Original Article

Effects on Packed Cell Volume and Parasitic Worm Load from Deworming Pupils of a Public School in Rivers State, Nigeria

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ABSTRACT

BACKGROUND: Parasitic worms infect millions of school age children worldwide and this is even more evident in the tropics where basic personal general hygiene still remains a challenge. One of the consequences of parasitic worm infestation in children is anaemia which is objectively measured by estimating the packed cell volume. This study carried out through four months was to examine the effects, (on packed cell volume and parasitic worm load) of de-worming pupils of a primary school in Rivers State.

METHOD: This two-phase quasi-experimental intervention study had 218 pupils (i.e. study and control groups) selected by multi-stage sampling from a primary school. Their packed cell volumes were estimated with centrifuge hematocrit and stool examined for parasitic worms with saline wet prep microscopy. A dose of Albendazole was administered to the study group. The data presented in Microsoft Excel spread sheet, were then analysed using SPSS version 17, T-test and Chi Square respectively.

RESULTS: The prevalence of ova in the stool of the study group dropped significantly from the pre-intervention 53.4% to a post intervention 11.5% (P=0.00). Also, the mean packed cell volume in the study group increased from 32.2+3.3% to 33.1+3.0% (P=0.03). The values for the control remained essentially same pre- and post-intervention.

CONCLUSION: The de-worming intervention significantly reduced the parasitic worm load and improved the packed cell volume of the pupils. It is recommended that school age children be routinely dewormed as part of the School Health Programme.

KEY WORDS: Packed Cell Volume, Helminthes, Pupils, Deworming

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INTRODUCTION

More than two billion people worldwide are infested with Schistosomes and Soil Transmitted Helminthes (STH). Soil transmitted infection accounts for over 40% of worldwide burden of tropical disease excluding malaria[1]. Although most infections are chronic and non life threatening, 300 million of those affected suffer severe illnesses and over 150,000 die annually[2, 3]. About four hundred million school age children are infected with parasitic worms worldwide and they have the highest intensity of worm infestation of any age group. Helminthiasis is more prevalent among school children aged 5-14 years [4, 5]. The frequency of worm infestation among school children varies from place to place and even amongst individuals. These could be due to various climatic conditions and habits. Worms do not multiply in the body but, they increase in number following repeated infestations from renewed contact with contaminated soil, food or water[6].The parasitic worms which affect humans include Schistosomes, Filarial and Soil transmitted helminthes (STH)[7,8]. The STH include the Nematodes, Cestodes and flat worms[9, 10.]

The exact burden of this disease condition in Nigeria is not known due to inadequate and poor data management. In Okenne, Ogun State Nigeria, among pre-school children, the prevalence was 51.3%[11]and in Ilobu Osun State, the prevalence among school age children was 60%.However, in Akoko Edo in Edo State Nigeria, a very high prevalence of 91.1% was seen among pre-school age children [12]. In the Eastern parts of Nigeria, prevalence among primary school pupils was 48.08% and 80.9% respectively.[13,14] Also in Calabar, a prevalence of 49.7% was reported among school children of peasant farmers [15]. Among inhabitants with poor environmental sanitation, infestation is higher if their personal hygiene is poor[16]. Adult STH and Schistomes are transmitted via eggs passed in the feaces and urine of infected individuals contaminating soil and water. The eggs in soil can be transferred to vegetables and the hands before being passed to humans by ingesting raw vegetables or penetration through the skin depending on the species. Worms live in the intestinal tracts and do not multiply in the body. Their numbers increase through repeated infection from renewed contact with contaminated soil, food or water[17]. Most children with intestinal worm will come down with anaemia due to subtle blood loss and loss of appetite [18,19] and malnutrition. Chronic diarrhoea is also a common manifestation[20]. Also, pneumonia, vomiting, pica, urticaria, rectal prolapse and intestinal obstruction which could lead to abdominal discomfort have also been associated with heavy worm infestation[21,22]. Studies show that infestation by worms could have significant effect on the development of children[23]. It could cause reduced physical fitness and constrained growth[24]. There might also be subtle but important developmental effect on cognitive and

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educational achievement[25]. Furthermore, heavily infested children attend school half as much as their uninfected peers[18]. Studies have shown that de-worming is the most cost effective way of improving attendance to school and improving academic performance of school children [26,27,28]. De-worming school children regularly is an essential component of school feeding services of the national School Health Programme (SHP) of the Federal Ministry of Education, Nigeria. This study carried out through four months was to examine the effects (on packed cell volume and parasitic worm load) of de-worming pupils of a primary school in Rivers State

Materials and Method

Study design and population: This quasi experimental study was carried out in State Primary School Ubima a public co-educational school in Ikwerre, one of the 23 Local Government Areas of Rivers State in the South-South geopolitical region of Nigeria. The school had 480 pupils aged 6-12 years with about 40 pupils in each class. Ubima is rural, with a population of about fifteen thousand made up mainly of farmers, hunters and traders. The study involved pre- and post-deworming assessment of two groups of pupils (viz control and study respectively); by estimating their packed cell volume (PCV), stool microscopy for presence of ova of parasite and an interviewer administered bio-data entry sheet.

