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Epidemiolgical Study of Schistosomiasis in Numan Local Government Area of Adamawa State, Nigeria

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Abstract: *Schistosomiasis is a major disease of public health importance and is widespread in the tropics. This study was conducted in Numan LGA, Adamawa State to determine the prevalence and intensity of schistosomiasis. A total of 300 study subjects were randomly selected, each donating urine and stool samples which were examined for schistosomiasis using urine sedimentation for schistosomahaematobium and formal ether concentration method for schistosomamansoni. Of this number, 110(36.7%) were infected with S. heamatobium (males, 67(48.6%), females, 43(26.5%). Chi-square test indicated that, sex is associated with infection (p<0.05). Prevalence was highest in Gbalapun, 32(53.3%) with 84±0.86 eggs/10mls intensity of infection and there was significant difference in infection between communities (p<0.05). Subjects within age range, 10-20, 73(48.7%) years were most infected with 159± 3.45 eggs/10mls, while the least infected were within age range, 41-50, 3(10.3%) years with 5±0 intensity of infection, and there was a significant difference in infection between age groups (p<0.05). Fishermen, 24(39.3%) were most affected and there was relationship between schistosomiasis and occupational status (p<0.05). Findings revealed Numan LGA as endemic focus for schitosomiasis due to S. haematobium. No subject had S. mansoni infection. This result may serve as baseline information for further studies.*

Keywords: *Age, communities, Nigeria, occupational status, Schistosomiasis.*

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I. Introduction

Schistosomiasis also known as Bilharziasis or Snail fever is named after Theodor Bilharz who first discovered the parasite in Egypt in 1851 [1] and is one of the oldest human parasitic diseases. In terms of social economic and public health importance in tropical and subtropical areas, it is second to none in prevalence among water-borne parasite diseases [2]. It is ranked second to malaria [3, 4] as a source of human morbidity caused by parasitic agent [5,6and7]. An estimated 600-800 million people are at risk of the infection [8,9 and10] as their agricultural, domestic and recreational activities expose them to snail-infected water bodies. Of this estimate, more than 207 million people are infected worldwide with 93% occurring in sub-Saharan Africa with the largest number in Nigeria (29 million) [11,12] and about 300,000 deaths occur annually worldwide [13, 14].Of the estimated number of infected people, 20 million have severe clinical illness [15, 16, and17] with varying pathological presentations.

Schistosomiasis is most prevalent in rural and pre-urban where ponds, rivers, streams, ditches and inland lakes form major sources of water for domestic use and where urination and defecation are done indiscriminately [9](no safe water, inadequate sanitation and poverty).Farmers and fishermen are predominantly affected as an occupational hazard. This is compounded by poor sanitary practices of urinating and defecating in pounds, rivers and streams which are used for water-related activities.Introduction of irrigated agricultural schemes have been associated with introduction of Schistosomiasis in various parts of Africa [I8, 19 20, 21 and 22]. Authors further stated that dams constructed, reduced dependence of rain-fed agriculture had resulted in the increase and spread of Schistosomiasis. While providing water for domestic use and irrigation, the dams also created conducive environment for breeding of the snail vectors of the disease.

There are five species of schist someworms that cause Schistosomiasis. These include: *Schistosoma mansoni*, *Schistosoma japonicum*, *Schistosoma mekongi*,and all cause intestinal schistosomiasis while *Schistosoma haematobium*and *Schistosoma intercalatum*cause urinary schistosomiasis [23, 24, and 25]. The intermediate hosts of the disease are of various species of fresh-water snails which acts as an intermediate host of thefollowing schistosomiasis species;oncomelania species the intermediate hosts of *S. japonicum*, Biomphilariaspecies the intermediate hosts of *S. mansoni* and Bulinus species, the intermediate hosts of

S.Haematobium and *S. intercalatum* [26]. Transmission takes place only in the place where fresh-water snail vector is present and where there is contact between the population and the infested water.

The disease affects many people in the developing countries especially children by the age of fifteen years [27], that acquire the disease by playing within infected water bodies. It has been estimated that school aged children experience a considerable burden of schistosomiasis which may have both immediate and long-term consequences on their health, growth and education [16]. In areas highly endemic for schistosomiasis, three out of four children may be infected with the disease [23]. While in contact with contaminated water source, the parasite larvae easily enter human body through their skin and further mature within the body system [26].

