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Socio-economic, educational and environmental health correlates of intestinal worm infestation of pupils attending a public primary school in Rivers State, Nigeria

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Abstract

Background: Worm infestation is a public health problem of global concern, which causes devastating health challenges in school age children. Infestation causes health, educational and developmental challenges in these children.
Objectives: The objective of the study is to evaluate the socio-economic, educational and environmental hygiene factors which may influence intestinal worm infestation of pupils in a public primary school.
Materials and method: The study is a descriptive cross–sectional study, conducted among primary school pupils aged 6-12 years in government primary school, Ubima, Rivers State. A multi stage sampling technique was used to select one functional public primary school from one of the 23 local government areas in the state. Two hundred and eighteen eligible respondents were chosen from the list of all pupils in the school using systematic sampling technique. Data was obtained using pretested interviewer administered questionnaires. Also stool sample were collected from pupils to analyze presence or absence of ova of helminths. Results were analyzed using statistical package for social sciences version 22.0. Association between categorical data was done using chi-square test with statistical significance set at $p< 0.05$. Ethical clearance was obtained from the ethical review committee of Rivers State Hospital management board.
Result: Results revealed statistically significant association between personal hygiene, ($p<0.05$) environmental health status of pupils ($p<0.05$) and socio-economic/educational attainment of parents of pupils($p<0.05$) with intestinal worm infestation.
Conclusion: Worm infestations affects pupils of school age and are significantly influenced by personal, environmental hygiene of pupils and socio-economic/educational attainment of parents.

Keywords: Worm infestation, pupils, personal hygiene, educational attainment, socio-economic, environmental health status

Introduction

Worm infestation is a global public health problem and they cause an equally devastating health challenges especially in school age children. It is therefore pertinent to give adequate attention to this problem by appropriate authority. School age children have the highest intensity of worm infestation of any age group.[1] Children are infested with schistosomes and soil transmitted helminths (STH) which live in their intestine, depriving their host of essential nutrients leaving them malnourished and tired.[2] Adult schistosomes and STH are transmitted via eggs which pass out of infested individuals through their feces and urine which then contaminate soil or water. The eggs in soil can be transferred onto vegetables. The eggs in the soil can also be transferred directly into the

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mouth or ingested by eating raw vegetables. Ingestion or skin contact with transmission stages can result in an infection depending on the species. Worms live in intestinal tract and do not multiple in the body. Their number increase through repeated infection from renewed contact with contaminated soil, food or water.[3] Signs and symptoms of worm infestation in school children depends on intensity of infection and includes: Anemia, chronic diarrhea, vomiting, pica, urticaria, pneumonia, rectal prolapse, intestinal obstruction, and abdominal discomfort.[4] Also, long term effects such as significant developmental challenges on children,[5] reduced physical fitness and constrained growth,[6] subtle but important effect on cognitive and educational attainment also occur.[7] Heavily infected children attend school half as much as their uninfected peers.[8] It was shown that de-worming is the most cost-effective way of improving school attendance and academic performance in school age children.[9] In Kenya, it was revealed that an extra year of primary school was gained by de-worming school children and also improved school participation by 7%.[10]

About four hundred million school age children are infested with parasitic worms worldwide.[1] Intestinal worm accounts for an estimated 11% and 12% of total disease burden for school age children in low-income countries.[11] Rates of infestation with STH is high in sub-Sahara Africa (45-100%), south East Asia (25 – 44.9%), some parts of Latin America and the Caribbean's.[12] The burden of this disease among school age children is very high considering prevalence of 81.0% in Pakistan and 80.9% in Nigeria respectively.[13,14] Literature reviewed disclosed correlation between intestinal helminthic infection in school age children with certain factors associated with parents/care givers (Aunties, Uncles, Foster parents etc.) such as socio-economic status, (15) (16) (17) educational level,[13,17] and environmental/sanitary condition.[3,13,17,18]

Hence this study aims to evaluate the socio-economic, educational, personal and environmental hygiene factors which may influence intestinal worm infestation of pupils in a primary school. Following increasing number of out of school children in the country, said to be the highest in sub-Sahara Africa[19] and also poor academic performance of these children[20,21] especially the ones from poor socio-economic background,[22] it has therefore become important, hence the relevance of this study, to evaluate factors which will predispose school children to poor academic performance.

