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Deworming as a Measure of the Prevalence of Soil Transmitted Helminths among Primary School Children in Bonny Local Government Area of Rivers State

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Abstract:- The investigation was carried out in selected public primary schools in Bonny Local Government Area of Rivers State. A total of 424 samples were collected from the study areas. Sample size was determined using Taro Yamane's formula for sample size determination.178 samples were from CS Bonny, 126 samples were from GPS Abalamabie and 120 samples were from CPS Finima. A self-structured questionnaire was first administered to the study participants to obtain their basic biodata and duration of deworming. Zinc sulphate flotation technique was used for isolation of parasites. Data generated was analysed using simple percentages. The result showed that no form of deworming was carried out within specified period of this research in CS Bonny, *A. lumbricoides* and hookworm were present in 40.4%. Results from GPS Abalamabie and CPS Finima were dewormed by the Government and no helminth was extracted, indicating a zero prevalence of helminths in the schools sampled. The study shows that deworming plays a major role in the fight against helminthiasis among school children. Therefore the need for Government to continue with routine deworming exercise to maintain the zero prevalence status of helminths among school children in the study area.

Keyword:- *Deworming, prevalence, soil helminthes, school children, and Bonny L.G.A.*

I. INTRODUCTION

A. Background to the Study

Soil-transmitted helminthes (STHs) are parasitic nematodes or round worms that are transmitted to humans through contact with or ingestion of faecally contaminated soil (Bethony et al., 2016; Hotez et al., 2018). Although traditionally seen as rural diseases, they have become of great public health concerns in urban slums of developing countries (Crompton, 2019). They are most prevalent among impoverished populations in developing countries characterized by low socio – economic status; poor housing and sanitation, lack of safe water supplies, inefficient or no health care, poor education and low earnings (Stephenson et al., 2010b). Climatic and environmental factors such as soil type are closely related with the distribution of STH infections in a country. For this reason, tropical and subtropical regions of the world where climatic and environmental conditions tend to be conducive for the development of infective stages are major endemic zones. These include countries of South and Central America, south and south-west China, India and south-east Asia as well sub-Saharan African countries (de Silva et al., 2013; Hotez et al., 2016).

The common roundworm known scientifically as *Ascaris lumbricoides* (roundworm) the whipworm (*Trichuris trichiura*) and the hookworms (*Necator americanus* and *Ancylostoma duodenale*) are regarded as the 3 most important STHs because they have the highest prevalence rates and they cause the greatest burden on health (Hotez, 2018). They are major public health problems with an estimated 135,000 deaths due to them annually. However, their major public health significance lies in the chronic morbidities they cause in their hosts (WHO, 2012).STH infections can have both short and long term effects on their hosts, where they impact on nutrition, growth, cognitive development and lifelong health of humans, especially children. Due to the chronic and often times asymptomatic nature of the diseases these impacts are often subtle and difficult to assess (Crompton and Nesheim, 2012), as a result, health conditions such as anemia, growth stunting, protein-calorie malnutrition, fatigue, and poor cognitive development arising from the impacts of the infections, tend to persist in affected populations (Hotez et al., 2018b), even leading to the acceptance of helminth infections as normal part of life in such populations (Tanner et al.,2019).

Deworming has been shown to result in improvement in appetite and growth of the children with an overall decrease in the prevalence of malnutrition. Physical fitness and psychological development of children have also been shown to improve with deworming (Adams et al.,2014; Latham,2017; Northrop-Clewes et al.,2011). Deworming has been shown to prevent 82% of stunting, as well as cause an increase in weight gain by 35% in undernourished children and cause a 25% reduction in school absenteeism as well as improvement in school enrolment for the girl child (Ault et al.,2011). Soil transmitted helminths is one of the leading Neglected Tropical Diseases due to its low mortality irrespective of its high morbidity even when compared with the so called the big three, including HIV/AIDS, tuberculosis, and malaria. The diseases caused by helminthes infection receives less than 1% of global

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research funds, The global burden of disease caused by these intestinal nematodes is estimated at 22.1million disability adjusted life years (DALYs) lost to hookworm, 10.5 million to *A. lumbricoides*, 6.4million to *T. trichiura*, giving a combined total of 39 million DALYs. The disease burden is as great as that due to tuberculosis (34.7 million DALYs) or malaria (46.5million DALYs.

