# Endemicity And Intensity Of Vesical Schistosomiasis: Epidemiological Profile Of Two Local Government Areas Of Benue State - Nigeria

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**Abstract**

Vesical schistosomiasis is one of the major public health problems facing developing countries with severe social and economic consequences. Studies were carried out to ascertain the prevalence, incidence, intensities and aspects of morbidities in Schistosoma haematobium infection in two Local Government Areas of Benue State, Central –Nigeria. The study was conducted in the dry season between November 2008 and March 2009. Seven hundred and fifty (750) urine samples were obtained from primary schools, secondary schools and communities. Using the urine filtration technique for the quantification of Schistosoma haematobium eggs, an overall infection of 44.6% was observed out of the 750 urine examined. The months of February 2009 and March 2009 recorded the peak of infection with 52.0% each and no significant difference was observed between monthly infection ($X^2$=27, P>0.05). A linear relationship was observed between the season of greatest risk (dry season) and prevalence of infection (r = 0.1, p<.01). The age groups (7-10), (11-13) and (15-18) years had the highest prevalence rates of 7.2%, 15.1% and 12.8% respectively. Males recorded higher infection than females, 24.8% and 19.8% respectively, there was no significant difference in infection between age groups, and between males and females ($X^2$ = 15.7, P>0.05). Painful urination, urinary frequency, visible haematuria and terminal haematuria were the common symptoms encountered in the study area and were significantly associated to infection (r = 0.3; r = 0.3; r = 0.4; r = 0.5 respectively, p<.01). The study revealed that Schistosoma haematobium infection is endemic and is considered as a public health problem in the areas. Therefore, treatment of infected people and health education are recommended as the first line of intervention.

## INTRODUCTION

Vesical schistosomiasis is a tropical parasitic disease caused by a blood dwelling fluke worm Schistosoma haematobium. It is still one of the major public health problems facing humanity with severe social and economic consequences [1.] According to World Health Organization (WHO), 200 million people are infected world wide, leading to the loss of 1.53 million disability-adjusted life years, although these figures need revision [2] . About 66 million children in 76 countries are affected and in some villages in Africa over 90% of the children are estimated to be infected by the disease [3] . Accordingly the estimates for morbidity and mortality in affected populations are high with school age children usually presenting with the highest prevalence and intensity of infection [3] . However, in many rural communities these endemicities are mainly attributed to some prevailing factors like lack of potable water supply, poverty, ignorance and poor environmental conditions. Although infection with schistosomes does not always result in clinical disease, and many infections are asymptomatic, persons with these infections in resource-constrained tropical areas of the world often present for care with severe illness and often only after complications have developed [4] . In vesical schistosomiasis the risk of haematuria, dysuria, nutritional deficiencies, lesion of the bladder, kidney failure, an elevated risk of bladder cancer and growth retardation in children are well known [4] .

In Nigeria the disease is considered to be a public health problem particularly among rural and sub-urban areas. Surveys reporting the disease in some towns and rural communities have been documented [5, 6, 7, 8, 9, 10] . Published data on the epidemiology of vesical schistosomiasis is scanty in Benue State, and this is limited to only few reports [11, 12, 13, 14] .

The present study was made to describe the pattern of Schistosoma haematobium infection by determining the current status, incidence and intensity of Schistosoma

haematobium infection and the aspects of morbidities in school children and communities. This is with the view to provide epidemiological information that would be required to monitor socio-economic impact, treatment control programs and assess re-infection after treatment in rural communities, in order to develop most effective and sustainable strategies that would have relevance for future control efforts in resource constrained endemic settings.

## MATERIALS AND METHODS

### STUDY AREA

The study was conducted in Buruku and Katsina-Ala Local Government Areas of Benue State between November 2008 and March 2009. The climate of both areas is tropical and the vegetation characteristic is predominantly guinea savanna with an average annual rainfall of about 900-1000mm. The minimum temperature ranges between 21.7ºC to 33.7ºC and a maximum of 30.10ºC to 34.09ºC. There are two distinct seasons, the wet and dry seasons. The former lasts between April and October, while the latter from November to March. The areas are drained by streams, ponds, and rivers among which river Benue is the biggest.