Nigeria is among the 44 countries in Africa where the disease is endemic [26, 28]. Schistosomiasis is considered as one of the important health problems in the Nigeria primarily rural in distribution but urban schistosomiasis is also becoming important in the country [17]. The existence of schistosomiasis has been reported in the northern part of the country such as Kano, Katsina, Zaria and Kaduna [29].The overall prevalence of urinary Schistosomiasis ranged from 13.5-21.2% in Nigeria [5, 6, 7, 16 and27]. Also higher rates of the infection have been reported by [30] for riverine, rural settings in Nigeria. A high prevalence rate of schistosomiasis due to *S. haematobium* (62%), without positive case of *S. mansoni* was recorded by [31]**.**Some previous studies have shown infection rates of the disease up to 54%, 73% in Abeokuta and Ibadan respectively. A prevalence rate of 13% was reported among school children in Lagos, Nigeria [32].A report by some authors who conducted a survey in Abia State recorded high prevalence of schistosomiasis(47. 5%) for both males and females [28],while others [33] who conducted a survey onschistosomiasis in Cross-River State reported higher infection rate in males (53.7%)than their female (30.0%) counter parts. The authors further reported higher infection rate among rice-farmers (59.5%).Results from studies carried out by [28,33and34] for 14.84%, , 52 0%, 5.82% respectively, revealed that children belonging to age bracket 10-20 years old had the highest prevalence rate of schistosomiasis. This study was designed to determine the prevalence and intensity of schistosomiasisamong inhabitants in some selected communities in Numan Local Government Area of Adamawa State, Nigeria, and to determine the predisposing factors of the disease.

II. Materials and Methods

2.1Study Area and population

Adamawa state is located in north eastern part of Nigeria, and lies between latitude 7^0 and 11^0N of the equator and between longitude 11^0 and 14^0E of Greenwich meridian. It lies within the tropical region having savannah type of vegetation with marked dry and rainy season typical of tropical climate.Numan Local Government Area (LGA) lies between latitude 9^013^1 and 9^046^0 north and between longitude 11^030^1 and 12^0 10^1 East of the meridian. Numan LGA is predominantly rural and the residents live in segmented large and small communities speaking different languages and dialects. The communities are located near rivers, streams and ponds which serve as their major source of water supply. Farming, fishing, poultry and livestock keeping are very common while those that inhabit the river banks practice irrigation during the dry season to provide food crops and fresh vegetables. The abundant surface water system and grass vegetation in the area also support widespread fishing and livestock rearing activities. The study was carried out in five communities; Nzumosu, Salti, Gbalapun, Byemti and Kodomti in Numan LGA of Adamawa state. The communities and the study subjects were randomly selected for the study and a total population of 300 subjects was sampled comprising males and females. Structured questionnaires were given to the subjects as regard to demographic information on age, gender, and occupation.Ethical clearance was sought and obtained from the director Primary Health Care Agency, Numan LGA.

2.2 Collection of Urine and Stool samples

During sampling, each participant was given a pre-numbered autoclaved wide mouthed, leak proof universal container. The name of the person, age, and gender were entered against the appropriate number on a form into which results was later entered. About 50ml of urine samples were collected between 10hrs and 14hrs (GMT+1) in 50mluniversal specimen bottle from randomly selected people. Visitors and women who were menstruating were excluded from the survey. Samples with visible haematuria were noted. Samples were placed in a cold box with ice packs. Stool was passed onto a clean sheet of and using an applicator, about 3-4g was put into the labeled specimen bottle. Both the urine and stool samples were then immediately taken to the Zoology laboratory of the ModibboAdama University of Technology Yola, for examination.

Parasitological examination of urine was done using the method described by W0rld Health Organization [35], while stool examination was done using formal ether concentration techniques described by Cheesbrough [36]. Data obtained from the study was processed in percentage before analysis using Chi-square. The conventional level of confidence, 95% (0.05) was used to interpret the results.

III. Results

Three hundred (300) participants across five villages in Numan Local Government Area were examined for both S*chistosoma mansoni* and *Schistosoma haematobium*. Out of this participants, 110(36.7) were infected with *Schistosoma haematobium* comprising, 67(48.6%) males and 43(26.5%) females (TABLE 1). The infection was higher in males as compared to females and there was a significant difference in infection between gender ($p<0.05$). None of the subjects examined for *Schitosomamansoni* had infection. The overall intensity of infection was 231±3.87 eggs/10ml with breakdown in relation to gender, 135±3.02 and 96±2.7 eggs/10ml for males and females respectively (TABLE 2). Males had higher intensity rate of infection than their female counterparts.