Worm infection is world-wide with increasing number of cases being reported from Africa and the Asia. However Intestinal helminth infections are prevalent in most developing communities. It is estimated that over one billion people living in developing regions of sub-Saharan Africa, Asia, and the Americas are infected with one or more helminthes especially the very poor ones plagued with other diseases and living on less than two US dollars per day. It causes about five hundred thousand to one million deaths annually. School-age children (including adolescents) and preschool children for reasons of lack of knowledge of deworming exercises, compared with any other age group harbor some of the most intense infections. Of 246 children, aged 7–12years, attending school in rural Akpet Cross River State, 91% carried *Ascaris lumbricoides* and 82% carried *Trichuris trichura*. In Madagascar, a study revealed prevalence of 93% for *Ascaris lumbricoides*, 55% for *Trichuris trichiura* and 27% for Hookworm. Findings have shown that about 50% of school children in semi-urban communities were infected by one or more helminths, the most prevalent STH being *Ascaris lumbricoides* (47.6%). Studies in Nigeria reported prevalence levels of between 17.8 to 87% in various parts of the country.

These infections produce adverse effects on health, growth, and learning ability with diminished physical fitness as well as impaired memory and cognition. These adverse health consequences combine to impair childhood educational performance, reduce school attendance and subsequent productivity. As Soil Transmitted Helminths (STHs) affect education and health it thus directly and indirectly has a negative impact on economic growth. Studies have shown that infection with hookworm during childhood is associated with a 43% reduction in future wage-earning capacity. While the Soil Transmitted Helminths promote poverty, poverty also promotes Soil Transmitted Helminths infections. This is evidenced by the fact in countries where STH infestations are endemic, afflicting much of the population, are the countries where sanitation system is lacking i.e. lack of latrines, houses are poorly constructed (floors are not cemented) and in habitants do not wear shoes. In pregnancy, worm infections are also important diseases causing neonatal prematurity, reduced neonatal birth weight, and increased maternal morbidity and mortality.

Although the World Health Organization (WHO) recommends deworming of school-age children as a feasible and cost-effective control strategy, there is no policy-backed approach for helminth control in Nigeria. Ideally, we should have a functional school health program in all our schools, that would include deworming and health education. However, there were almost non-existent, especially in our rural schools. Even where there is one, it is usually physical examination and treatment of minor ailments that are established without deworming and focused health education. This study would explore the parent's knowledge and practice of deworming as well as prevalence of STHs and potential benefit of making deworming a routine in our primary schools in Bonny Local Government Area, Nigeria.

B. Statement of the Problem

In Nigeria, the implementation of mass deworming through the Healthy School program began in 1990s and efforts to reach national coverage have intensified over the years. Despite these efforts, prevalence of STH infections remains high in Nigeria. There are no available data on the evaluation of the Success of these interventions in terms of decreasing prevalence or intensities, improving health status, and cognitive abilities of children that receive deworming treatment. Moreover, there is a scarcity of information on the association between STH, and deworming. There is therefore an urgent need to investigate these situations especially in high-risk areas of the country. Data generated from such studies will go a long way in assisting control efforts. Therefore, the need to determine deworming as a measure of the prevalence of Soil Transmitted Helminths among primary school children in Bonny Local Area of River State Nigeria.

C. Scope of the Study

This study limited to deworming as a measure of the prevalence soil transmitted helminthes among primary school children in Bonny Local Government Area of Rivers State.

D. Significance of the Study

Worm infection has plagued human for centuries now. This predates the era of our recorded history and still poses a great threat to global health. It is in view of this that this study is conducted to explore the parent knowledge and practice of deworming as well as prevalence of Soil Transmitted diseases and potential benefit of deworming among primary school children in Bonny Local Government Area of River State. With a view to providing additional data on the incidence of such enteropathogenic diseases for necessary action on the part of sanitation, provision of toilet facilities, rising awareness of school age children (7 to 12 years) and their families on STH infection.

E. Aim and Objectives

The aim of the study is to evaluate the deworming as a measure of the prevalence of soil transmitted helminths among primary school children in Bonny, Rivers State.

