

SJMLS-2(3)-2017-017

Effect of Environmental Modification and Renewal on Prevalence of Parasitic Infections Among Primary School Pupils in Esan West Local Government Area of Edo State, Nigeria.

Jemikalajah, Daniel Johnson

Department of Medical Microbiology and Parasitology, Delta State University, Abraka, Nigeria

Author for Correspondence: jemikalajahjohnson2007@yahoo.com/+2347032222372

Abstract

Intestinal parasitic infections constitute a global public health challenge particularly among primary school pupils in developing countries. A total of 444 stool samples were collected from pupils aged 3 to 16 years in 2 urban and 2 rural primary schools to determine the prevalence of intestinal parasitic diseases in relation to environmental conditions of learning in Esan West Local Government Area of Ekpoma, Edo State, Nigeria. The stool samples were examined for evidence of parasitic infections by wet and concentration methods. Overall, the prevalence of intestinal parasitic infection was 27.9%. A prevalence rate of 15.8% was obtained for Hookworm, 5.9% for *Ascaris lumbricoides*, 2.5% each for *Entamoeba histolytica* and *Trichuris trichura*, 0.6% for *Strongyloides stercoralis*, 0.3% for *Schistosoma mansoni*, 0.2% each for *Fasciolopsis buski* and *Enterobius vermiculari* in descending order. Hookworm was the most prevalent parasitic infection in the study. The age group 8 -12 years had the highest prevalence of 16.2% and lowest 3.1% in the age group 13-16 years. The prevalence also varied significantly based on gender with females having a higher prevalence (15.3%) compared to males (12.6%). The Prevalence of 12.3%, 7.0%, 4.5% and 4.1% was observed for Uke non-renovated, Ihumudumu renovated in rural and Ujoelen non-renovated, Eguare renovated in urban primary schools respectively. There was a significant difference ($p>0.05$) in the prevalence of parasitic infection between rural (19.3%) and urban (8.6%) rural schools. Infection rate was highest in Uke primary school 55(53.9%) and lowest in Eguare primary school 18(6.7%). In spite of environmental modification, this study has shown that intestinal parasitic diseases remain a major public health care challenges in the study area.

Keywords: Environment, Prevalence, Parasites, Pupils, Ekpoma

Introduction

Environmental modification is the techniques for changing the dynamic, composition or structure of the earth, including its biota, lithosphere, hydrosphere, atmosphere and outer space through deliberate manipulation of natural process (United Nations, 1990). Fundamental determinants of health are highly affected as a result of changes in the environment and with a significant impact on the quality of life and health for those living and working in the urban environment by influencing the potential for physical, mental, social and environmental well-being. (WHO, 2003).

In Africa, most people move into the urban area because of the prevailing factors such as poverty, environmental degradation, religious strife, political persecution, food insecurity and lack of basic infrastructure and services in the rural area (Tarver, 1996).

Parasitic organisms are pathogen that infects vast number of human and animal hosts, causing widespread chronic disease and morbidity (Crampton and Nesheim, 2002). Poor people in developing countries endure the burden of disease caused by some species of



soil transmitted nematodes that inhabit the gastrointestinal tract namely *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Necator americanus* (Crampton and Nesheim, 2002). Children and pregnant women are the main sufferers from these parasitic diseases (WHO, 2003). Among the effect associated with these parasites are growth retardation, intestinal obstruction, hepatic and biliary disease, impaired cognitive development, dysentery syndrome, fever, dehydration, vomiting and nutritional effects such as iron deficiency anaemia which can result to death of the victim (Beers and Berkow, 1999; Bundy *et al.*, 1992). These parasites are common in rural area in the developing countries of Asia, Africa and Central America and are often linked to poverty and social problems such as poor sanitation and lack of clean water (WHO, 1998).

Intestinal helminth infections are a major health concerns because factors that predispose man to the infections such as poverty, poor sanitation, ignorance and malnutrition prevail (Ijagbone and Olagunju, 2006). The habit of playing on sand resulted in very widespread parasitism with a variety of helminths, in addition to the eating habits that involve the consumption of raw vegetables, fish, crustacean and meat (Montessor, 2002). Previous studies have shown that more than one billion of the World's populations including at least 400 million school age children are chronically infected with soil-transmitted helminths. In Nigeria, various studies have been carried out to estimate the status of soil transmitted helminth infections (Oyewole *et al.*, 2007) but there is paucity of report on intestinal heminthiasis among school children in Ekpoma. Therefore, this study set out to assess the prevalence and intensity of intestinal helminth infections among primary school children in Ekpoma, Edo State, Nigeria.

Materials and Methods

Study Area

The study was conducted at Ihumudumu community, Eguare community, Uke community and Ujoelen community in Ekpoma,

the administrative headquarters of Esan West Local Government area of Edo State. It lies between latitude 60 40°N and 60 45°N longitude 60 05°E and 60 10° having a population of about 2000 (Gazzeter Nigeria, 2007). The inhabitants of Ekpoma are predominately farmers and civil servants, whose main produce are rice and cassava. Ekpoma was chosen because it is the town where Ambrose Alli University is located, the rainfall and the occupation of the inhabitants. The standard of school buildings and environmental conditions commonly found, influenced government interest in the concentration and the renewal of urban infrastructures.

