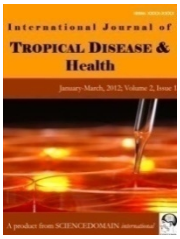

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Schistosomiasis in Ipogun: Update Assessment on Endemicity and Efficacy of Praziquantel in Chemotherapy

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Authors' contributions

This work was carried out in collaboration between all authors. Author MOO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors MAI and ODJ managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Aims: To assess the present endemicity of urinary schistosomiasis among school aged pupils in Ipogun, a notable endemic village in Ondo state, Nigeria and also the efficacy of single dose Praziquantel in chemotherapy.
Study Design: The overall goal of the study was to assess the current endemicity status and efficacy of Praziquantel in treatment at the standard dose of 40mg/kg body weight. Mass screening was conducted in all primary schools in the village after informed consent had been sought from their parents, teachers and the village king. The only age bracket excluded in the study were the under 3 year old.
Place and Duration of Study: Department of Biology, Federal University of Technology, Akure, Nigeria, between January and June 2012.
Methodology: Urine samples were collected from 567 pupils from five different primary schools in the village and examined for schistosome eggs using centrifugation method. Infected pupils at the first screening exercise were treated with single dose Praziquantel (40mg/kg body weight) and re-examined 3 weeks after treatment to assess cure rate.
Results: Results revealed that 100 pupils were positive at the first screening giving a prevalence rate of 18% and post-treatment urinalysis showed that 80 of the previously

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infected pupils were negative three weeks after initial treatment giving 80% parasitological cure rate. Infection was higher among male pupils than the female and pupils from schools that were close to the village river had the highest prevalence of infection.
Conclusion: Our findings revealed that prevalence of infection had reduced remarkably among the pupils in the village and that Praziquantel is still effective and remains a reliable drug of choice in chemotherapy in the study area.

Keywords: Urinary schistosomiasis; endemicity; praziquantel; efficacy; Ipogun.

1. INTRODUCTION

Schistosomiasis is caused by trematode flatworms of the genus *Schistosoma*, the second most prevalent tropical disease. It affects approximately 200 million people worldwide, an estimated 85% of whom living in Africa, and particularly the poor in rural settlements in the developing countries [1,2,3]. It is considered by the World Health Organization as the second most socio-economically devastating parasitic disease, next only to malaria, with hundreds of millions infected worldwide both in the tropical and subtropical regions. The distribution of the different species depends mainly on the ecology of the snail hosts. Natural ponds and lakes are typical sources of infection, but over the past few decades man-made reservoirs and irrigation systems have contributed to the spread of schistosomiasis. The disease is largely a rural problem, but urban foci can be found in many endemic areas [4]. Snail populations, cercarial density, and patterns of human water contact show strong temporal and spatial variations, resulting in a focal distribution of the infection within countries, regions, and villages. Those at high risk of infection are people involved in fishing activities, farming, bathing, paddling of canoes, swimming and possibly handling of infected snail host in the case of collecting edible ones [4].

In Nigeria, *Schistosoma haematobium* infection had been found in many parts of the country with varying intensities and prevalence rates and incidence is believed to be on the increase [5]. The true epidemiological data appears difficult in developing nations, because of inadequate researches and no epidemiological control/ information centre on tropical diseases despite its relevance in planning for control in any locality. In Ondo state, the disease is a public health problem where the prevalence rates in all 18 Local Government Areas was between 41- 95.7%, with Ifedore Local Governement having 47.3% [6]. Urinary schistosomiasis is endemic in Ipogun village, Ondo state. The village came into limelight in 2001 when 'Newsline', a national television documentary reported it as a village where men menstruate! Since then it has remained endemic with epileptic prevalence rates ranging from 59% in 2003 [7] to 53.1% in 2006 [8]. Oniya and Olofintoye [9] also reported a prevalence rate of about 18.22% among school pupils in the Local Government area in 2008.