### STUDY POPULATION

Before the start of the research, permission was obtained from the Local Government Chairmen and Local Government Education authorities of both areas. The areas were selected based on the reports from local hospitals and primary health care of cases of urinary schistosomiasis. A total of 750 subjects participated in the study: primary school children (250), Secondary school children (250) and communities (250) living both in the urban and rural settings of the local government areas. School children were randomly selected from different classes, from class 3 to class 6 for primary schools and from junior class 1 to senior class 3 for the secondary schools. Schools children were considered for this study because: (i) schools are accessible without much difficulties, (ii) the peak of prevalence of urinary schistosomiasis is to be found in this group [15] . In the communities, people were mobilized through announcements made in churches and the house of the head kindred in each community served as a ground for the collection of urine samples and people were duly informed of the significance of the study. There was a good compliance from both the communities and schools.

### LABORATORY ANALYSIS

Urine samples were obtained from 372 males and 378 females. A 20 ml clean and well –labeled sterile bottle was given to each participant and urine collected was placed in a cooler. Samples were obtained between 10:00 hrs and 14:00 hrs of the day and taken to the Microbiology laboratory of the University of Mkar, Benue State for examination and quantification of schistosome eggs. In situation where delay in transportation of specimens were inevitable, ordinary household bleach was added to the urine samples (0.40ml bleach/20 ml urine) to preserve any schistosome ova present [16,17] . The information on age, sex, socioeconomic factors and symptoms related to the infection were obtained through questionnaire administration. Selected primary school children were interviewed individually and some of the questions were communicated in the local language for ease of understanding by a translator. The presence of visible haematuria in any sample was recorded. The standard parasitological method, the filtration technique using a 10 ml syringe, swinney filter holder (13mm diameter) and polycarbonate membrane filters (13µm porosity and 13mm diameter) was employed to recover Schistosoma haematobium eggs in the laboratory [16] . Examination was done under the 10x and 40x objectives.

### STATISTICAL ANALYSIS

Microsoft Excel 2007 and SPSS for windows version 15.0 were used for data analyses. Chi-squared test was used to compare differences in infection between the areas, months, age groups and sexes at $P < 0.05$ significance level. Correlation test was used to assess association between season of greatest risk and aspects of morbidities to S.haematobium infection at $P<0.01$ significance level

## RESULTS

Table 1 outlines the investigations results of 750 subjects examined for vesical schistosomiasis in Buruku and Katsina-Ala Local Government Areas. An overall prevalence rate of 44.6% was recorded among the different groups (primary schools, secondary schools and communities), with Buruku having 46.1% and Katsina-Ala 43.2%. Light infection accounted for 27.3% followed by mild infection 11.2%. Heavy infection recorded the least with 6.1%. The differences in prevalence between the two LGAs were not statistically significant ($X^2 =3$, $P>0.05$).

### Figure 1

Table 1: Prevalence and intensity of infection in the study area

| LGAs | Intensity of infection per 10ml of urine (%) | | | Total | |
|---|---|---|---|---|---|
| | Light (1-10 eggs) | Mild (11-49 eggs) | Heavy (>50 eggs) | Exam | Pos (%) |
| Buruku | 106 (28.2) | 48 (12.8) | 19 (5.0) | 375 | 173 (46.1) |
| Katsina-Ala | 99 (26.4) | 36 (9.6) | 27 (7.2) | 375 | 162 (43.2) |
| **Total** | **205 (27.3)** | **84 (11.2)** | **46 (6.1)** | **750** | **335 (44.6)** |

($X^2$=3, P>0.05)

A monthly analysis shows that light infection fluctuated between (16.6%) and (36.6%) in Nov.08 and Mar.09 respectively; Mild infection between (12.0%) and (8.6%) in Nov.08 and Mar.09 respectively. Heavy infection recorded (7.3%) in Nov.08 and (6.6%) in February. The highest rate of infections was recorded during February and March with (52.0%) each and the least infection rates were observed during Nov.08, (36.0%) and Jan.09, (36.6%). There was no significant difference between months and infection rate ($X^2$ = 27.09, P>0.05). (Table 2)

