

1 INTestinal PARASITES IN SCHOOL-AGED CHILDREN OF RUMUODOGO, EMOHUA
2 LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA.

3

4 ABSTRACT

5 **Aim:** ~~An~~ This epidemiological survey was carried out to assess the prevalence of intestinal
6 parasites in School aged Children.

7 **Place and Duration of study:** The study was carried out in Rumuodogo Community in Emohua
8 Local Government area of Rivers State, Nigeria between the months of March to June 2019.

9 **Methodology:** Microscopic examination of stool samples from 200 school-aged pupil between
10 the ages 3-18 years was carried out using formol-ether concentration and direct wet mount, and
11 stained iodine. Demographic data as well as epidemiological data was obtained using a
12 ~~questionair~~questionnaire. The study was done by microscopic examination of stool samples from
13 school aged children in the area. Iodine staining and normal saline were used in detection and
14 identification of the parasites. A total of 200 faecal samples were examined.

15 **Results:** The finding reveals an overall prevalence of A total of 49.5% prevalence recorded
16 ($P=0.05$). However, there was / was no significant difference in the mean value ($\chi^2 = \dots, df = \dots, P = \dots$)
17 The common intestinal parasites identified were *Ascaris lumbricoides* 19.5%, *Ancylostoma*
18 *duodenale* 9.5%, *Trichuris* spp. 6%, *Strongyloides* spp. 4.5%, *Enterobius* spp. 1%, *Taenia*
19 *solium*, 1.5%, *Taenia saginata* 1%, *Entamoeba histolytica* 4.5%, *Giardia lamblia* 4% and
20 *Schistosoma mansoni* 2%. However, there was / was no significant difference in the mean value
21 ($\chi^2 = \dots, df = \dots, P = \dots$) A wide range of variation occurred in both the toilet facilities used. The
22 prevalence of intestinal parasites infections with respect to the available and use of toilet facility
23 revealed that Pit toilet users had the highest prevalence of 62 (56.9%) while no infection was
24 recorded among users of water closet toilet. The result showed that there was / was no significant
25 difference in the mean value ($\chi^2 = \dots, df = \dots, P = \dots$). When age group was compared the result did / did
26 not show difference in the mean value ($\chi^2 = \dots, df = \dots, P = \dots$) amongst the The finding however, showed
27 that age groups, 6-10 years had the highest prevalence of 55.6%. Maximum of seven children
28 had multiple infections. The male female ration was 62:37 while the percentage for males was
29 43.2% and 50% for females.

30 **Conclusion:** Intestinal parasitic infections are associated with reduced development of children
31 manifested by a reduced physical fitness which may result from vitamin deficiencies, inducing
32 intestinal bleeding, and protein energy malnutrition. Therefore, the high prevalence of intestinal
33 parasites recorded in this study calls for an intensified effort in the control of the infections.
34 Regular deworming of children and environmental sanitation should be carried out to further
35 reduce the prevalence.

36 Keywords; Parasites, Children, School, Rumuodogo

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40 **1.0 INTRODUCTION**

41 In spite of the tremendous advances in medicine and clinical Parasitology, globally over the past
42 few decades, human intestinal parasitic infections remain the single largest cause of human death
43 and discomfort in school children and poor communities. These infections are the most prevalent
44 in the tropical and sub-tropical regions of the world, where adequate water and sanitation are
45 lacking [1]. ~~The major factor that contributes to transmission and prevalence of intestinal~~
46 ~~parasitic infection most especially in many endemic areas of the tropics are is poor~~
47 ~~environmental sanitation, poor hygiene practices, indiscriminate disposal of human and animal~~
48 ~~waste that resulted to the contamination of the environment which predisposes humans to~~
49 ~~infection as a result of interaction of humans to contaminated environment due to poverty [1,2].~~
50 ~~These infections are the most prevalent in the tropical and sub-tropical regions of the world,~~
51 ~~where adequate water and sanitation are lacking [1]. In many endemic areas of the tropics,~~
52 ~~transmission has been attributed to environmental contamination interacting with human~~
53 ~~behavior and low socio-economic living standards and suitable environment [2], also contact~~
54 ~~with animals, poor hygienic practices and improper disposal of human and animal waste~~
55 ~~contributes to increase in transmission [1].~~ Reports by the world health organization [3], puts the
56 figure of infected children worldwide at 880 million. This high infection is due to severe
57 shortage in health care, education, sanitation, transport and chronic poverty [4].