Inclusion Criteria were that the school must be a public one as most pupils here are from the low socio-economic group where worm infestation is high and that the pupils must be between 6 and 12 years, an age group with high worm infestation.

Sample size: Using the formula for comparison of two proportions, 109 pupils each for study and control groups respectively, were selected by multistage sampling comprising balloting to select the local council of the study, the public school and the participating pupils.

Data collection and analysis: Two pharmacy attendants, two laboratory technologists, two auxiliary nurses, one clerical assistant and the two teachers of the pupils were recruited and trained on blood sample collection for hematocrit centrifuge (i.e. PCV), administration and computation into the bio-data entry sheet, and saline stool prep for microscopy. Data were entered directly into Microsoft Excel spread sheet version 2007 statistical software. Analysis of the data was done using SPSS version 17 software, students T-test and Chi Square test.

Intervention: A single dose of 400mg albendazole was given to each pupil in the study group under direct observation by the researcher. The control group was not given any de-worming tablet. The pupils were then observed for any ill health and possible cause for four months as school was in session.

Post-Intervention: After 4 months, PCV and stool analysis were re-assessed for all respondents (study and control groups) just as was done in the pre-intervention period. The control group was then de-wormed.

Ethical Consideration: Ethical clearance was obtained from the Research and Ethics Committee of the University of Port Harcourt Teaching Hospital. The permission to carry out the study was also obtained from Ikwerre Local Government Area, the Rivers State Primary Schools Management Board and the head mistress of the school. Furthermore, parents and guardians were requested to sign a written consent after explaining the benefits and objectives of the study. The pupils were also given health talk/education on the protocol and benefits of the study. Confidentiality of respondent's information was assured and respondents were free to decline from participation at any stage.

Limitation was that some parents/care givers 'initially withdrew' their wards from the study and also convinced other parents/care givers not to allow their wards to participate in the research mainly due to ignorance. This initially slowed down recruitment but was overcome by extensive enlightenment campaign, health education and advocacy and the sample size including adjustment for adjustment were achieved.

Results

Table 1: Socio demographic data of respondents

Characteristics	Study group n=105		Control group n=102		Total	X^2	p
	Freq.	%	Freq.	%			
Sex							
Male	55	26.6	57	27.5	112	0.1	0.7
Female	50	24.2	45	21.7	95		
Religion							
Christian	98	47.3	100	48.3	198		
Muslim	1	0.5	1	0.5	2		
Eckankar	6	2.9	1	0.5	7	1.7	0.4
Tribe							
Ikwerre	80	38.6	82	39.6	162		
Igbo	19	9.2	9	4.3	28		
Yoruba	3	1.4	2	1.0	5	3.7	0.5
Hausa	1	0.5	1	0.5	3		
Ogoni	2	1.0	6	2.9	8		
Kalabari	0	0.0	2	1.0	2		
Whom the Pupils live with							
Father and mother	60	29.0	76	36.7	136		
Father only	9	4.3	3	1.4	12		
Mother only	15	7.2	14	6.8	29	4.6	0.2
Caregiver	21	10.1	9	4.3	30		

A total of 218 pupils were recruited for the study; 109 each for study and control groups respectively. There were a total of six classes with each producing about 34(16.4%) and 17(8.2%) respondents in the study and control groups respectively. A total of 207 respondents completed the study; 105(96.3%) for the study and 102(93.7%) for control groups respectively. Average age of respondents was 9 years with a mean age of 8.9±2.1 Majority of the pupils were Christians, 198(95.7%).

Table 2: Occurrence of ova in the stool of pupils at baseline

Presence of ova	Study group n= 105		Control group n= 102		X^2	p
	Freq	%	Freq	%		
Present	56	53.4	60	58.8		
Absent	49	46.6	42	41.2	1.98	0.26
Total	105	100	102	100	df=1	

Most pupils had ova in their stool at baseline; 56(53.4%) for study and 60(58.8%) for control group respectively. There was no statistically significant difference between the study and control. (p=0.26).