Material and method

The study is a descriptive cross-sectional study conducted among primary school pupils aged six to twelve years in a government primary school Ubima, in Ikwerre Local Government Area (LGA) of Rivers State. Using formula (23) for determination of sample size for cross sectional study, a sample size of 218 was derived after making adjustment for attrition. A multistage sampling technique was used to choose respondents for the study. It involved selecting one LGA (Ikwerre) from a list of all 23 LGAs by means of simple random sampling (balloting) system. Ubima primary school was then selected from the list of all functional primary schools in Ikwerre LGA by means of balloting method. Systemic sampling technique was used to select eligible respondents from the list of pupils aged 6 – 12 years in the school. Pupils whose parents/caregivers decline consent were excluded from the study. Study tool was a structured pretested interviewer administered questionnaire, adapted and prepared in English language. Stool samples were also collected from eligible pupils and analyzed for presence /absence of ova of parasite. Data collected was entered into Microsoft excel workbook and transported into statistical package for social sciences version 22.0 software for analysis. Results were presented in a simple frequency distribution table.

Association between categorical data was analyzed using chi-square test with statistical significance set at p value < or = 0.05. Ethical clearance was obtained from the ethical review committee of Rivers State hospitals management board. Written consent was obtained from parents of pupils that participated in the study.

Results

Table 1: Socio demographic characteristics of respondents.

Most 112 (54.1%) respondents were males while 198 (95.6%) of respondents were of Ikwerre ethnic. Majority 136(65.7%) of pupils live with their father and mother with only 12 (5.8%) living with their

Table 1: Socio-demographic characteristics of respondents

Variable	(n=207) Frequency	Percentage (%)
Sex		
Males	112	(54.1)
Females	95	(45.9)
Religion		
Christian	198	(95.6)
Muslim	2	(0.9)
Others	7	(3.5)
Tribe		
Ikwerre	162	(78.3)
Igbo	28	(13.5)
Non-rivers ethnicity	7	(3.4)
Other rivers ethnicity	10	(4.8)
Whom pupil lives with		
Father and mother	136	(65.7)
Father only	12	(5.8)
Mother only	29	(14.0)
Care-giver	30	(14.5)

*** Care giver – uncles, aunties, foster parents etc. (Other than parents)**

Table 2: Environmental health profile and occurrence of ova of helminthes in stool of pupil.

Env. health profile	Variables	Ova of helminth in stool Present Freq (%)	Absent Freq (%)	Total (%)	$\times^2$	p
Source of drinking water	Well Bore-hole	102 (64.3) 14 (29.3)	57 (35.7) 34 (70.7)	159 (76.8) 48 (23.2)	18.3	0.0004 *
Sewage disposal method	Water closet Pit latrine	12(15.6) 104(80.0)	65(84.4) 26(20.0)	77(37.2) 130 (68.8)	81.4	0.000*
Number of occupants in respondents room	Two = three	43(44.7) 73(76.1)	53(45.3) 38(23.9)	96 (46.4) 111 (53.6	9.2	0.026*
Refuse disposal method	Into bush Burning	57(60) 56(50.0)	38(40) 56(50.0)	95 (45.9) 112 (54.1)	2.1	0.149

* Significant value

Table 3: Personal hygiene practice and occurrence of ova of helminth in stool of pupils