58 Intestinal parasitic infections could have significant effect on the growth and development of
59 children which manifests as reduced physical fitness and constrained growth due to problems
60 such as vitamin deficiencies, inducing intestinal bleeding, and protein energy malnutrition
61 associated with their effects. There might equally be a subtle but important development effect
62 on cognition and educational development [4, 5, 6].

63 Intestinal parasitic infection may also pose some serious consequences on human health, such as
64 hepatomegaly, oesophageal varices and bleeding [7]. Individuals infected with helminthes
65 according to Mulu et al. [8], could be susceptible to other infections such as malaria and HIV.

66 Intestinal parasites especially *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm species
67 are most common in Nigeria. Prevalence of these parasites especially *Ascaris*, according to
68 [Ovutu and Olaniyi](#) [1, 9] ~~has~~ [has](#) remained unchanged in the last 50 years and poly-parasitism
69 occurs. [Ezey et al.](#) [4] reported a 70% prevalence of intestinal helminthes in school children of
70 Khana, Rivers State. [Mafiana](#), [10] equally reported 70.8% prevalence in Ilewo Ogun State
71 Nigeria. This study was carried out to determine the prevalence of intestinal parasites in school-
72 aged children in Rumuodogo town Emohua, Rivers State.

73 2.0 Materials and Methods

74 2.1 Study Area

75 The study was carried out in Rumuodogo ~~c~~Community in Emohua Local Government Area of
76 Rivers State, Nigeria. It is located at [latitude](#) 4° 53'0 North [and longitude](#) 6° 52'0 East of the
77 Greenwich. The area lacks ~~a motorable road, electricity, a non-functional health center and a~~
78 ~~primary school~~ [social amenities](#). The vegetation is rainforest and the humidity is very high. The
79 community is surrounded by both fresh and saline waters and their major occupations are
80 subsistence farming and fishing.

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84 2.2 Ethical Clearance for the study

85 Approval for the study was given by the school authorities and the parents and guardians of the
86 children

87 2.3 Collection of stool samples

88 Morning stool samples were collected using sterile vials from 200 pupils with the help of their
89 parents. The specimens were preserved in 10% formalin and transferred to the Animal and
90 Environmental Biology laboratory of Rivers State University for analysis.

91 **2.4 Examination of stool samples**

92 **2.4.1 Formol-Ether Concentration Technique**

93 | This method was adopted [from by Cheesbrough](#) [11]. About 1g of the stool was emulsified in
94 about 4ml of 10ml of formol solution in a test tube. The formol solution was prepared by mixing
95 50% strong formaldehyde solution with 450ml distilled water. 4 ml of the formol water was
96 added to the solution and mixed properly by shaking the mixture was filtered into a test tube
97 using a cloth gauge and about 3-4ml diethyl ether was added and shaken vigorously and allowed
98 to stand for 2 minutes. The mixture was centrifuged at 1000 revolutions per minute for 3
99 minutes. Using a glass rod, the faecal debris from the side of the tube was loosened and the test
100 tube inverted to pour off the supernatant leaving the deposit at the bottom of the test tube in an
101 upright position. The deposit was mixed by tapping the tube with the finger and using a Pasteur's
102 pipette, a drop of the deposit was applied on a microscope slide mixed with Lugol's iodine,
103 covered with a cover slip and viewed under the microscope with X10 and X40 objective
104 respectively. The eggs and larvae of the parasites were identified with reference to Atlas of
105 Parasitology.

106 **2.4.2 Direct wet preparations**

107 A little portion of stool was mixed with 2 drops of 0.85% saline solution on a slide. A drop of
108 iodine was added and examined under the microscope [11].

109 **2.5 Data Analysis**

110 Data was entered into Microsoft excel 2010 and analysis done using the Chi-square statistical
111 tool. Descriptive statistics was calculated and presented in tables [12]

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117 **3.0 Results**

118 **Table 1.** Incidence of intestinal parasites in School-Aged Children in the study area

Age groups in years	(%)No. Examined (%)	(%)No. Positive (%)	(%)No. Negative (%)
3-6	62 (31)	35 (56.4)	27(43.5)
7-10	72 (36)	40 (55.5)	32 (54.0)
11-14	37 (18.5)	17 (45.9)	20 (54.1)
15-18	29 (14.5)	7 (24.1)	22 (75.9)
Total	200	99 (49.5)	101 (50.5)