The highest prevalence rate of infection was recorded in Gbalapun, 32(53.3%) (TABLE 1), which also had the highest intensity of 82±0.86 eggs/10ml, (TABLE 2).This was followed by Byemti, 25(41.7%) with intensity rate of infection, 55±0.87, while the lowest rate of infection was observed in salti, 13(21.7%) with intensity rate of 17±0.48 eggs/ml. Others were kodomti, 23(38.3%) with intensity rate of 44±0.90eggs/10ml and Nzumosu, 17(28.3%) with intensity, 33±0.70 eggs/ml. Chi-square analysis showed that there was a significant difference in infection between the five villages ($p<0.05$). The distribution of schistosomiasis by gender according to village is as follows; the males had higher infection rate, 17(56.7%), 16(59.3%), 12(46.1%) and, 9(40.9%) for kodomti, Byemti, Nzumosu and salti respectively, than their female counterparts who had, 6(20.0%) 9(27.3%), 5(14.7%) and, 4(10.5%) respectively (TABLE 1). However, in Gbalapun, females, 19(63.3%) were more infected than the males, 13(43.3%).

The result revealed that subjects belonging to age bracket, 10-20, 73(48.7%) years old were the most infected with 159±3.54 eggs/10mls intensity of infection, followed by those within age group 21-30, 22(36.7%) years old who had intensity rate, 43±3.22 eggs/10mls, (TABLES 3 and 4). Those within the age range of 31-40 and 41-50 years old, had infection rate of 12(35.2%) and 3(10.3%), with 24±2.97 and 5±0 eggs/10mls intensity rate of infection respectively. A statistical test showed a significant difference in infection between the age groups ($p<0.05$). TABLE 5 indicates the relationship between schistosomiasis and occupational groups encountered in the study area. The result showed that fishermen had, 24(39.3%), school children, 58(38.7%) and farmers, 25(36.2%), with fishermen being the most affected. Civil servants were observed with zero schistosomiasis, while others, 3(30%) had the lowest infection. Chi-square analysis showed a relationship between schistosomiasis and occupational status in the study area with the probability of 0.169($p<0.05$). The intensity of infection was, 127±2.97 eggs/10ml, 58±1.78 eggs/10ml, 39±2.93 eggs/10ml and 7±0 eggs/10mls for school children, fishermen, farmers, and others respectively, with school children having the highest intensity rate of infection (TABLE 5).

TABLE1: Prevalence of *Schistosoma haematobium*Infection in some Villages of Numan LG A, Adamawa State.

Villages	No. Examined	No. (%) infected		Total
		Male	Female	No.(%) infected
Gbalapun	60	13(43.3)	19(63.3)	32(53.3)
Byemti	60	16(59.3)	9(27.3)	25(41.7)
Kodomti	60	17(56.7)	6(20.0)	23(38.3)
Nzumosu	60	12(46.1)	5(14.7)	17(28.3)
Salti	60	9(40.9)	4(10.5)	13(21.7)
Total	**300**	**67(48.6)**	**43(26.7)**	**110(36.7)**

TABLE 2: Egg intensity/10ml urine in *Schistosoma haematobium*Infection among Residents in some Villages in Numan LGA

Villages	Egg Count/10ml Mean Intensity	Gender	
		Male	Female
Gbalapum	82±0.86	36±0.73	6±0.70
Byemti	55±0.87	29±0.54	26±0.70
Kodomti	44±0.90	31±0.39	13±0.75
Nzumosu	33±0.76	26±0.83	7±0.55
Salti	17±0.48	13±0.53	4±0
Total	**231±3.87**	**135±3.02**	**96±2.78**

TABLE 3: Distribution of Schistosomiasis by Age in Five Villagesin Numan LGA

Age (years)	No. Examined	No. (%) Infected
10-20	150	73(48.7)
21-30	60	22(36.7)
31-40	34	12(35.3)
41-50	29	3(10.3)
> **51**	27	0(0)
Total	**300**	**110(36.7)**

TABLE4:Intensity of Infection according to Age in some selected Communities of Numan LGA

Age (yrs)	Nzumosu	Salti	Gbalapum	Kodomti	Byemti	Total
10-20	21±0.71	4±0.98	60±0.98	44±0.67	30±0.60	0±0159±3.54
21-30	8±0.55	10±0.84	15±0.84	0±0	10±1.30	43±3.22
31-40	3±0.71	3±1	6±1	0±0	12±0.55	24±2.97
41-50	1±0	0±0	1±0	0±0	3±0	5±0
>51	0±0	0±0	0±0	0±0	0±0	