The objectives include to:

- ascertain the rate and regularity of deworming exercise in the school
- evaluate the occurrence and prevalence of soil transmitted helminths among primary school pupils in the study area
- determine the prevalence of soil transmitted helminthes in relation to species
- ascertain the prevalence of soil transmitted helminthes in relation to age and sex of school children in the study area

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II. MATERIALS AND METHODS

A. Study Area

The study was carried out in selected public primary schools in Bonny Local Government Area of Rivers State (Fig. 3.1). Bonny (or Ibani) is an island town and a Local Government Area in Rivers State in southern Nigeria, on the Bight of Bonny, Bonny is near Port Harcourt; Ferries are the main form of transport to and from the Island. According to 2006 census the Bonny has an estimated population of 214,983 inhabitants. Bonny covers a wide area of about 645.60 km². The Local Government Area lies on latitude 4°26′N to 5^{0}02'N and longitude 6^{0}56'E to 7°10′E. The local government has two urban centers; Bonny and Finima. The predominant occupations include farming (fishing), trading and civil/public servants.

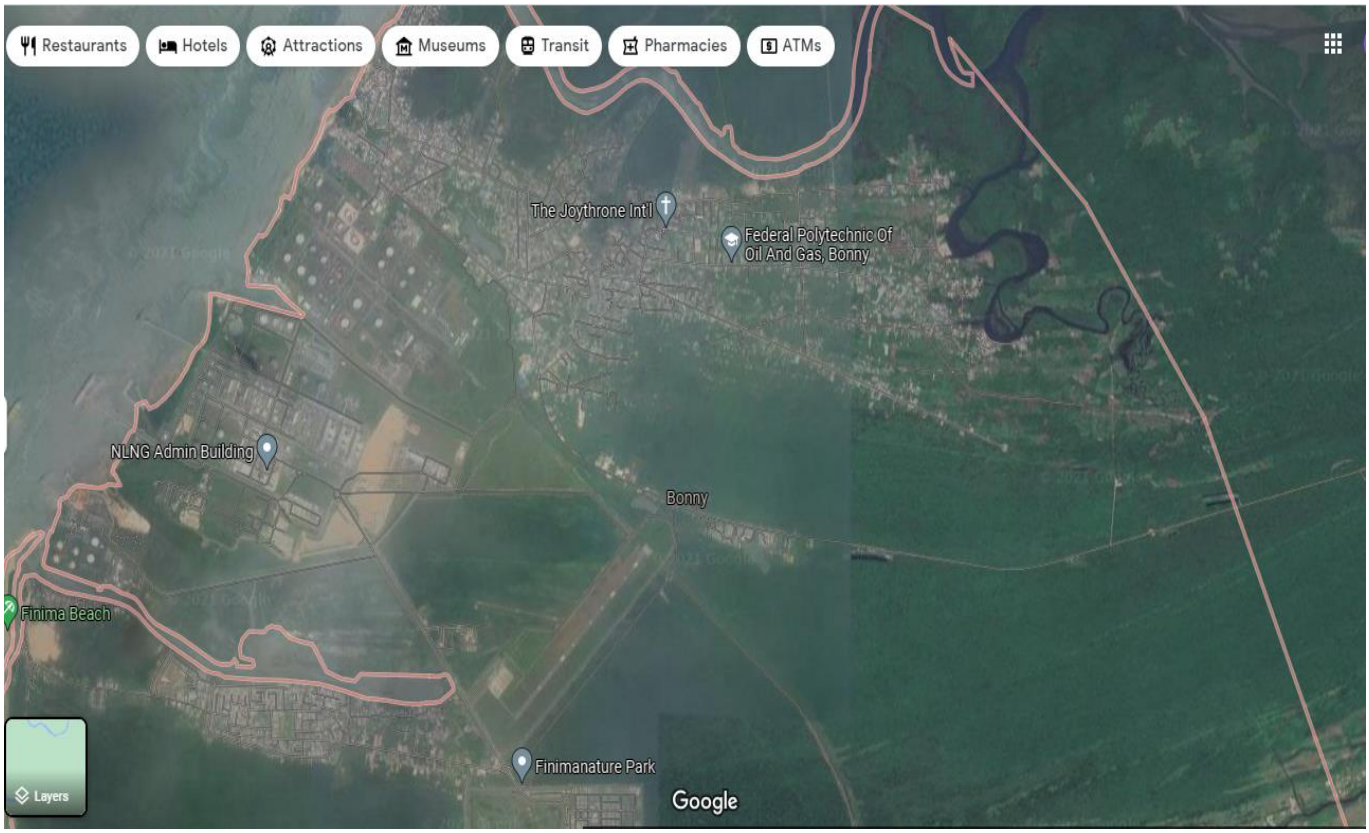

Fig. 1: Map showing Bonny LGA

Source Google map, 2021

B. Sampling Sites

Three primary schools were randomly selected for the study. They include; Central school Bonny, Community Primary School, Abalamabie and Community Primary School, Finima. Pupils of Central School Bonny with a total population of 320 school children were not dewormed within the period of this study while Community Primary School, Abalamabie and Community Primary School, Finima with total population of 327 and 309 primary school children respectively were dewormed.

