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Study of the prevalence of *Schistosoma haematobium* infection and the treatment using praziquantel among school children in Ezza north local government area of Ebonyi state, Southeast Nigeria

Nneka L. Ozowara, Oliver O. Njoku, Oliver O. Odikamnoro, Cosmos Uhuo

Department of Applied Biology, Ebonyi State University, P.M.B 053, Abakaliki. Nigeria

ABSTRACT

A study was carried out to determine the efficacy of praziquantel (PZQ) against S haematabium, in Ezza North Local Goveernment Area of Ebonyi State from January through March 2009. Of the combined total of 812 pupils examined, 375 (46.18%, 95% confidence interval (C.I.), 42.6-49.4%) were positive for S. haematobium. Children (n = 310) infected with S. haematobium received a single treatment with praziquantel (40mg/kg) and 300 were re – examined after five weeks post-treatment. Cure rate at three weeks post-treatment were high (> 69.00). There were no significant differences in cure rate between the three schools, sex and age (P < 0.05). The remaining 31% that was not cured could be as a result of either that worms were killed very slowly, non-compliance to treatment, drug resistance, or more likely that eggs continued to be released from tissues after the death of adult worms. Since children were in contact with transmission sites during the study period, the result suggested good efficacy of PZQ against S. haematobium infection.

Key words: Schistosomiasis, Praziquantel, Efficacy, Haematuria, Chemotherapy.

INTRODUCTION

Human schistosomiasis is an important and widespread infection in the tropics. It gives rise to complex of acute and chronic diseases with widely differing signs and symptoms (WHO 1993). Information on schistosomiasis infection from a number of different geographical settings indicates that infection intensity and immunological reactions to infection are related in some way to age (Butter worth, *et. al.* 1992, Roberts *et. al.* 1993). Information levels are normally highest in children and following chemotherapeutic cure, children are more rapidly re – infected

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(Butterworth, *et al.* 1991, Korve, 2002 and Bundy *et. al.* 1992). Morbidity control in schistosomiasis requires effective initial treatment and the prevention of re-infection. In view of recent concern that praziquantel resistance might develop, there is a great need for research and development of novel substances with antischistosomal properties.

A critical aspect in the assessment of PZQ efficacy is its activity against the different parasite developmental stages. Indeed, experimental laboratory studies have shown that the activity of PZQ is stage dependent (Sabah, *et. al.* 1986). Thus, doses of drugs that are curative against mature adult worms infection are sub-curative against developing worms. (Saathoff, *et. al.* 2004, Kahama, *et. al.* 1999, Maha and Dewolfe, 1998).

In recent years, new large-scale population-based programmes have been implemented in Uganda, Tanzania, Zambia, Burkina Faso, Mali and Niger under the all species of schistosomiasis control initiative. Praziquantel has been used extensively and successfully in National Control Programmes in Brazil, China, Egypt, and the Philippines, and there is little evidence of the development of clinically relevant resistance (*Hagan, et. al. 20004*).

Nigeria has a schistosomiasis control programme that has the ultimate goal of eliminating schistosomiasis as a public health problem in the country. The age group 5-19 years has been defined as the target population for the Nationwide control through the school system (Awogun, 1990). The rapid identification of disease pockets in the endemic states of the Nation will greatly define the control programmes actual need and identify priority areas for intervention in a phased control programme (WHO, 1993). Therefore, a study was conducted to determine Praziquantel efficacy at three weeks post treatment and it describes PZQ as the mainstay for morbidity control in infections of *S. haematobium*.

MATERIALS AND METHODS

Study Site and Children: The study was carried out in the rural district of Ezza North Local Government Area in Ebonyi State, South-Eastern Nigeria from January through March 2009. The climate and vegetation of the area has been described (*Uneke, et. al.* 2007, *Anosike, et. al.* 2006). The main transmission sites of schistosomiasis were identified as man-made pools, quarry pits, streams, as well as road ditches of which intersect the villages as their main source of water supply (Anosike, *et al* 2001).

With the approval of Education Secretary of the Local Government, Parent-Teacher Association and the teachers, three schools were sampled. Initially, 812 pupils from these three schools: Uwaoma Primary School Azunwoniyi Okposhi (n = 286), Unity Primary School Ogharaugo (n = 267) and Community Primary School Oharaugo (n = 259) were registered only after explanation of the objectives of the study to them, which was done by their different school heads. Of these numbers, 375 pupils were positive for *S. haematobium*. Giving an overall infection prevalence of 46.18%.

A total of 310 infected pupils were treated with a single dose of PZQ, by oral route according to their body weight (40mg/kg) of their body weight under close supervision of their school head.

Each child was given a packet of biscuits with a sachet of water before drug administration.

Treated children were re-examined after five weeks of post-treatment, and the cure rates was also recorded.