119
 120 Table 1 shows 99 (49.5%), prevalence of intestinal parasites in the study area, with children
 121 between ages 3-6 ~~had the~~having the highest prevalence of 56.4% ~~while ages 15-18 recorded the~~
 122 least-least~~amongst the age groups tested.~~

123 Table 1: Age related Incidence of intestinal parasites in School-Aged Children in the study area

<u>Age group (years)</u>	<u>No. Examined (%)</u>	<u>No. Positive (%)</u>
<u>3-6</u>	<u>62 (31)</u>	<u>35 (56.4)</u>
<u>7-10</u>	<u>72 (36)</u>	<u>40 (55.5)</u>
<u>11-14</u>	<u>37 (18.5)</u>	<u>17 (45.9)</u>
<u>15-18</u>	<u>29 (14.5)</u>	<u>7 (24.1)</u>
<u>Total</u>	<u>200</u>	<u>99 (49.5)</u>

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127 **Table 2. Sex related incidence of intestinal parasites amongst school-Aged Children in the**
 128 **area.**

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Sex	(%)No. Examined(Examined (%))	(%)No. Positive(Positive (%))	(%)No. Negative(Negative (%))
Male	125 (62)	54 (43.2)	71 (56.8)
Female	75 (37.5)	45 (60)	30 (40)
Total	200	99 (49.5)	101 (50.5)

130 Table 2 shows a the prevalence of intestinal parasites with respect to sex. The result shows that higher
 131 prevalence male: female ratio of 125 (62:37). Than their female counterpart which had 75(37.5)
 132). Females had a higher prevalence when compared with the males.

Species of Parasite	Age groups (Years)				Total
	(%)3-6(%)	(%)7-10(%)	(%)11-14(%)	(%)15-18(%)	
<i>Ascaris lumbricoides</i>	18 (9)	13 (6.5)	4 (2)	4 (2)	39 (19.5)
<i>Hookworm sp.</i>	7 (3.5)	6 (30)	4 (2)	2 (1)	19 (9.5)
<i>Trichuris trichiura</i>	3 (1.5)	5 (2.5)	3 (1.5)	1 (1.5)	12 (6.0)
<i>Strongyloides stercoralisstercolaris</i>	2 (1)	4 (2)	3 (1.5)	0	9 (4.5)
<i>Enterobius vermicularis</i>	2 (10)	0	0	0	2 (1)
<i>Schistosoma mansoni</i>	2 (1)	1 (0.5)	1 (0.5)	0	4 (2)
<i>Taenia sp.</i>	2 (1)	3 (1.5)	0	0	5 (2.5)
<i>Entamoeba histolytica</i>	2 (1)	5 (2.5)	0	2 (1)	9 (4.5)
<i>Giardia lambia</i>	4 (2)	4 (2) 6	0	0	8 (4)
Total (200)	42 (21)	41 (20.5)	15 (7.5)	9 (4.5)	107 (53.5)

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133 | **Table 3: Incidence of intestinal parasites species in relation to age groups**

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135 | Table 3 shows that *Ascaris lumbricoides* had the highest prevalence of 19.5% while *Shistosoma mansoni*
136 | and *Enterobius vermicularis* had the least prevalence in the study area respectively.

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139 | **Table 4: Incidence of intestinal parasites with respect to dominant toilet facility in the study area.**

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Toilet Facility	(%) No. Examined	(%) No. Positive	(%) No. Negative
Bush	88	36 (40.9)	52 (59.0)
Pit	109	62 (56.9)	47 (43.1)
Water closet	3	0	3 (100)
Total	200	98 (49)	102 (51)

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141 | Table 4 indicates pit toilet users ~~as having~~ the highest prevalence of 56.9% than those who used bush
142 | ~~as well as water closet that didn't record any incidence.~~

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144 | 4.0 Discussion

145 | There has not been any ~~previous report of~~ work on the prevalence of intestinal parasites among
146 | school-aged children in the study area. From the results of this study, high prevalence (49.5%) of
147 | ~~observed possibly may be due to poor hygiene condition of the area and thus the~~ various
148 | intestinal parasites ~~was observed~~ recorded.

149 | The prevalence of 49.5% ~~was~~ recorded ~~in this study ; this~~ was lower when compared with 66.3%
150 | observed by [Agi \[13\]](#) in Choba community, 70% by [Ezey et al. \[4\]](#) in Sii, Gwara and Gure
151 | communities in Khana Local Government Area in Rivers State and 72% finding by [14] in
152 | University of Guyana, Georgetown, Guyana.

