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Copyright AJCEM 2020: <https://dx.doi.org/10.4314/ajcem.v21i2.10>**Short Communication****Open Access****Prevalence of intestinal helminthic infections among secondary school students in Edo State, Nigeria**<sup>1</sup>Anagha, L. I., <sup>2</sup>Inegbenosun, C. U., and <sup>\*3</sup>Inegbenosun, H.<sup>1</sup>Department of Animal Environmental Biology, University of Benin, Benin City, Nigeria<sup>2</sup>Department of Animal and Environmental Biology, Ambrose Alli University, Ekpoma, Edo State, Nigeria<sup>3</sup>Department of Periodontics, University of Benin Teaching Hospital, Benin City, Nigeria\*Correspondence to: [inegbenosun190@gmail.com](mailto:inegbenosun190@gmail.com)**Abstract:****Background:** Intestinal helminthic infections are generally common in children accounting for the largest disability adjusted life years (DALYs) of all the parasitic agents. In this study, we determined the prevalence of intestinal helminthic infections among secondary school students in a semi-urban community in Edo State, Nigeria.**Methodology:** A descriptive cross sectional study of 489 students from four secondary schools in Esan West Local Government Area of Edo State, Nigeria was conducted between December 2018 and July 2019. The schools were selected by stratified random sampling and all eligible students in each school were enrolled. Stool samples were collected from each student into sterile universal bottle and direct wet mount as well as formol-ether concentrated samples were examined under compound light microscope at the Animal and Environmental Biology Laboratory of the University of Benin, Benin City, Nigeria. Structured questionnaire was administered to collect data on socio-demographic and potential risk factors for helminthic infection. Data were analysed with SPSS version 22.0 and associations between variables compared using Chi square or Fischer exact test, with  $p < 0.05$  as significant value.**Results:** Of the total 489 students examined (261 males, 228 females), 6 had intestinal helminthic infection, giving an overall prevalence rate of 1.2%, with 0.7% ( $n=2$ ) in males and 1.8% ( $n=4$ ) in females ( $p=0.4244$ ). Three helminthic parasites, *Ascaris lumbricoides*, *Trichuris trichiura* and *Ancylostoma duodenale* were identified. All the 6 subjects with helminthiasis had been de-wormed at interval of more than 1 year. Regular hand washing practices ( $p < 0.025$ ) and de-worming interval of 1 year or less ( $p=0.000$ ) were factors significantly associated with low prevalence of helminthic infection while other risk factors were not significantly associated.**Conclusion:** The study shows low prevalence of intestinal helminthic infections among secondary school students in Esan West LGA, Edo State, Nigeria. The high level of hand hygiene practices among the participants may account for the low prevalence, which emphasizes the effective role of hygiene practices in the control and elimination of intestinal parasitic infections. De-worming of students at regular interval (yearly) is recommended.**Keywords:** Intestinal helminth, Prevalence, risk factors, hand hygiene, de-worming

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Copyright 2020 AJCEM Open Access. This article is licensed and distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided credit is given to the original author(s) and the source.**Prévalence des infections helminthiques intestinales chez les élèves du secondaire dans l'État d'Edo, au Nigéria**<sup>1</sup>Anagha, L. I., <sup>2</sup>Inegbenosun, C.U., et <sup>\*3</sup>Inegbenosun, H.<sup>1</sup>Département de biologie environnementale animale, Université du Bénin, Benin City, Nigéria

Département de l'Animal et de l'Environnement de la Biologie, Université Ambrose Alli, Ekpoma, État d'Edo, Nigéria

<sup>3</sup>Département de parodontie, Hôpital universitaire de l'Université du Bénin, Benin City, Nigéria\*Correspondance to: [inegbenosun190@gmail.com](mailto:inegbenosun190@gmail.com)**Abstrait:****Contexte:** les infections helminthiques intestinales sont généralement fréquentes chez les enfants représentant les

plus grandes années de vie corrigées de l'incapacité (Avci) de tous les agents parasites. Dans cette étude, nous avons déterminé la prévalence des infections helminthiques intestinales chez les élèves du secondaire dans une communauté semi-urbaine de L'État D'Edo, au Nigeria