Personal hygiene	Variable	Ova of helminth in stool Present Freq (%)	Absent Freq (%)	Total	$\times^2$	p
Use of foot wear	Yes	55(38.2)	89(61.8)	144(69.6)	6.3	0.01 *
	No	36(57.2)	27(42.8)	63(30.4)		
Hand wash after defecation	Yes	19(35.8)	34(64.2)	53(25.6)	59.0	0.000 *
	No	137(89.0)	17(11.0)	154(74.4)		
Method of hand washing	Water only	68(48.6)	72(51.4)	140(67.6)	0.2	0.6
	Water and soap	31(46.3)	36(53.7)	67 (32.4)		
Hand wash before and after meal	Always	43(37.7)	71(62.3)	114(55.1)	4.6	0.03 *
	Sometimes	49(52.7)	44(47.3)	93(44.9)		
Sex	Males	65(58.1)	47(41.9)	112(54.1)	0.3	0.5
	Females	51(53.7)	44(46.3)	95(45.9)		

* Significant value

Table 4: Socio-economic and educational status of parents/caregivers of pupils and occurrence of ova of helminth in stool

Socio-economic status	Ova of helminth in stool	Senior civil servant	Junior civil servant	Trader/ business	Farmer/ hunter	Nil	$\times^2$	p
Occupation of father	**Present**	**10(34.4)**	**35(63.6)**	**43(52.2)**	**24(70.5)**	**4(57.1)**	**10.1**	**0.04**
	Absent	**19(65.6)**	**20(36.4)**	**39(47.8)**	**10(29.5)**	**3(42.9)**		
	Ova of helminth in stool	**Senior civil servant**	**Junior civil servant**	**Trader/ bussiness**	**Farmer/ hunter**	**Nil**	$\times^2$	**p**
Occupation of mother	**Present**	**2(22.2)**	**19(41.3)**	**28(43.8)**	**62(74.9)**	**5(50)**	**29.7**	**0.00**
	Absent	**7(77.8)**	**27(58.7)**	**36(56.2)**	**16(20.6)**	**5(50)**		
	Ova of helminth in stool	**Nil**		**Primary**	**Secondary**	**Tertiary**	$\times^2$	**p**
Educ. status of father	**Present**		**9(69.2)**	**28(58.3)**	**63(51.2)**	**4(17.4)**	**13.1**	**0.004**
	Absent		**4(30.8)**	**20(41.7)**	**60(48.8)**	**19(82.6)**		
	Ova of helminth in stool		**Nil**	**Primary**	**Secondary**	**Tertiary**	$\times^2$	**p**
Educ. status of mother	**Present**		**19(67.9)**	**44(53.0)**	**24(29.3)**	**5(35.7)**	**16.7**	**0.0007**
	Absent		**9(32.1)**	**39(47.0)**	**58(70.7)**	**9(64.3)**		

father only.

Table 2: Environmental health profile and occurrence of ova of helminthes in stool of pupils.

Source of drinking water for majority 159 (76.8%) of pupils was well water with 102 (64.3%) of them significantly infested with intestinal helminths (p = 0.0004). Also, 130 (62.8%) of pupils use pit latrine with 104 (80.0%) of them significantly infested with intestinal helminths (p =0.000).

Table 3: Personal hygiene practice and occurrence of ova of helminth in stool of pupils.

The study recorded 63 (30.4%) pupils that do not use foot wear to school with 36 (57.2%) of them significantly infested with intestinal worm (p = 0.01). Also, 154 (74.4%) pupils do not wash their hands after defecation with 137 (89.0%) of them significantly infested with intestinal helminths (p =0.000).

Table 4: Socio-economic and educational status of parents/caregivers of pupils and occurrence of ova of helminth in stool.

Majority 24 (70.5%) of pupils whose fathers were farmers/hunters had intestinal worm infestation while 19 (67.9%) of pupils whose mother had no formal education were significantly infested with intestinal helminth (p = 0.0007).