C. Sample size

178 specimen were collected from Central School Bonny (Not dewormed) and a total of 246 specimen were collected from both Community Primary School, Abalamabie and Community Primary School, Finima (126 and 120 respectively). Sample size was determined using Taro Yamane's formula (1967) for sample size determination.

The Taro Yamane's statistical formulais

$$n = \frac{N}{1 + N(e)^2}$$

'n' is the required sample size from population under study

'N' is the whole population that is under study

'e' is the precision or sampling error which is usually (0.10 = 90%, 0.05 = 95%, 0.01 = 99%)

Using a precision error of 0.05

Therefore, sample size for Central School Bonny (Not dewormed) was

$$n = 320/1 + 320(0.05)^2$$

$$= 320/1 + 320(0.0025)$$

= 320/1 + 0.8

= 320/ 1.8

= 178

While sample size for Community Primary School, Abalamabie and Community Primary School, Finima (dewormed) combined was

$n = 636/1 + 636(0.05)^2$

= 636/1 + 636(0.0025)

= 636/1 + 1.59

= 636/ 2.59

= 245.5 or 24

D. Collection of Demographic data

A self-structured questionnaire was administered to the study participants to obtain their basic biodata and duration of deworming. Information such as school name, gender, age range, deworming status and source of deworming drugs were obtained using the questionnaire.

E. Collection of stool samples

Ten percent (10%) of formalin was prepared and 10ml was poured into each sample bottle. The sample bottles were distributed to the pupils with the help of the Headmasters and class teachers after proper orientation was given to the pupils. The sample bottles which contained 10ml formalin were taken home by the pupils and returned the next day with stool inside. Each sample bottle given to the study participants were labelled with same name registered on the questionnaire by the same study participant and the samples were immediately transported to the research laboratory, Department of Biology, Ignatius Ajuru University of Education, Rivers State for examination and identification of trapped parasites.

F. Laboratory Examination

Zinc sulphate flotation technique was used for concentration of the parasites. 10ml of a well prepared zinc sulphate solution was added to1g of stool in a test tube. It was shaken for proper mixture of the sample and the solution. The content was filtered into another test tube to remove debris from the stool mixture. The test tube was then place vertically on a test tube rack and filled to the brim with more zinc sulphate solution. A cover slip was placed at the top of the test tube and allowed to stay for 45minutes. The cover slip – after the 45mins - was later placed on a glace slide and viewed under the microscope for presence of helminths

G. Statistical Analysis

Data generated were analysed using the following formulae

$$\text{Overall prevalence of parasites} = \frac{\text{No. of samples with parasites}}{\text{Total number of samples examined}} \times 100$$

$$\text{Prevalence of parasites} = \frac{\text{No. of samples with specific species of parasite}}{\text{Total number of samples examined}} \times 100$$

$$\text{Parasite Intensity} = \frac{\text{No. of specific parasites}}{\text{Sample per 10ml}}$$

III. RESULTS

A. Demographic Characteristics of the Study Participants

The tables below (Table 4.1a and 4.1b) shows the demographic characteristics of the study participants. Table 4.1a shows that, out of 178 study participants from Central School Bonny, 8(5%) were within the ages of 4-6 years, 104(58%) were within the ages of 7-9 years and 66(37%) were within the ages of 10-12 years. 87(58.9%) of the study participants were males while 91(51.1%) were females. No dewormed took place in Central School Bonny.

Table 4.1b shows that out of 126 study participants from CPS Abalamabie, 49(39%) were within the ages of 7-9 years and 77(61%) were within the ages of 10-12 years. Out of 120 study participants from CPS Finima, 2(1.7%) were within the ages of 4-6 years, 43(35.8%) were within the ages of 7-9 years and 75(62.5%) were within the ages of 10-12years. Out of the entire 246 study participants, 2(1.7%) were within the ages of 4-6 years, 92(37.4%) were within the ages of 7-9 years and 152(61.8%) were within the ages of 10-12years. This shows that a great percentage (61.8%) of the study participants were within the ages of 10-12years.Out of 126 study participants from CPS Abalamabie, 68(54%) were males while 58(46%) were females. out of 120 study participants from CPS Finima, 59(49%) were males while 58(46%) were females. The result of the study indicated that out of the 246 participants investigated, 127(51.6%) were males while 119(48.4%) were female. This shows that the percentage of male participants in the study is slightly higher than the female participants.

