-0.81) with age. This could be due to the fact that young children are often involve in more activities that bring them to infested ponds, such as watering of the cattle, washing and bathing. The decrease with increase in age could also be due to reduced water contact and increased immunity with increase in age as earlier reported by Okoli *et al.,* (2006) and Chigozie *et al.,* (2007).

There was a significant association between the occupation and the prevalence and intensity of the disease. This can be attributed to the high frequency of contact the herdsmen and farmers have with the infested water, which predisposes them to the risk of infection as reported by Nmorsi *et al*., 2005; Okoli *et al*., (2006).

Based on the activities carried out in the infested ponds, the highest intensity was recorded in those who fish, wash, bath and water their cattle at these water bodies. All these activities increase the frequency of contact the inhabitants had with the infested water bodies. This agrees with Udonsi, (1990), who reported that water contact activities and traditional agricultural practices are factors which contribute to the transmission of the disease.

The use of these ponds as the major source of water supply predisposes the inhabitant to the risk of infection with urinary schistosomiasis. This can be attributed to high contact with the infested water bodies, which is a risk factor, as reported by Chigozie *et al*., (2007).

CONCLUSION

With a heavy egg burden of 73.93±17.4, Dumbi is endemic with urinary schistosomiasis. Risk factors such as occupation, activities at the infested ponds and source of domestic water supply influence the transmission of the disease. This is because water contact activities and traditional agricultural practices are important factors in not only the transmission of the disease but also the intensity of infection. It is recommended that the disease can be controlled by integrated approach through the provision of safe water supply, good personal hygiene, snail vector control and chemotherapy.

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