Discussion

Results obtained from this study revealed a statistically significant association between socio-economic and educational status of parents and also environmental and personal hygiene status of pupils with intestinal worm infestation. The study recorded 56.04% prevalence rate of worm infestation among pupils. This result was close to the prevalence of 51.3% and 60.0% recorded among preschool age children in Okenne in Ogun state and Ilobu in Osun state respectively.[24,18] However, in Akoko Edo in Edo state, a higher prevalence of 91.1% was seen among school pupils.[16] Contrastingly, a low prevalence of 21.7% was recorded in a study in Abbottabad Pakistan.[12] Disparities in prevalence highlighted above could be due to differences in climatic, environmental and personal hygiene status of pupils. Also, time of de worming and government policy on deworming which might influence regularity of deworming school children could also affect the prevalence recorded in these studies.

More 65(58.1%) males were infected than females 51(53.7%), though this was not statistically significant (p = 0.5). The result obtained were in consonance with result seen in a study conducted in Osun State. (18) However, more females were infested than males in a study in Ozubulu, Anambra State.[15] The difference noted among different sexes were most times not significant and could not be attributed to any known environmental or biological factor.

Pupils whose parents were farmers/hunters were significantly more infested than pupils whose parents/ care givers are civil servants and traders. This result is in tandem with findings in other studies conducted in Nigeria.[15,16] Further credence was shown in a study which revealed that pupil whose parents were farmers were infected more than those whose parents were traders, artisans and civil servants respectively in that order.[17] It is expected that pupils whose parents are farmers might join their parents to farm and eventually get infested by STH especially when they go bare footed. Also, high income paying jobs comes with healthful housing and environment which to some degree protect against worm infestation. Furthermore, de-worming a child regularly, though of minimal cost, may further worsen the already depleted financial base of parents whose job attracts low income. Therefore, deworming may not be a priority for such parents especially when its beneficial effect is not easily discernible.

In this study, pupils whose parents attained tertiary education were significantly least infected compared to pupils whose parents attained primary or had no formal education. These results were corroborated with results from other studies.[17,13] Within the context of logical reasoning, it is expected that high level of education increases chances for high income, increases awareness for the environment and also creates more concern for individual and family health. Parents who have attained higher level of formal education will most likely appreciate the benefit of deworming their children than parents with little or no formal education.

There was a statistically significant difference between the environmental health status of pupils and intestinal worm infestation. This study noted that source of drinking water, sewage disposal

method and over-crowding evidenced by the number of occupants in a room, significantly affected the presence or absence of ova in stool of pupils. Studies revealed that use of borehole as source of drinking water reduces chances of infestation with helminths compared to sources from well water.[18] It was shown that population that used stored water supply system from tap or borehole were infected more than population that used open running system of water.[13] Also, the use of water cistern or other sanitary sewage disposal method reduces the risk of infestation compared to the use of insanitary fecal disposal method such as bush and latrine.[11,16,18] In furtherance, overcrowding has been shown to be associated with factors which encourage infestation with helminths such as poor disposal of garbage and poor health system.[25] Result of family size has shown that houses with high number of occupants in a room have high prevalence of infestation compared to family with few numbers of persons in an apartment.[13]

Personal hygiene factors such as use of foot wear, hand washing after defecation, hand washing before and after meals were significantly associated with occurrence of ova of stool in pupils as seen in this study. This result was in conformity with results from other studies.[11,12,17,26]

Most helminths are transmitted via the oval stages of their life cycle through contaminated fingers or food. Therefore, hand washing before meal and also after defecation will assist in breaking the transmission cycle. Also, transmission of STH by skin penetration will be obliterated by the use of foot wear. It was shown in this study that pupils that do not wear foot gear to school were significantly more infested compared to those that use foot gear ($p = 0.01$)

Conclusion

There was a moderate rate of worm infestation amongst pupils. Infestation was significantly associated with socio-economic and educational level of parents and also environmental and personal hygiene status of pupils. Improving their personal hygiene, raising their environmental health standard and enhancing the socio-economic and educational background of their parents/caregivers will assist to curtail adverse effects which may be inherent with worm infestation.

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