Table 4.1b also shows the deworm status of the study participants before participating in the study. From CPS Abalamabie, 126(100%) of the study participants were dewormed within two months before the study while 120(100%) of the study participants from CPS Finima dewormed within one month before participating in the study. The result also shows that both pupils from CPS Abalamabie (126) and CPS Finima (120) were dewormed by the Government. This means that the deworming exercise which occurred in CPS Abalamabie and CPS Finima within

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Two months and One month respectively was carried out only by the Government.

Table 1: Characteristics of Study Participants from Central School Bonny, (Not Dewormed)

School	Central School Bonny (n=178)	%
Age(years)		
4-6	8	5
7-9	104	58
10-12	66	37
Gender		
Male	87	48.9
Female	91	51.1
Deworm Status		
One month	-	-
Two months	-	-
Three months	-	-
None	178	100

Table 2: Characteristics of Study Participants from Community Primary School, Abalamabie and Community Primary School, Finima (Dewormed)

School	CPS Abalamabie (n=126)(%)	CPS Finima (n=120)(%)	Total	%
Age(years)				
4-6	-	2(1.7)	2	0.8
7-9	49(39)	43(35.8)	92	37.4
10-12	77(61)	75(62.5)	152	61.8
Gender				
Male	68(54)	59(49)	127	51.6
Female	58(46)	61(51)	119	48.4
Deworm Status				
One month	-	120(100)	120	48.8
Two months	126(100)	-	126	51.2
Three months	-	-	-	
None	-	-	-	
Source of Deworming				
Parents/home	-	-	-	-
Government/school	126(100)	120(100)	246	100
Others	-	-	-	-

B. Occurrence of soil transmitted helminths among primary school children in Bonny, Rivers State

The table below shows the occurrence of soil transmitted helminths among primary school children in Bonny. Out of 178 samples examined from Central School Bonny, 72 (40.4%) were positive for at least one soil transmitted helminth. Out of 126 and 120 samples from Community Primary School, Abalamabie and Community Primary School, Finima, respectively, none was positive for any of the soil transmitted helminths.

Table 3: Occurrence of soil transmitted helminths among primary school children in Bonny Rivers State

Primary School	No. examined	No. positive	%
Central School Bonny (Not dewormed)	178	72	40.4
Community Primary School, Abalamabie	126	-	0
Community Primary School, Finima	120	-	0
Total	**424**	**72**	**40.4**

C. Prevalence of soil transmitted helminths in relation to species among primary school children in Bonny, Rivers State

The table below (Table 4.3) shows the prevalence of soil transmitted helminths in relation to species among primary school children in Bonny, Rivers State. Out of 72 samples from Central School Bonny with at least one soil transmitted helminth, 38 (52.7%) were infected with *Ascaris lumbricoides*, 23 (32%) were infected with hookworm ova, none had *Trichuris trihciura* and 11 (15.3%) had mixed infection consisting of *A. lumbricoides* and hookworm. All infected

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Table 4: Prevalence of soil transmitted helminths in relation to species among primary school children in Bonny, Rivers State

Schools	*Ascaris lumbricoides*	Hookworm	*Trichuris trichiura*	Mixed infection	Total
Central School Bonny (Not dewormed)	38	23	-	11	72
Community Primary School, Abalamabie	-	-	-	-	-
Community Primary School, Finima	-	-	-	-	-
Relative abundance (%)	**52.7**	**32**	**-**	**15.3**	**100**

D. Prevalence of soil transmitted helminths in relation to age and sex among primary school children in Bonny, Rivers State

The table below (Table 4.4) shows the prevalence of soil transmitted helminths in relation to age and sex among primary school children in Bonny, Rivers State. Only samples (72) from Central School Bonny were infected with at least one Soil transmitted helminth. For age distribution, out of 72 of the samples, 1 (1.4%) was from children within the ages of 4-6years, 56 (77.8) from children within the ages of 7-9years and 15 (20.8%) were within the ages of 10-12years. For gender, 61 (84.7%) were males while 11 (15.3%) were females