Chemotherapy still remains the principal tool in the global battle against the scourge with Praziquantel being the current drug of choice. As eradication of schistosomiasis is still beyond human and financial resources, the aim of most control programs remains the reduction of morbidity by treating infected people on an individual or population basis by using chemotherapeutic agents such as Praziquantel [10]. Praziquantel was effectively used to treat schistosomiasis since the last two decades [10,11]. The treatment of schistosomiasis by Praziquantel requires administration of a single dose 40mg/ kg of body weight [1]. There have been concerns on drug resistance in Praziquantel-induced therapy in schistosomiasis [12]. Praziquantel is virtually the only drug currently available for clinical management and control. It is noteworthy that pressure on Praziquantel is growing, following the policy

adopted at the 54th World Health Assembly to increase distribution of the drug and treat at least 75% of school-aged children and other high-risk groups living in areas with high burden of the disease by 2010 [13,14,15] and new efforts made by the Schistosomiasis Control Initiative to millions of school-aged children in selected African countries [16]. In an earlier mathematical model, King et al. [12] reported that Praziquantel resistance by *S. haematobium* was predicted to emerge in about 10 or more years. The import of resistance to Praziquantel in disease management will be grave as there are no suitable alternatives for now. Hence constant field evaluation is desirable to keep up with the drug's performance.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Ipogun, (7º 19'N; 5º 05'E), a village in Ifedore Local Government Area of Ondo State, south west Nigeria. The primary source of water for agrarian and most domestic activities is the 'Aponmu' river, flowing through the village; it is this river that serves as the contact site. The inhabitants are mainly farmers who use water from the river in carrying out their daily and recreational activities including bathing and washing. The two distinct seasons in the area are the wet and dry seasons. The wet season lasts from April to October and is characterized by heavy rains with occasional flooding of river banks. The dry season lasts from November to March, characterized by increased temperature [8].

2.2 Study Subjects

Five primary schools in Ipogun community were surveyed. The primary schools are Morohunkeji nursery and primary school, Muslim primary school, St. Jude primary school, St. Paul CAC primary school and Evangel nursery and primary school. Of the five schools, Morohunkeji nursery and primary school, Muslim primary school and St. Jude primary were situated close to the village river. Before embarking on urine collection, the state ministry of health was contacted and the study was integrated into the routine mass chemotherapeutic school based programmes carried out by the health ministry. Similarly, the village king and the primary health care coordinator were informed as well as the heads of schools and teachers. The names of the pupils were collected in their various classes in accordance with the arrangement on the class register presented by the class teachers.

2.3 Urine Collection and Analysis

The survey was conducted between March and April, 2012, Urine samples were collected between 09:00 and 12:00h. Demographic data including the name, age, gender and weight of all participants were recorded. Each pupil was given a clean, dry, screw-capped bottle to urinate in. The urine collected was then immediately taken to the laboratory for analysis. A total of 567 [294 (52%) male and 273 (48%) female] samples were collected. Urine samples were analyzed using the centrifugation method as described by Chugh et al. [17]. The eggs were counted and recorded as eggs/10 mL of urine. All pupils were treated within the state's mass chemotherapy campaign with single dose Praziquantel (40 mg/kg body weight) and supplied by the Ondo State ministry of health. Positive-Treated pupils were rescreened three weeks post treatment.

3. RESULTS

3.1 Urinalysis/ Prevalence by School

Out of the 567 pupils, I00 (18%) were infected, 109 (19%) showing visible haematuria (Table 1). The overall prevalence rate in the five schools was 18% and the highest prevalence was recorded in St Jude primary school with 22% and 46% haematuria. Morohunkeji primary school was the second highest with prevalence of 20% while Muslim primary school and Evangel nursery and primary showed prevalence of 15% and 13% respectively. The lowest prevalence rate was observed in St Paul CAC primary school (11%). Gender prevalence showed 58 (20%) male and 42 (15%) female infected pupils (Table 2). Of the three schools situated close to the village river, Muslim pry school was the closest.