**Méthodologie:** une étude transversale descriptive de 489 étudiants de quatre écoles secondaires dans la zone de Gouvernement Local D'Esan West de L'État D'Edo, au Nigeria, a été menée entre décembre 2018 et juillet 2019. Les écoles ont été sélectionnées par échantillonnage aléatoire stratifié et tous les élèves admissibles de chaque école ont été inscrits. Des échantillons de selles ont été prélevés chez chaque étudiant dans une bouteille universelle stérile et une monture humide directe ainsi que des échantillons concentrés de Formol-éther étaient examinés au microscope optique composé au Laboratoire de Biologie animale et environnementale de L'Université du Bénin, Benin City, Nigeria. Un questionnaire structuré a été administré pour recueillir des données sur les facteurs de risque sociodémographiques et potentiels d'infection helminthique. Les données étaient analysées avec la version SPSS 22.0 et les associations entre les variables comparées à l'aide du Chi carré ou du test Fischer exact, avec  $p < 0,05$  pris comme valeur significative.

**Résultats:** sur les 489 étudiants examinés (261 hommes, 228 femmes), 6 avaient une infection helminthique intestinale, ce qui donne un taux de prévalence global de 1,2%, avec 0,7% ( $n=2$ ) chez les hommes et 1,8% ( $n=4$ ) chez les femmes ( $p=0,4244$ ). Trois parasites helminthiques, *Ascaris lumbricoides*, *Trichuris trichura* et *Ancylostoma duodenale* ont été identifiés. Tous les 6 sujets avec d'helminthiase avaient été vermifugés à intervalle de plus d'un an. Les pratiques régulières de lavage des mains ( $p < 0,025$ ) et l'intervalle vermifuge de 1 an ou moins ( $p=0,000$ ) étaient des facteurs significativement associés à une faible prévalence de l'infection helminthique alors que d'autres facteurs de risque n'étaient pas significativement associés.

**Conclusion:** L'étude montre une faible prévalence des infections helminthiques intestinales chez les élèves du secondaire à Esan West LGA, dans L'État D'Edo, au Nigeria. Le niveau élevé de pratiques d'hygiène des mains chez les participants peut expliquer la faible prévalence, ce qui souligne le rôle efficace des pratiques d'hygiène dans le contrôle et l'élimination des infections parasites intestinales. Il est recommandé de déparasiter les élèves à intervalles réguliers (chaque année).

**Mots-clés:** helminthes intestinaux, prévalence, facteurs de risque, hygiène des mains, vermifuge

## Introduction:

Gastro-intestinal helminthic infections are common parasitic infections globally and occur more frequently in children. They are caused by some species of nematodes, with over 2 billion people reportedly infected worldwide. They account for the highest number of infection burden in form of disability adjusted life years (DALYs) among parasitic disease causing agents (1). The role of environmental determinants, improved water supply, and impact of interventions such as increased availability of public and effective waste disposal system/facilities have been widely advocated (2,3). In reality, these suggestions have attracted relatively little or no attention especially in developing countries, which are endemic for these infections.

Meanwhile there are number of reasons to believe that the rate of intestinal helminth infection has decreased over the years. These include increased level of hygiene practice among individuals, proliferation of more private and clean public schools who often uphold good sanitary conditions (4), accessibility, availability, effectiveness of anti-helminthic drugs, and decreasing prevalence reports (5-10). With the burden of infection highest in children, efforts over the years have concentrated on primary school population.

The present study therefore was aimed at determining the prevalence pattern in a population of secondary school students and highlighting the possible risk factors associated with acquisition of these infections.

## Materials and methods:

### Study area and setting

This study was carried out from December 2018 to July 2019 in four (4) post primary schools located in Esan West Local Government Area of Edo State, Nigeria (Fig. 1). They include three public and one private school (Ujoelen Grammar School, Eguare Secondary School, Ogwa Secondary School and Christ is the Answer Secondary School). The population of Esan West Local Government Area in the last 2006 National Population Commission report, stood at 77,483. The area is dominated by a tropical climate with high temperature, humidity and heavy rainfall. It is located on a relatively flat plateau referred to as the Esan plateau and it is approximately 466m above the sea level with two distinct characteristic seasons, wet season (between March to November) and dry season (November to February) (11). The water aquifer of the study area is very low and is put at approximately 150m, thus inhabitants depend more on water stored in wells and rain water for their water needs.