TABLE 5: Prevalence and intensity of infection in relation to occupation in some selected communities of Numan LGA

Occupation	No Examine	No.(%) infected	Nzumosu	Salti	Gbalapun	Kodonti	Byemti	Total
C. Servant	10	0(0.0)	0±0	0±0	0±0	0±0	0±0	**0±0**
S. children	150	58(38.7)	16±0.82	4±0	40±0.80	44±0.60	23±0.73	**127±2.97**
Farmer	69	25(36.2)	9±0.96	5±.58	10±0.52	0±0	15±0.87	**39±2.93**
Fishermen	61	24(39.3)	8±0.21	8±0.55	30±0.46	0±0	12±0.56	**58±1.78**
Others	10	3(30.0)	0±0	0±0	2±0	0±0	5±0	**7±0**
Total	**300**	**110(36.7)**	**33±1.99**	**17±1.13**	**82±1.78**	**44±0.60**	**55±2.16**	**231±7.68**

IV. Discussion

The results from this study indicate the endemicity of schistosomiasis of an overall prevalence rate of(36.7%) due to *S. haematobium* in the study area. This differed from the 13.5-21.2% range of overall prevalence of urinary schistosomiasis reported by [5, 6, 7, 16and 27] in Nigeria. No positive case of *S. mansoni* was recorded in this work, which is in line with the report by [31]**,** who recorded high prevalence of *S. haematobium*, (62%) without *S. mansoni*, but disagrees with the report by [28] who observed the occurrence of *S. mansoni*. This could be as aresult of socio-cultural differences and believe. The high prevalence rate of schistosomiasis observed in this study also compares with 54% in Abeokuta and 73% in Ibadan [32]. The results also concurred with that of [17] who stated that, the prevalence of *S. haematobium*ranged from 20-40% rural dwellers and conformed to the report by [27] More males (48.6%) than females (26.7%) were infected which is in agreement with the report by [33]who conducted a survey on schistosomiasis in Cross-River State and reported higher infection rate in males (53.7%) than their female (30.0%)counter parts. The prevalence and intensity rate of infection recorded in males than females counterpart may be as a result of males spending more time fishing and farming than females in this study Area. The highest infection rate observed among Fishermen (39.3%) in this work is contrary to the reports by [33] who reported the highest infection rate in farmers.The high infection rate among the fishermen could be attributed to their regular contact with infected water whether in the day time or at night due to the nature of their occupation; water contact behavior as the predisposing factor for acquiring Schistosomiasis.

The highest prevalence rate, 48.7%of infection recorded among the age bracket 10 – 20 years old in this study conformed to a number of other findings of [28, 34 and 33] who reported the highest infection rates of 14.84%, 5.82%, 52.0% respectively, within the same age group. This could be attributed to their frequent visit to streams and rivers in the quest to swim, bath as well as farming, and fishing both in the dry season (irrigation) and rice cultivation during the raining season; thus, they are more exposed than the other age groups. Also, the highest intensity of infection (74 eggs/10ml of urine) was recorded in subjects within 10 – 20years age range which is expected, because in younger age group infections egg excretion is more pronounced than in older infections. The high intensity in these age groups may be attributed to increased worm burden and the high fecundity rate of parasite, while the low intensity of infections encountered in adult and elderly subjects with age range of 41 – 50years could be due to reduced schistosome worms and less egg excretion and could also be attributed to the development of immunity known to occur in the infection.

The high prevalence of schistosomiasis could be as a result of high level of water contact activities, poverty, ignorance, low literacy level, poor living conditions, the inadequate and indiscriminate disposal of human sewage by the inhabitants in the areas under study, which may have been the major factors responsible for the transmission of Schistosomiasis in the study area.

V. Conclusion

The results obtained from the research work have established a high prevalence of schistosomiasis due to *S. haematobium* in the study area. With the results obtained the areas can be said to be endemic with urinary schistosomiasis. Health education among the populace on the method of transmission and prevention of the disease is highly recommended. Also, the present schistosomiasis control programme in the community should be reviewed with the aim of addressing social, economic and cultural contributory factors so as to eradicate schistosomiasis. There is urgent need for Local Government authority, State Government, Federal Government as well as non-Governmental organization to establish feasible control programmes in the study area.

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