### Figure 2

Table 2: Incidence of infection the study area

| Intensity of infection | Incidence (%) | | | | |
|---|---|---|---|---|---|
| Eggs/10ml of urine | Nov.08 | Dec.08 | Jan.09 | Feb.09 | Mar.09 |
| Negative | 96(64.0) | 80(53.3) | 95(63.3) | 72(48.0) | 72(48.0) |
| Light (1-10 eggs) | 25(16.6) | 41(27.3) | 37(24.6) | 47(31.3) | 55(36.6) |
| Mild (11-49 eggs) | 18(12.0) | 20(13.3) | 15(10.0) | 18(12.0) | 13(8.6) |
| Heavy (>50 eggs) | 11(7.3) | 9(6.0) | 3(2.0) | 13(8.6) | 10(6.6) |
| **Exam** | **150** | **150** | **150** | **150** | **150** |
| **Total** | | | | | |
| **Pos (%)** | **54(36.0)** | **70(46.6)** | **55(36.6)** | **78(52.0)** | **78(52.0)** |

($X^2$=27.09, P>0.05)

Table 3 shows the prevalence of urinary schistosomiasis among genders and age groups in the study area. The total prevalence among males was 186 (24.8%) and females 149 (19.8%) respectively. The age groups (11-14) and (15-18) recorded higher prevalence rate of infection with 114(15.1) and 96(12.8%), with males having higher prevalence rate of 68(9.0%) and females 60(8.0%) respectively. The total prevalence among males was not significantly different from that among females($X^2$ =15.71, P>0.05).

### Figure 3

Table 3: Sex and Age distribution of in the study area

| Age (years) | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Exam | Pos (%) | Exam | Pos (%) | Exam | Pos (%) |
| (3-6) | 9 | 4(0.5) | 17 | 9(1.2) | 26 | 13(1.7) |
| (7-10) | 49 | 30(4.0) | 62 | 24(3.2) | 111 | 54(7.2) |
| (11-14) | 133 | 68(9.0) | 130 | 46(6.1) | 263 | 114(15.1) |
| (15-18) | 109 | 60(8.0) | 80 | 36(4.8) | 189 | 96(12.8) |
| (19-22) | 18 | 12(1.6) | 17 | 4(0.5) | 35 | 16(2.1) |
| (23-26) | 11 | 5(0.6) | 12 | 4(0.5) | 23 | 9(1.9) |
| (27-30) | 8 | 2(0.2) | 11 | 6(0.8) | 19 | 8(1.0) |
| (31-34) | 4 | 0(0.0) | 4 | 1(0.1) | 8 | 1(0.1) |
| (35-38) | 7 | 1(0.1) | 7 | 5(0.6) | 14 | 6(0.7) |
| (39-42) | 7 | 2(0.2) | 9 | 3(0.4) | 16 | 5(0.6) |
| (43-45) | 3 | 0(0.0) | 1 | 1(0.1) | 4 | 1(0.1) |
| (46-49) | 2 | 0(0.0) | 3 | 0(0.0) | 5 | 0(0.0) |
| (50-53) | 2 | 1(0.1) | 10 | 2(0.2) | 12 | 3(0.3) |
| (54-57) | 0 | 0(0.0) | 2 | 1(0.1) | 2 | 1(0.1) |
| (58-61) | 4 | 0(0.0) | 4 | 1(0.1) | 8 | 1(0.1) |
| (62-65) | 0 | 0(0.0) | 1 | 1(0.1) | 1 | 1(0.1) |
| (66-69) | 1 | 0(0.0) | 1 | 0(0.0) | 2 | 0(0.0) |
| (>70) | 4 | 1(0.1) | 7 | 5(0.6) | 11 | 6(0.8) |
| **Total** | **372** | **186(24.8)** | **378** | **149(19.8)** | **750** | **335(44.6)** |

($X^2$=15.71, P>0.05)

Table 4 identifies the season of greatest risk among the inhabitants of the study area. Of the four hundred and ninety one (491) subjects recorded having contact with water through different activities during dry season, 242(72.2%) were found positive for Schistosoma haematobium eggs. While out of the 174 recorded having contact with water during rainy season, only 86(25.6%) were infected. There was a linear relationship between the season of greatest risk and prevalence of infection(r = 0.1, P<0.01).