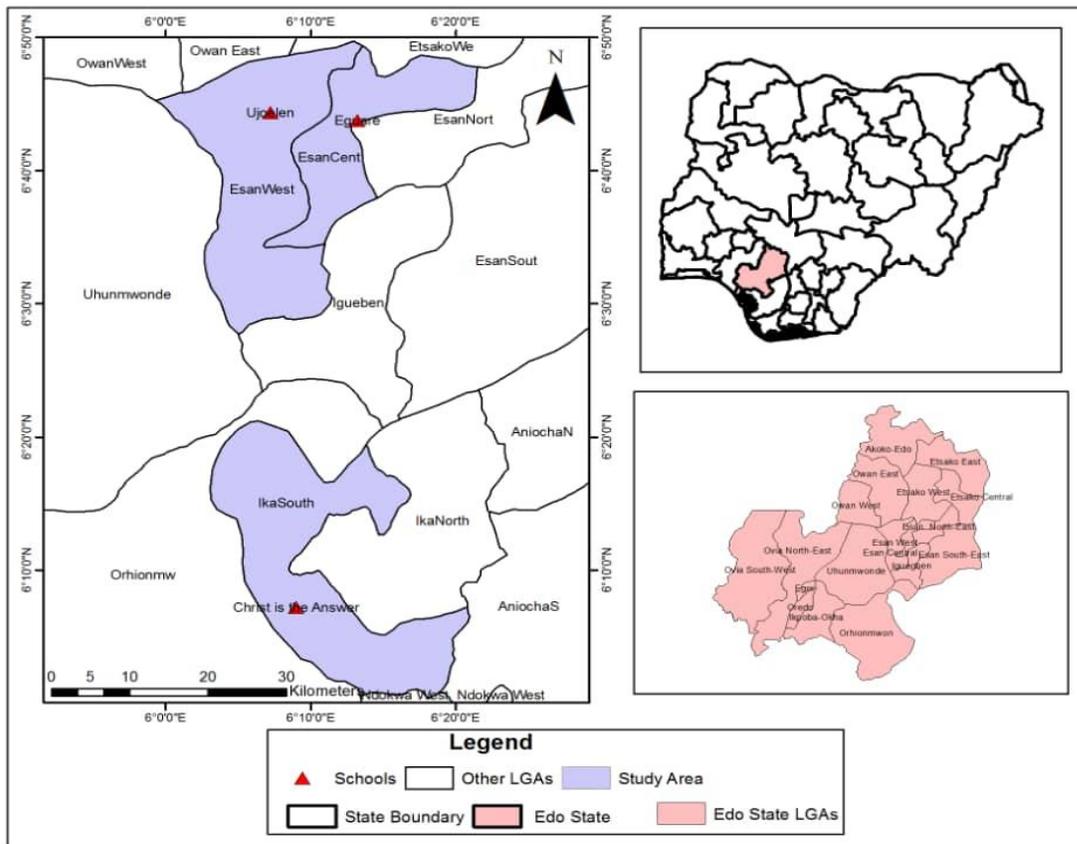


Fig 1: Esan West LGA showing the study location

### Ethical clearance

Prior to the survey, ethical clearance was obtained from the Ministry of Education in Esan West Local Government Area Council with reference no EW/LGM BEE/001/9. Consent from the principals of the schools and representatives of the parents and teachers associations (PTA) were also obtained after due consultations.

All procedures contributing to the study complied with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975 as revised in 2008 and the author asserts that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guides on the care and use of laboratory animals.

### Subjects and sample size determination

The sample size for the study was determined using the formula of Charan and Biswas (12) for simple independent proportion with a mean prevalence of 25% from previous

studies (13-15) in the study area. The calculated sample size was 288 but after adjusting for non-response rate, the sample size was increased to 489.