Table 1. Prevalence of urinary schistosomiasis among school pupils in the study area

School	No examined	No Positive (%)	Haematuria (%)
Morohunkeji nur/pry	192	38 (20%)	32 (29%)
Muslim pry	91	14 (15%)	5 (5%)
St Jude pry	138	30 (22%)	50 (46%)
Evangel nur/pry	102	13 (13%)	16 (15%)
St. Paul CAC pry	44	5 (11%)	6 (6%)
Total	567	100 (18%)	109 (19%)

Table 2. Prevalence of *Schistosoma haematobium* infection among school pupils according to Gender

School	No Examined	No positive	No Examined	No positive	Total
	Male (%)	Male (%)	Female (%)	Female (%)	
Morohunkeji	93 (48%)	22 (24%)	99 (52%)	16 (16%)	192
Muslim	49 (54%)	8 (16%)	42 (47%)	6 (14%)	91
St. Jude	73 (53%)	17 (23%)	65 (47%)	13 (20%)	138
Evangel	58 (57%)	7 (12%)	44 (43%)	6 (14%)	102
CAC	21 (48%)	4 (19%)	23 (52%)	1 (4%)	44
Total	294 (52%)	58 (20%)	273 (48%)	42 (15%)	567

3.2 Post-Treatment Assessment

3 weeks after treatment of the 100 infected pupils, a re-screening to assess the efficacy of the administered drug showed that 20 (20%) of them were still infected (Fig. 1). The drug showed an overall parasitological cure rate of 80% and produced significant reduction in cases of haematuria, from 109 (24%) to 4 (4%). Similarly, there was a marked reduction in the intensity of infection (Table 3) in all the schools in the village following the single dose therapeutic regimen. Geometric egg mean counts dropped from 12.95 before treatment to 3.03 after Praziquantel administration.

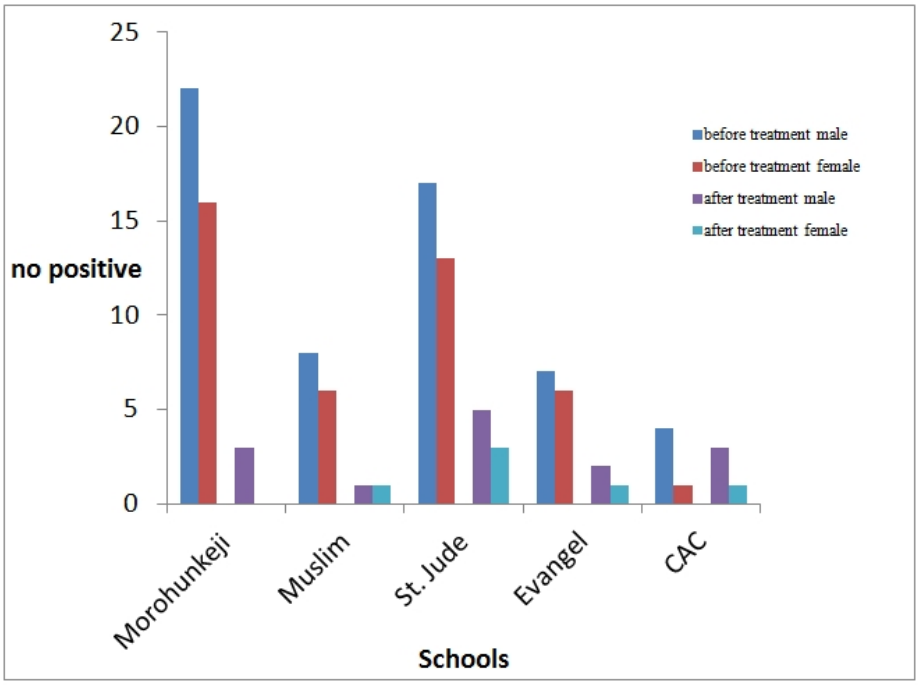

Fig.1. Frequency of infection in pupils before and after treatment with Praziquantel.