Parasitological Techniques: About 20ml of clean-catch midstream urine sample were collected in 50ml capacity autoclaved wide mouthed, leak proofs universal containers by subjects themselves, who were previously subjected to a little exercise to agitate their bladder and carefully instructed with illustration aids. Samples were obtained between 10.00am and 2.00pm (Bradley, 1993). Samples with visible haematuria were noted. Each urine sample were appropriately labeled with identification numbers and placed in a cold box with ice packs. The samples were then transported to the departmental laboratory of Applied Biology, Ebonyi State University Abakaliki for analysis. The urine specimens were thoroughly agitated and 10ml of each sample were centrifuged (model HNS //CFC 301) 1000 rpm for 5 minutes. The supernatant was discarded and the sediment examined for eggs of *S. haematobium* and counted under the microscope (Model B045781). The results were analyzed as eggs/10ml urine according to schools, age, sex, heavy and light infection.

Statistical Analysis: The data analysis was done using the Chi-square test to determine the difference in proportion P < 0.05 achieved statistical significance.

RESULTS

A combined total of 812 pupils were examined between January through March 2009, from three primary schools in Ezza North Local Government Area of Ebonyi State, Nigeria. Out of the 518 males and 294 females examined, 249 (48.06% 95% C.I., 43.6 – 52.4%) and 126 (42.85%, 95% C.I., 37.5 – 48.5%) had the infection respectively. 375 (46.18%, 95% C.I, 42.6 – 49.4%) were infected with *S. haematobium* in the schools, table 1. The males were more infected than the females in all the schools (48.06% versus 42.85% 95% C.I., 43.7 – 52.3% versus 37.3 – 48.7%) respectively. The difference was not statistically significant ($x^2 = 0.763$, df = 1, P > 0.05).

Between the age groups examined, 11 - 15 years had the highest prevalence of (52.52%, 95% C. I., 48.5 – 57.5%) while 5-10 yrs and ≥ 16 yrs had (40.80%, 95% C. I., 34.2 – 47.8% and 31.85%, 95% C. I., 24.1 – 39.9%) respectively, Table 2. Also the prevalence of heavy infection was higher among the ages of 11 - 15 yrs than 5 – 10 yrs and ≥ 16 yrs (53.30%, 95% C. I., 6.0 – 46.0%, 27.42%, 95% C. I., 15.9 – 38.1% and 27.27%, 95% C. I., 13.9 – 40.1%) respectively. There is significant difference in the rate of infection ($X^2 = 8.163$, df = 2, P > 0.05). The overall study showed higher prevalence of light infection than heavy infection (49.90%, 95% C.I., 45.7 – 54.3% and 39.93%, 95% C.I., 34.5 – 45.5%) respectively, table 3.

Cure Rates: During chemotherapy, 310 pupils received treatment from the three primary schools while 300 pupils gave their urine samples for re – examination. The cure rates in the schools were 207 (69.00%, 95% C.I., 63.8 –74.2%). There was no significant difference in the cure rate between the sexes (males 76.32%, 95% C.I., 69.9 – 82.1%, while females were 56.36%, 96% C. I., 46.7 - 65.3%) (X² = 0.005, df =1, (P< 0.05)

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Furthermore, there was no significant difference in the cure rate between the age groups examined, 5-10yrs, (65.67%, 95% C.I., 55.7 – 78.3%), 11-15yrars, (69.00%, 95% C. I., 62.6 – 75.4%) and \geq 16 years, (75. 76%, 95%, C.I, 61.4 – 90.6%), table 2. ($X^2 = 0.19$, df= 2, P>0.05). The cure rate of heavy and light infections was higher among males than females (\geq 50 eggs / 10ml =33.33%, 95% C.I., 20.8 – 45.2%, <50 eggs / 10ml = 94.03%, 95% C.I., 54.0 – 98.0% versus \geq 50 eggs / 10ml 25.71%, 95% C.I., 11.5 – 40.5%, <50 eggs / 10ml =71.62%, 95% C. I., 61.8 – 82.2%) respectively, table 3. Statistical analysis showed no significant difference between the heavy and light infected males and females cured in the study area ($x^2 = 0.073$, df =1, P> 0.05).

However, between the heavy and light infected age groups, the cure rates were ($\geq 50 \text{ eggs}/10\text{ml}$ urine 30.43%, 95% C. I., 20.6 – 39.4%) and < 50 eggs/10ml urine 86.06%, 95% C. I., 81.3 – 90.7%), table 3. Statistical analysis showed significant difference in the cure rates between heavy and light infection in the study area ($x^2 = 19.91$, df = 1, P > 0.05).

TABLE 1: SCHOOLS EXAMINED FOR PRESENCE OF SCHISTOSOMA HAEMATOBIUM INFECTION.