### Sampling technique

The stratified random sampling technique was used first with random selection of four secondary schools in the local government area (LGA), and then enrolment of all students in each of the school. A total of 160 students were enrolled from Ujoelen Grammar School, 160 from Eguare, 85 from Ogwa and 84 from "Christ is the Answer" Secondary Schools.

### Inclusion and exclusion criteria

The inclusion criteria were secondary school students who gave informed assent or whose parents/guardians gave informed consent. Subjects with gastrointestinal disorders manifesting as diarrhoea, dysentery, abdominal pain, bloating and nausea, and those who have received anti-parasitic drugs two weeks preceding the study were excluded.

### Sample collection and examination

Each enrolled student was given a sterile specimen bottle for stool sample collection, which after collection was immediately transported to the Department of Animal and Environmental Biology Laboratory of the University of Benin, Benin City, Nigeria, for examination by direct wet mount preparation and Formol-ether concentration methods as previously described (16). This procedure was done over a period of 2 days in each school visited (17).

### Data collection by questionnaire

Structured questionnaires were administered to all student participants to obtain socio-demographic data such as occupation of parents/guardians, family size, toilet types, household water sources and other information necessary to access potential risk factors.

### Statistical analysis

Data were analysed with SPSS version 22.0, and association between variables were compared using Chi square ( $\chi^2$ ) or Fischer exact test, with significant association set at  $p < 0.05$ .

### Results:

A total of 489 students (age range 10-17 years) from 4 randomly selected secondary schools in Esan West LGA of Edo State were examined for intestinal helminth infections, with 261 (53%) males and 228 (46.6%) females. A total of 160 students (74 males, 86 females) were from Ujoelen Grammar School; 160 (71 males, 89 females) from Eguare Secondary School; 85 (51 males, 34 females) from Ogwa Secondary School; and 84 (65 males, 19 females) from "Christ is the Answer" Secondary School (Table 1).

Table 1: Distribution of subjects by gender and schools in Esan West LGA, Edo State, Nigeria

School/ Gender	Male (%)	Female (%)	Total (%)
UGS	74 (46.3)	86 (53.7)	160
ESS	71 (44.4)	89 (55.6)	160
OSS	51 (60)	34 (40)	85
CSS	65 (77.4)	19 (22.6)	84
Total	261 (53.4)	228 (46.6)	489 (100)

UGS=Ujoelen Grammar School; ESS=Eguare Secondary School; OSS=Ogwa Secondary School; CSS=Christ is the Answer Secondary School

Of the total 489 students, 6 had intestinal helminthic infection, giving an overall prevalence rate of 1.2%. The prevalence of 0.7% ( $n=2$ ) in the males was not significantly different from 1.8% ( $n=4$ ) in the females ( $p=0.4244$ ) and there was also no significant difference in the distribution of intestinal helminthiasis among the different age groups ( $p > 0.05$ ) (Table 2).

Of the 6 students with infection, 3 were from Ujoelen Secondary School, 2 from Ogwa Secondary School, and 1 from "Christ is the Answer" Secondary School. None of the students from Eguare Secondary School had intestinal helminthiasis. In total, 3 helminthic parasites, *Ascaris lumbricoides*, *Trichuris trichura* and *Ancylostoma duodenale* were identified with frequency of 0.8%, 0.2%, and 0.2% respectively (Table 3).

Table 3: Parasite types identified among secondary school students in Esan West LGA, Edo State, Nigeria

Parasite types	Male (%) (n=261)	Female (%) (n=228)	Total (%) (n=489)
<i>A. lumbricoides</i>	2 (0.8)	2 (0.9)	4 (0.8)
<i>T. trichura</i>	-	1 (0.4)	1 (0.2)
<i>An. duodenale</i>	-	1 (0.4)	1 (0.2)
Total	2 (0.8)	4 (1.8)	6 (1.2)

A=Ascaris; T=Trichuris; An=Ancylostoma

Table 2: Prevalence of helminthic infections among secondary school students with respect to age group and gender in Esan West LGA, Edo State, Nigeria

Age group (years)	Male		Female		Total	
	No examined	No infected (%)	No examined	No infected (%)	No examined	No infected (%)
10 - 12	60	-	51	2 (3.9)	111	2 (1.8)
13 - 15	117	1 (0.9)	101	1 (1.0)	218	2 (0.9)
16 - 17	84	1 (1.2)	76	1 (1.3)	160	2 (1.3)
Total	261	2 (0.7)	228	4 (1.8)	489	6 (1.2)