Table 3. Intensity of infection in the study group before and after Praziquantel administration

Schools	Geometric egg mean count (GMEC) before treatment	Geometric egg mean count (GMEC) after treatment	Percentage reduction of Geometric egg mean count (GMEC)
Morohunkeji	34.13	4.48	86.87%
Muslim	7.19	3.16	50.05%
St. Jude	9.89	3.61	63.50%
Evangel	10.76	2.88	73.23%
CAC	13.94	1.73	87.59%
Total	12.95	3.03	76.60%

4. DISCUSSION

Schistosomiasis remains one of the major health problems among school aged children in Ipogun. A high intensity of infection implies repeated exposure to infection [18] which may be the case in the present study as previously identified [7]. The low prevalence of 18%, as reported by Oniya and Olofintoye [9], may be a result of increased awareness and some form of interrupted/staggered intervention through previous works conducted in the village [7,8,9] over the last nine years. However the inherent socio-cultural behaviour in the village [19] and interrupted control programmes will always expose them to re-infection thus making absolute control very tedious.

Praziquantel administered in a single oral dose at 40mg/kg body weight showed 80% parasitological cure rate 3 weeks post-treatment and also reduced remarkably, the intensity of infection. Presently, disease control is principally centered on chemotherapy in Ondo state, however, the rate of re-infection following parasitological cure is another concern for a multipronged approach. Prevalence in male was higher than female. This may be attributed to the greater exposure of male pupils because of their water contact activities like fishing, swimming etc [19]. The result revealed that the percentage of male pupils (20%) infected was higher than female (15%) and expectedly, results also showed that pupils from schools that were close to the village river had the highest prevalence of infection (Morohunkeji nursery and primary school, Muslim primary school and St. Jude primary school).

There have been several calls for inclusion of infant and pre-school children for treatment in schistosomiasis control programmes in endemic countries [20,21]. Although, all school-aged pupils except under 3yr old that tested positive were treated with the standard dose 40 mg/kg of Praziquantel and there were no apparent side effects or non compliance issues. However, the issue of the safety of Praziquantel in infants less than 3 years old needs to be addressed as seen in a recent study where side effects were reported [22]. Therefore, further studies are needed in other endemic communities on the safety of Praziquantel treatment in infants so that the treatment can be extended to this age group.

5. CONCLUSION

Although, the problem of lack of potable/pipe borne water supply in schools and homes in Ipogun puts the children at high risk of exposure to infection and re-infection, our findings revealed that prevalence and intensity of infection had reduced remarkably among the pupils in the village and that Praziquantel is still effective and remains a reliable drug of choice in chemotherapy in the study area.

Having surveyed this community in the last nine years, one perhaps may wish to suggest that in developing countries, where there is abject poverty and poor health delivery system, control ambitions should first be to reduce the scourge to a single digit prevalence rate and once attained total eradication may ensue. Even at this, it will take concerted efforts to have a 2 to 5 year uninterrupted campaign in achieving this goal. The need for state and local governments in endemic countries to show genuine political commitment in order to halt transmission in their communities is urgent and once again brought to perspective.

CONSENT

Informed Consent was sought from the Village King, Parents and Teachers of the Pupils before the survey began. The local Primary health care coordinator in the village was also contacted before the survey began. No compensations were promised, however results were made known to the teachers for transmission to the parents and all infected children were treated with Praziquantel.

ETHICAL APPROVAL

The objectives of the study were explained to the state Ministry of health following which a request for a clearance was sought from the ethical committee and approval given. Moreover, the survey was integrated into the routine state chemotherapeutic campaign,

which we have been a part of for the last eleven years with the Ondo state Ministry of 'Health. All drugs used in treatment were supplied by the state Ministry.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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