Table 5:Prevalence of soil transmitted helminths in relation to age and sex among primary school children in Bonny, Rivers State

School	CS Bonny (n=178)	CPS Abalamabie (n=126)	CPS Finima (n=120)	Total	%
Age(years)					
4-6	1	-	-	1	1.4
7-9	56	-	-	56	77.8
10-12	15	-	-	15	20.8
Gender					
Male	61	-	-	61	84.7
Female	11	-	-	11	15.3

IV. DISCUSSION

The study was carried out to investigate rate of deworming as a measure of the prevalence of soil transmitted helminthes among primary school children in Bonny, Rivers State. Prior to the collection of samples from the study participants, questionnaires were administered to each pupil to confirm the last date and rate of deworming along with the source of deworming. This was carried out to know the variables that may affect the outcome of the experiment. Central school (CS) Bonny, Community Primary School, Abalamabie and Community Primary School, Finima were selected for the study. The results (Table 4.1b) showed that no form of deworming was carried out within the specified period of this research in Central school Bonny. This was used as control to check if deworming plays a role in curbing the spread and control of Soil Transmitted Helminths. Results (Table 4.3) showed that, of the three known soil transmitted helminths, *A. lumbricoides* and Hookworm present in 40.4% of the samples collected from Central School, Bonny. This may be connected to the fact that no deworming exercise was carried out in the school within the study period of this research. The results (Table 4.1b) of the questionnaire also showed that pupils from CPS Abalamabie were dewormed by the government about two months before stool samples were collected while those from CPS Finima were dewormed by same Government about a month before stool samples were collected. Out of 246 samples collected from both schools, no helminth was extracted from the samples. This could be linked directly to the deworming exercise carried out by the government in those schools. This could also be linked indirectly as most parents are learned and had good knowledge about worm infection and deworming as gathered from the verbal interaction with the headmasters, class teachers as well as the parents. The pupils equally had a prevailing fair environmental condition in terms of availability of toilets and sewage disposal as well as source of water supply. This shows that mass deworming program plays a major role in the fight against helminthiasis. This was also observed in work carried out by Stoltzfus et al. (2014). They recorded a significant improvement in growth, anemia and appetite after antihelminthic treatment was administered in Zanzibari to infants < 30 months old that had very light infections of helminths. Deworming tablets allows people to absorb the critical nutrients needed to be and stay healthy. Deworming has been shown to improve child growth in many cases of malnutrition (Latham, 2017). Although the effects of intestinal helminths infection on growth is manifested more in heavily infected children while those with light infections may also manifest some growth faltering especially if the nutritional status of the community is poor (Stephenson et al., 2010).

Parasitic worms and their larvae are generally found in contaminated food and water in poor communities or areas where cleaning does not frequently happen. Conditions resulting from STH infections like vomiting, diarrhoea, anorexia, abdominal pain and nausea may also lead to reduced food intake, further reducing availability of nutrient to the host (Stephenson et al., 2010b). With a zero prevalence of helminths among students of the two schools studied, maximum academic participation will be achieved in those schools. The socioeconomic burden of helminths in the lives of those students will be down to zero as Ezeamama and coworkers (2015) observed that malnutrition and reduced physical fitness were associated with mild to moderate intensity childhood helminth infections. School-aged children are the most vulnerable group to STH infections and they often harbor the highest intensities of the

infections. Deworming has been shown to result in improvement in appetite and growth of the children with an overall decrease in the prevalence of malnutrition. Significant improvements in appetites, conditions such as anemia, physical fitness and development of the children as well as the children's psychological development have been associated with deworming in many studies (Adams et al., 2014; Latham, 2012; Northrop-Clewes et al., 2011; Stephenson et al., 2011; Stephenson et al., 2010b; Stoltzfus et al., 2013).

V. CONCLUSION

The study shows that deworming plays a major role in the fight against helminthiasis among school children which in turn will improve their full participation in academic activities. The prevalence of worm infection in this study was very low as compared to some studies in Nigeria, Africa, Asia and other parts of the world. The deworming and practice on worm infestation were good among the respondents studied. Deworming extremely reduced the worm infection. Therefore the need for Government to continue with routine deworming exercise to maintain the zero prevalence status of helminthes among school children in Bonny Local Government of Rivers State, Nigeria.

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