### Figure 4

Table 4: Prevalence and intensity of infection in relation to season of greatest risk in the study area

| | Intensity of infection (%) | | | Total | |
|---|---|---|---|---|---|
| Season | Light | Mild | Heavy | Exam | Pos (%) |
| Nil | 5(0.6) | 0(0.0) | 2(0.2) | 85 | 7(0.9) |
| Dry | 145(19.3) | 68(9.0) | 29(3.8) | 491 | 242(32.2) |
| Rainy | 55(7.3) | 16(2.1) | 15(2.0) | 174 | 86(11.4) |
| Total | 205(27.3) | 84(11.2) | 46(6.1) | 750 | 335(44.5) |

(r = 0.138, P<0.01)

The occurrence of urinary symptoms in Schistosoma haematobium infection is presented in Table 5. Painful urination was the predominant clinical sign of the disease in the area 31.4% followed by urinary frequency 27.3%, terminal haematuria 24.1% and visible haematuria (macrohaematuria) 15.0%. There were significant

relationships between urinary symptoms and Schistosoma haematobium infection(r = 0.3, painful urination; r = 0.302, frequency urination; r = 0.5, terminal haematuria; r = 0.3, visible haematuria; P<0.01)

**Figure 5**

Table 5: Occurrence and association of urinary symptoms in infection

| Symptoms | Light | Mild | Heavy | Exam | Pos (%) |
|---|---|---|---|---|---|
| Painful urination | 143(19.0) | 60(8.0) | 33(4.4) | 750 | 236(31.4) |
| Urinary frequency | 125(16.6) | 44(5.8) | 36(4.8) | 750 | 205(27.3) |
| Terminal haematuria | 98(13.0) | 51(6.8) | 32(4.2) | 750 | 181(24.1) |
| Visible haematuria | 58(7.7) | 29(3.8) | 26(3.4) | 750 | 113(15.0) |
| Itching body after Contact with water | 17(2.2) | 8(1.0) | 7(0.9) | 750 | 32(4.2) |

(r = 0.3, painful urination; r = 0.3, urinary frequency; r = 0.5, terminal haematuria; r = 0.4, visible haematuria. P<0.01).

## DISCUSSION

The result of this study showed that vesical schistosomiasis is endemic in Buruku and Katsina-Ala Local Government Areas of Benue State. Similar endemicity was also reported in Ogbadibo Local Government Area of Benue State [14] . This prevalence is however, higher than 15.9% reported among school children in Benue State [13] and lower than 83.3% and 65.0% reported in the Niger Delta area and Edo State of Nigeria respectively [18, 19] .

The high incidence of Schistosoma haematobium infection observed during the months of Feb.09 and Mar.09 may be due to the increased human activities during the hot season in the area. People in these areas depend largely on the ponds, streams and particular the biggest river known as river Katsina-Ala for washing, bathing, fetching water, swimming and recreational purposes. The fact that spending time in infested water bodies with Schistosoma haematobium increases the rate and endemicity of schistosomiasis corroborates the report observed in a rural community of Edo State, Nigeria [19] .

The low incidence observed during the month of Nov.08 may be due to the reduced water contact activities of the inhabitants as the water remains high in the river bed, streams and ponds. Less water-contact activities were also observed during Dec.08 and Jan.09, this is mostly because of the cold-dry period known mostly as the harmattan period in the area. A linear relationship(r = 0.138, P<0.01) was observed between the Schistosoma haematobium infection and the dry season.

The high prevalence and intensity of infection recorded in the (11-14) and (15-18) years old have been also observed in other communities where Schistosoma haematobium infection is endemic [20, 18, 14, 6] . This high prevalence observed in these age groups may be due to the fact these children are more adventurous in the streams, ponds or river through swimming, fishing or washing.

The occurrence of clinical signs such as painful urination, urinary frequency and terminal haematuria has a similar trend to those observed in Badagry Area of Lagos, Nigeria [21] . These clinical signs are observed significant in the study area and the potential risk of severe pathological damage of kidneys in the later years of life is correspondingly high especially if these cases remain untreated and the symptoms were significantly correlated to the intensity of Schistosoma haematobium.

The lack of logistic means and roads, so as to have easy access in some remotest areas where cases of S. haematobium have been reported to be high are considered to be the study limitations

The outcome of this work has shown that vesical schistosomiasis is quite endemic in Buruku and Katsina-Ala Local Government Areas of Benue State, Nigeria; this could constitute a great source of socio-economic problem if not stemmed on time and the risk of future complication is high. Prompt intervention in the study area and further investigation to identify other possible foci of transmission in the state has become necessary. Treatment of infected people and health education are suggested as the first line of intervention. Long term integrated control measures aimed primarily at improved water supply, house sanitary conditions and health facilities to the communities are advocated.

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