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BEFORE TREATMENT
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TREATMENT

THREE WEEKS AFTER TREATMENT

Schools	No. Examined	No. Infected	No. Treated	No. Re - Examined	Cure Rate
Uwaoma Primary.	286	124, (143. 35%)	103	100	78 (78.00)
Unity Primary.	267	117, (43.82%)	95	92	54, (58.70%)
Community Primary.	259	134, (51.74%)	112	108	75, (69.44%)
Total	812	375, (46.18%)	310	300	207, (69.00%)

TABLE 2: SUMMARY OF SEX AND AGE GROUP ENROLLED IN THE STUDY

BEFORE TREATMENT							T	TREATMENT					THREE WEEKS AFTER TREATMENT				
NO EXAMINED				ED	NO INFECTED			NO TREATED			NO RE- EXAMINED			CURE RATES			
	AGE GROUP	М	F	TOTAL	М	F	TOTAL	М	F	TOTAL	М	F	TOTAL	М	F	TOTAL	
	5-10	123	78	201	52 (42.28%)	30 (38.46%)	82 (40.80%)	46	24	70	44	23	67	30 (68.18%)	14 (46.67%)	44 (65.67%)	
	11 – 15	275 2	201	476	160 (58.18%)	90 (44.78%)	250 (52.52%)	129	75	204	126	74	200	98 (77.78%)	40 (54.05%)	138 (69.00%)	
	<u>></u> 16	83	52	135	27 (32.53%)	16 (30.77%)	43 (31.85%)	22	14	36	20	13	33	17 (85.00%)	8 (61.54%)	25 (75.76%)	
_	TOTAL	481 3	331	812	239 (41.69%)	136 (41.09%)	375 (46.18%)	197	113	310	190	110	300	145 (76.32%)	62 (56.36%)	207 (69.00)	

TABLE 3: RATE OF LIGHT AND HEAVY INFECTION ACCORDING TO SEX IN ALL THE SCHOOLS EXAMINED

BEFORE	TREAT	MENT		TREATMENT						THREE WEEKS AFTER TREATMENT					
NO EXAMINED			NO INFECTED			NO TREATED			NO RE- EXAMINED			CURE RATE			
AGE GROUP	MF	TOTAL	М	F	TOTAL	М	F	TOTAL	М	F	TOTAL	М	F	TOTAL	
< 50	294 215	509	(56.12%) 165	41.40% 89	49.90% 254	139	76	215	134	74	208	94.03% 126	71.62% 53	179 86.06%	
\geq 50	87 116	303	(39.57%) 74	40.52% 47	39.93% 121	59	36	95	57	35	92	33.33% 1	9 25.71% 9	28 30.43%	
TOTAL	481 331	812	49.69%) 239	41.09% 136	46.18% 375	198	112	310	191	109	300	75.92% 145	56.88% 62	207 69.00%	

DISCUSSION

Before chemotherapy, the overall prevalence of *S haematobium* infection in the study area was high (46.18%), which suggest that the disease is endemic in the State, (*Uneke et. al. 200*,7 *Anosike, et. al. 2006*). The present study supports a number of previous reports, which have consistently shown that *S. haematobium* infection endemicity in Nigeria is on the increase particularly in the rural areas with school children at greatest risk (*Korve, 2002 and Bundy, et. al. 1992*).

The result shows that the prevalence of *S. haematobium* was higher among the males than females (48.06% and 42.85%) respectively. This is presumably due to higher water contact activities by male pupils particularly in the swamp-rice farming and fishing, where fathers engage every male in their household in the profession. In addition, other regular water-contact activities such as swimming and bathing in cercariae infested streams and rivers are male dominated. This is similar to the observations made in Ebonyi State, Nigeria by (Anosike, *et. al.* 2006).

Among the age groups examined, the observations made showed that the prevalence of Shaematobium infection was higher between the ages of 11-15 years, followed by 5-10 years and lower in ≥ 16 years. This was similar to the observations made by (Awogun, 1990). Five weeks after chemotherapy with PZQ, the result of the present study indicated that a single treatment with PZQ (40mg/1kg per body weight) was safe, resulted in high parasitological cure and egg reduction rates. This agrees with other finding done by (Sabah, et al 1986, Diana, et. al. 1998). After re-examination of pupils, the overall percentage cure rates was 69.00%, and the cure rates of light infection was high (86.06%) than heavy infection (30.43% as to compare with the status of infections before chemotherapy. This is similar to the observations made in KwaZulu-Natal South Africa (Saathoff, et. al. 2004) and in Kenya, (Kahama et. al. 1999), 93 (31.00%) pupils that received chemotherapy were not cured after three weeks post treatment. This could be as a result of either drug resistance, non – compliance to treatment, worms that are killed very slowly, religious belief, or more likely, that eggs continue to be released from tissue after worms death. This is similar with other works done in Egypt, (Doenhoff, et. al. 2000, Maha and Dewolfe, 1998, Louis Albert et al 2004). Where patients failed to be completely cured of S. mansoni infections even after PZQ had been administered three times and some children could not swallow the PZQ tablets.

In conclusion, this study showed that in Ezza North, PZQ has a high cure rate against *S*. *haematobium* infections and should be given to every infected child in the area to achieve drop in prevalence and incidence of certain health problems.

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