Table 4: Factors associated with helminthic infections among secondary school students in Esan West LGA, Nigeria

Factors	Subjects		p value
	No examined (%) (n=489)	No infected (%) (n=6)	
<b>Father's occupation</b>			
Farmer	87 (17.8)	1 (1.2)	0.454
Teacher	44 (9.0)	-	
Artisan	111 (22.7)	3 (2.7)	
Trader	247 (50.5)	2 (0.8)	
<b>Mother's occupation</b>			
Farmer	49 (10.0)	-	0.682
Trader	271 (55.4)	4 (1.5)	
Artisan	93 (19.0)	2 (2.2)	
Teacher	76 (15.5)	-	
<b>Type of toilet system</b>			
Water closet	182 (37.2)	3 (1.7)	1.000
Pit latrine	169 (34.6)	2 (1.2)	
Open defecation	101 (20.7)	1 (1.0)	
Stream/river	37 (7.8)	-	
<b>Sources of water</b>			
Bore hole	16 (3.3)	-	1.000
Well/Rain	384 (78.5)	6 (1.6)	
Stream	38 (7.8)	-	
River	51 (10.4)	-	
<b>Hand washing</b>			
Yes (regularly)	151 (30.9)	1 (0.7)	0.025*
Sometimes	336 (68.7)	4 (1.2)	
No	2 (0.4)	1 (50.0)	
<b>Onychophagy</b>			
Yes	329 (67.3)	4 (1.2)	1.000
No	160 (32.7)	2 (1.3)	
<b>Frequency of bathing</b>			
Once daily	198 (40.5)	2 (1.0)	0.291
Twice daily	271 (55.4)	3 (1.1)	
Others	20 (4.1)	1 (5.0)	
<b>Chewing money/items</b>			
No	401 (82.0)	6 (1.5)	0.535
Yes	88 (18.0)	-	
<b>Sanitary materials after passing faeces</b>			
Tissue paper	119 (24.3)	1 (0.8)	0.109
Water	100 (20.5)	-	
Leaves	70 (14.3)	2 (2.9)	
Paper	151 (30.9)	1 (0.7)	
None	49 (10.0)	2 (94.1)	
<b>Family size</b>			
<5	118 (24.1)	3 (2.5)	0.429
5-7	140 (28.6)	1 (0.7)	
>7	231 (47.2)	2 (0.9)	
<b>Duration of residence in study area</b>			
> 5 years	214 (43.8)	1 (0.5)	0.141
5 years	124 (25.4)	3 (2.4)	
2 years	72 (14.7)	2 (2.8)	
1 year	79 (16.2)	-	
<b>Habit of washing fruits before eating</b>			
Yes	366 (74.9)	4 (1.1)	1.000
No	123 (25.2)	2 (1.6)	
<b>Consumption of raw aquatic food</b>			
Yes	256 (52.4)	3 (1.2)	1.000
No	233 (47.7)	3 (1.3)	
<b>De-worming interval</b>			
3 months	311 (63.6)	-	0.000*
6 months	87 (17.8)	-	
12 months	91 (18.6)	6 (6.6)	

\* Statistically significant

Table 4 shows the risk factors associated with prevalence of helminthic infections in the study population. Hand-washing practices and de-worming interval were the two factors associated with prevalence of helminthic infection. Most subjects in the study usually (n=151) or sometimes (n=336) perform handwashing

while only few (n=2) do not perform hand-washing at all. Subjects who do not perform handwashing had significantly higher prevalence of helminthiasis (50%) than those who usually (1.2%) or sometimes (0.7%) perform handwashing ( $p<0.025$ ). The prevalence of helminthic infection in subjects who were de-wormed at 3 months, 6 months and more than

1 year interval are 0% (0/311), 0% (0/87) and 6.6% (6/91) respectively, which showed significantly higher prevalence of helminthiasis in subjects with de-worming interval of more than 1 year ( $p=0.000$ ). There was no significant association between prevalence of helminthiasis and other assessed risk factors ( $p>0.05$ ).