Table 3: Occurrence of ova in the stools of pupils after intervention

Presence of ova	Study group n= 105		Control group n= 102		X^2	p
	Freq	%	Freq	%		
Present	12	11.5	63	61.8	56.74	0.00
Absent	93	88.5	39	38.2		
Total	105	100	102	100	df=1	

After the period of intervention; 12(11.5%) of pupils in the study group had ovian their stool while 63(61.8%) of pupils in control group had ova in their stool. There was a statistically significant difference between the study and control group. (p=0.00).

Table 4: Types of ova in the stool of pupils at baseline

Types of ova	Study group n= 56		Control group n= 60		X^2	p
	Freq	%	Freq	%		
ascaris	19	33.9	18	30.0	2.6	0.98
hookworm	16	28.6	16	26.7		
trichuris trichuria	7	12.5	6	10.0		
taenia	2	3.6	4	6.7		
Others	8	14.3	6	10.0		
Mixed	4	7.1	10	16.6		
Total	56	100	60	100	df=5	

Here,19(33.9%) of pupils in the study group and 18(30.0%) in control group had *ascarislumbricoides.* 4(7.1%) in study group and 10(16.6%) in control group had mixed infection. There was no statistically significant difference between the study and control groups. (P=0.98).

Table 5: Distribution of PCV of pupils at baseline

Study group n= 105			Control group n= 102			T Test	P
Mean PCV (%)	Max. PCV (%)	Min. PCV (%)	Mean PCV (%)	Max. PVC (%)	Min. PCV (%)		
32.2±3.3	43	25	31.3±3.0	38	25	3.877	0.53

There was no statistically significant difference in the PCV of pupils between the study and control groups at baseline. (p=0.53)

Table 6: Distribution of PCV of pupils after intervention

Study group n= 105			Control group n= 102			T Test	p
Mean PCV (%)	Max. PCV (%)	Min. PCV (%)	Mean PCV (%)	Max. PCV (%)	Min. PCV (%)		
33.1±3.0	42	27	31.3±2.9	38	24	1.583	0.03

After period of intervention, there was a statistically significant difference in the PCV of pupils between the study and group (p=0.03)

DISCUSSION

This study showed a demographic profile which is uniform in character in both study groups . Most of the pupils were from the Ikwerre ethnic group which was not surprising considering that the study was carried out in that area (Table 1).

Before intervention Table 2, there was no statistically significant difference (P=0.26) between the study and control groups in the occurrence of ova in the stool of pupils. However, after intervention (Table 3), there was a remarkable statistically significant difference between the study and control groups (P= 0.00). These results are in keeping with the results from many studies which showed significant reduction in the occurrence of ova in the stools of pupils following de-worming intervention [28,29,30,31]. It is known that a single dose of albendazole (400mg) will reduce the number of intestinal helminthes significantly. It is therefore, important that mass de-worming of school children be carried out when the prevalence of stool ova exceeds 50% and only children affected should be de-wormed when the prevalence is less than 50% [29].

From Table 4, the results of this study revealed that *ascaris lumbricoides* infested the pupils more than any other helminthes; 37(38.89%). This was closely followed by hookworm (*ankylostoma duodenale and necatus americanus*) with a prevalence of 36(31.03%). There was no statistically significant difference in worm infestation between the study and control groups. The order in prevalence of intestinal infestation with

helminthes seen in this study was also similar to those found in Kenya and Nigeria respectively [13,24]. In this study, it was not clear which helminthes caused the greatest symptoms in school children but results from a study in Nigeria shows that hookworm infestation caused iron deficiency anemia more than any other helminthes [32].

The mean PCV (Table 5) at baseline for pupils in the study and control groups were 32.2 ± 3.3% and 31.3 ± 3.0% and expectedly there was no statistically significant (P=0.53) difference between the two groups. Post intervention (Table 6), there was a statistically significant difference (P= 0.03) in the mean PCV between the study and control groups. The findings in this study were similar to that carried out among pre-school aged children by Nmorsi et al in which, there was a significant increase in PCV from pre-treatment value of 22.8% to post-treatment PCV of 35.1% [12]. The findings were also in conformity with a study in Eastern Nigeria where over 70.5% of children infested with intestinal helminthes were anaemic with blood haemoglobin less than 0.5g/L [32]. Children with heavy intestinal infestation lose nutrients due to poor absorption with accompanying diarrhea.[21] This will manifest as long standing anaemia [20]. However, following de-worming, appetites for food returns[33,34], more nutrients are absorbed and consequently, the PCV rises.

CONCLUSION: The intervention by de-worming therefore significantly reduced the parasitic worm infestation and improved the packed cell volume of the pupils of this school. It is recommended that school age children be routinely de-wormed as part of the School Health Programme.

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