153 *Ascaris lumbricoides* was the most prevalent parasite encountered in the study followed by
154 hookworm and *Trichuris* species. This could be attributed to the involvement of the people in
155 agricultural practices of farming and fishing or lack of adequate personal hygiene. Hookworm
156 infection maybe as a result of walking or playing on infested soils bare footed.

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157 Findings are equally in line with [the report of Michael *et al.* \[15\]](#) who ~~reported found a~~ high
158 prevalence of *Ascaris lumbricoides*, ~~*Necator americanus* and *Trichuris trichiura*~~ among
159 communities in the vicinity of Port Harcourt. Also, [Abah and Arene -\[16\]](#) reported ~~that~~ *Ascaris*
160 *lumbricoides* (51.78%) occurred more frequently, (51.78%) among primary school-aged
161 children, followed by hookworm (25.0%) and *Trichuris trichiura* 15.18% in Rivers State.

162 The data shows that females had a higher prevalence of 60% which may be as a result of being
163 involved in domestic and agricultural activities which predisposes them to polluted
164 environments. The male work in farms, far from homes and are less exposed to heavily polluted
165 home environment and consequently less infected. This is consistent with [17].

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166 In the case of the most toilet facility (pit) used, most people in the area are poor and unable to
167 afford water closet. Table 5 shows that the pit latrine users had a comparative high prevalence of
168 (56.9%) than bush toilet system. The result is in agreement with [18] who observed a high
169 percentage of parasitic infection in Benin City among pit toilet users. But the bush users had a
170 prevalence of (40.9%) which is equally high. This practice is a product of underdevelopment and
171 shows lack of personal and community hygiene. The use of bush and pit as toilets is a major
172 source of soil and water pollution ~~and which~~ is responsible for the high incidence of soil
173 transmitted helminth parasites in Nigeria [1,4].

174 The high prevalence (55.5%) of the parasites among aged groups 6-10 years ~~Children between~~
175 ~~ages 6-10 had the highest prevalence of 55.5%. This~~ may be as result of ~~the~~ children in this age
176 group walking barefooted around homes ~~and~~ even when going to school and swim in
177 contaminated stream. The infection decreased in ages 11-14 and ages 15-18. This is consistent
178 with [Mafiana -\[10\]](#) who noted 82.1% prevalence in children aged 10-11 years. This sequence
179 may be attributed to the fact that children in older age groups had behavioural patterns different

180 from those of the younger groups; more knowledge of disease, and a little improvement on
181 personal hygiene.

182 *Gairdia lambia* and *Entamoeba histolytica* ~~has had~~ a prevalence of 4 and 4.5% respectively
183 which was higher when compared to findings by [Akaniwo](#) [19] who recorded a 2.5% prevalence
184 in Obio/Akpor but lower when compared to 11.7% observed by [Mercado et al.](#) [20] in Chile.
185 Poly-parasitism was observed in 7 out of the 200 faecal samples. The co-existence of the
186 different parasites in the infected individuals is an important feature in the [epidemiology](#)
187 ~~of biology of~~ these parasites. This is so because the acquisition of single infection produces a
188 different effect from acquisition of large number of worms. ~~The most prevalent of these~~
189 ~~combinations was *Asearis lumbricoides*.~~

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191 5.0 CONCLUSION

192 It was observed from this study that majority of those infected were not necessarily because of
193 poverty but because of ignorance as a result of lack of education and good environmental
194 sanitation (through proper waste disposal system), poor personal hygiene and shortage of
195 drinking water. Therefore, health facilities, pipe borne water, education through enlightenment
196 programme and improved sanitary conditions be provided since the infection is by no means than
197 water and poor sanitary conditions.