## Discussion:

This study reports a low prevalence rate (1.2%) of intestinal helminthic infection among secondary school students in Ekpoma, Edo State, Nigeria. Although, there have been many studies of helminthiasis among primary school children and other population groups such as pregnant women and students of tertiary institution in the same community (14,15,18), ours is the first survey among secondary school students in this environment. This rate is lower compared to those of Kamalu and colleagues (19) who reported 43% prevalence rate in a mixture of urban and rural high school students in Imo State, Nigeria. The rate is also lower than the previous study of Edogiawerie et al., (15) with 18.7% rate among primary school pupils. High prevalence rates have also been reported on different population groups in other studies from same community and elsewhere such as 33.3% (13), 24.5% (14), 12.5% (18) and 35.9% (21).

Meanwhile, a low prevalence (9.5%) of helminthiasis was reported among children attending a tertiary hospital in Benin City, the state capital which is about 80km from the study area (22), and therefore a much lower prevalence is likely in older population since evidence supports decrease in prevalence with increasing age (8,23,24). As there are recent reports of decreasing trend in the prevalence of intestinal helminthic infection across the country (8-10,25) compared to previous reports (6,7,24), the low prevalence rate reported in our study supports this trend. In addition, Salawu and Ughele (25) previously observed a decreasing pattern of helminth infection with increasing age because behavioural changes relating to hygiene and contact with soil improves compared to younger population whose behaviour may encourage frequent contact with helminth eggs in the soil (26). From our observation, more students reportedly practice good personal hygiene and regular hand washing.

Three helminthic parasites were identified in our study which is similar to previous report from a study on primary school children

(25), and also to those of Ogbaini-Emovon (21) and Foghi and Nzeako (27), except for the presence of *Strongyloides stercoralis* and *Enterobius vermicularis* in their studies but absent in ours. Similarly, Isibor and colleagues (14) reported three helminth parasites including *Ascaris*, hookworm and *Trichuris*, with an additional protozoan, *Entamoeba histolytica*. However, our findings differs from those of Edogiawerie et al., (15) who identified seven helminthic parasites, and Omorondion et al., (18), who identified five helminths including *Taenia solium*, and two protozoan parasites in pregnant women and students of higher institution in the study area.

Between gender, females were more infected than males (though this was not significant) which corroborated earlier reports (14,15,28) but contrasted the report of Nmor and Oguanya (13,27). However, this gender observation should be taken with caution as the numbers of positive cases were too few for useful statistical inference. Nevertheless, infectivity has been said to be multifactorial and may not necessarily be influenced by gender, but other factors especially external or environmental may increase exposure of either gender to parasitic infection depending on level of contamination of the environment, personal hygiene and other infection prevention practices. It is also believed that age play an important role in the prevalence and infection pattern of intestinal helminths (29,30), and the age group 10-12 years were more infected in our study than other age groups. However, the number of positive cases in this study is too low to infer that age-group is a key factor in the prevalence and infection pattern of intestinal helminths.

Although most other factors investigated in our study did not influence the prevalence of helminthiasis significantly, hand washing practice was one factor that significantly influenced the prevalence. The prevalence of helminthiasis was high (50%) among those who do not perform hand washing at all, and low among those who sometimes (1.2%) and who regularly (0.7%) perform hand washing. Hand hygiene practices have been reported to hugely impact transmission of intestinal parasitic agents as eggs of parasites can attach to fingers or trapped in nails after defaecation or contact with contaminated soil (22). This in turn completes the transmission cycle enabling the maintenance of such parasites in the environment through continued infection of hosts who engage in poor hand hygiene practices. Our study agrees with that reported by Salawu and Ughele (25).

In conclusion, this study reports low prevalence of intestinal helminthiasis among secondary students in Esan West LGA, Edo State, Nigeria. The high level of hygiene practices among the student participants may be responsible for this, and highlights the importance of handwashing in the control and elimination of intestinal parasitic infections. Together with sustained yearly de-worming of students, successful control and prevention of intestinal helminthiasis can be achieved in this locality.

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### Conflict of interest:

No conflict of interest is declared

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