198 REFERENCES

- 199 1. Ovutor, O. , Imafidor H., and Awi-waadu G.D.B (2017). Assessment of Physico-
200 chemical parameters of soils in fallowing farmlands on the abundance of human infecting
201 geohelminthes in Mgbuitanwo Emohua, Rivers state. *Journal of Advances in Biology and*
202 *Biotechnology*, 15(3): 1-8, ~~2017~~.
- 203 2. Udonsi, J. K., Benke, J M and Gilbert, F.S (1996). Analysis of the prevalence of infection
204 and association between human gastrointestinal nematodes among different age classes
205 living in urban and suburban communities of Port Harcourt. *J. Helminthol* 70 pp. 75- 84
- 206 3. World Health Organization (2013). Soil transmitted fact sheets. 2010 report, WHO press,
207 Geneva.107:16-171

- 208 | 4. Eze, C.N. , Owhoeli, O. and Ganale , S.S (2016) Assessment of intestinal helminthes in
209 | community school children of Khana Local Government Area, Rivers State. Nigeria.
210 | *Nigerian Journal of Parasitology* ;37 (1):pp
- 211 | 5. Abah, A E and Temple, B. (2015) Prevalence of Malaria Parasite among Asymptomatic
212 | Primary School Children in Angiama Community, Bayelsa State, Nigeria. *Trop Med*
213 | *Surg*;4(1):203
- 214 | 6. Odu, N.N. Okonko, I. O. and Ethi, O. (2011). Study of neglected tropical diseases
215 | (NTD)Gastrointestinal helminthes among school children in Port Harcourt, Rivers State
216 | Nigeria. *Report and Opinion* 3 (9): 6-16
- 217 |
218 | 7. Alum A, Rubino J R,and Ijaz M K(2010) The global war against intestinal parasites
219 | should be use in a holistic approach? *Int. J infected disease*. 2010;~~14~~:732; 14:732-730.
220 |
- 221 | 8. Mulu A., Maier M.,and Liebert U ~~GG~~ (2013) Deworming of intestinal helminthes
222 | reduces HIV- 1subtype C viremia in chronically coinfectd individuals. *International*
223 | *journal of infectious Diseases*;~~10~~; 10(6):02-016.
224 |
- 225 | 9. Olaniyi J E, Muktar H A, Pauline E J (2007) A review of intestinal helminthiasis in
226 | Nigeria and the need for school-based intervention. *Journal of Rural and Tropical Public*
227 | *Health*;6:33-39
228 |
- 229 | 10. Mafiana C. F. (1995) Intestinal Helminthiasis (Ascaris) among school children in illewo-
230 | Orile, Ogun State, Nigeria. *The Nigeria Journal of Parasitology* 16 pp.47-53.
- 231 | 11. Cheesbrough M. District Laboratory Practice in Tropical Countries. Part 1 (2ed)
232 | Cambridge University Press 2005: 194-202
- 233 | 12. Thrushfield, D.M. (1995). Veterinary Epidemiology. Blackwell Science
- 234 | 13. Agi P. I (1997). Comparative Helminth infection of man in two Rural Communities of
235 | Niger delta, *Nigeria WAJM* 16 (4) 232-236.
- 236 | 14. Jonathan W., Abdullah A. A and Kumar S, (2015) Prevalence and Association of
237 | Parasitic Helminths among the Cross Section of Male and Female Gender Groups at
238 | University of Guyana, Georgetown, Guyana. *Research Journal of Parasitology*, 10: 50-
239 | 57.
- 240 | 15. Michael E I., Abah A., Marcus P (2017). Prevalence of gastrointestinal parasitic infection
241 | among school children in Port Harcourt City Local Government Area, Nigeria. *J*
242 | *Bacteriol Parasitol* 8:323

- 243 | 16. Abah A E., ~~and, and~~ Arene F.O.A (2015). Status of intestinal parasitic infections among
244 primary school children in Rivers State, Nigeria, *Journal of Parasitology Research*, vol
245 2015. Article ID 937096.
- 246 | 17. Ephrem T., Tariku B., Seleshi K M., Ahmed Z and Tefera B (2017). Prevalence and
247 intensity of soil transmitted helminthes among school children of mendera Elementary
248 school, southwest Ethiopia. *Pan African Medical Journal*; 27:88.
- 249 | 18. Mordi R.M and Paul O.A.N. (2007). A study of blood and gastro-intestinal ~~pararsitesin~~
250 ~~Edo~~parasites Edo State. *African Journal of Biotechnology* Vol 6 (19). pp 2201-2207.
- 251 | 19. Akaniwo G. (1999) The prevalence of intestinal parasites among school-aged children in
252 Obio/Akpor Local Government Area Rivers State, Nigeria. Unpublished B.Sc.
253 Zoology Project.
- 254 | 20. Mercado R., Otto J P., Musleh M and Perez M(1997) Human infection by intestinal
255 protozoa and helminth in Calbuco Country; X Region, Chile. *Bio-clin-parasitol* 52(1-2)
256 pp.36-38

257
258
259