Sample Collection

A total of 444 stool samples were collected from pupils in four (4) different schools in rural 230 (Uke and Ihumudumu) and urban 214 (Eguare and Ujoelen) area of Ekpoma after verbal informed consent of the pupil's parents. Plain, clean, dry, wide-mouth screw capped plastic and leak-proof containers devoid of antiseptics and disinfectants as described by Cheesbrough (2006) were distributed to the children and were instructed on how and when the sample should be collected. Each container was labelled with the pupil's name, age and gender. The samples were transported immediately to the laboratory for analysis. Stool samples not examined immediately were preserved with 10% formol-saline.

Sample Analysis

The samples were analysed in the Diagnostic Laboratory in the College of Medicine, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Method of Analysis

The direct wet preparation method using the saline and Lugol's iodine mount technique and the concentration method using formol ether concentration technique as described by Cheesbrough (2006).

Ethical Approval

Ethical approval and permission was obtained from the ethical committee of Ministry of

Health, Benin-City and head masters/mistresses of the selected schools.

Statistical Analysis

The data collected was analysed using SPSS version 16.0 (Inc Chicago, Illinois, USA) statistical software. Data were expressed as mean± standard deviation. A p-value of $p \leq 0.05$ was considered as statistically significant.

Results

Out of the total four hundred and forty-four (444) stool samples examined, 27.9% were positive for intestinal parasites and 72.1% were negative. A prevalence rate of 15.8% was obtained for Hookworm, 5.9% for *Ascaris lumbricoides*, 2.5% each for *Entamoeba coli* and *Trichuris trichura*, 0.6% for *Strongyloides stercoralis*, 0.3% for *Schistosoma mansoni*, 0.2% each for *Fasciolopsis buski* and *Enterobius vermiculari* in descending order as shown in table 1.

The prevalence of intestinal parasites was compared based on age. Table 2 shows a prevalence rate of 8.6%, 16.2% and 3.1% for age groups 3-7, 8-12 and 13-16 years for intestinal parasites infections respectively ($p < 0.05$).

The prevalence of intestinal parasites was compared based on gender. A prevalence of 12.6% and 15.3% was obtained for males and females pupils ($p > 0.05$) in the schools respectively as shown in Table 3.

Table 4 shows that the prevalence of parasitic disease was highest in Uke primary school 12.3%, followed by Ihumudumu 7.0%, Ujoelen 4.5% and Eguare 4.1% in descending order. The difference observed in the infection rates in the study schools and their locations was statistically difference ($p > 0.05$).

Table 1: Distribution of Intestinal Parasites among the Subjects

| Parasites | No Examined | No (%) positive | No (%) negative | % Prevalence |
|----------------------------------|-------------|-----------------|-----------------|--------------|
| <i>Entamoeba histolytica</i> | 444 | 11 | 433 | 2.5 |
| Hookworm spp. | 444 | 70 | 374 | 15.8 |
| <i>Ascaris lumbricoides</i> | 444 | 22 | 422 | 5.9 |
| <i>Trichuris trichuria</i> | 444 | 11 | 433 | 2.5 |
| <i>Fasciolopsis buski</i> | 444 | 1 | 433 | 0.2 |
| <i>Schistosoma mansoni</i> | 444 | 1 | 433 | 0.2 |
| <i>Strongyloides stercoralis</i> | 444 | 3 | 441 | 0.6 |
| <i>Enterobius vermicularis</i> | 444 | 1 | 433 | 0.2 |
| Total | 444 | 124 | 320 | 27.9 |

Table: 2 Age -related distribution of Intestinal Parasitic Infection

| Age(Years) | No Examined | No (%) Infected Ujoelen | No (%) Infected Eguare | No (%) Infected Ihumudumu | No (%) Infected Uke | % Prevalence |
|------------|-------------|-------------------------|------------------------|---------------------------|---------------------|--------------|
| 3-7 | 86 | 3(3.4) | 2(2.3) | 7(8.1) | 26(30.2) | 38(8.6) |
| 8-12 | 265 | 15(5.7) | 10(3.8) | 22(8.3) | 25(9.4) | 72(6.2) |
| 13-16 | 93 | 2(2.2) | 6(6.5) | 2(2.2) | 4(4.3) | 14(3.1) |

**Table 3: Gender- related distribution of intestinal Parasitic Infection**

| Gender | No Examined | No Infected Ujoelen (%) | No Infected Eguare (%) | No Infected Ihumudumu (%) | No Infected Uke (%) | % Prevalence |
|--------|-------------|-------------------------|------------------------|---------------------------|---------------------|--------------|
| Male | 211 | 9(4.3) | 5(2.4) | 18(8.5) | 24(11.4) | 12.6 |
| Female | 233 | 11(4.7) | 13(5.6) | 13(5.6) | 31(13.3) | 15.3 |

Table 4: Prevalence of Parasitic Infection based on Location and School Status

| Location/ Schools | No. Examined | No. Infected (%) | % Prevalence | X ² | P-Value |
|---------------------|--------------|------------------|--------------|----------------|---------|
| Urban | | | | | |
| Ujuolen/Renovated | 106 | 20(18.7) | 4.5 | 2.994 | >0.05 |
| Eguare/No renovated | 108 | 18(16.7) | 4.1 | | |
| Rural | | | | | |
| Ihumudumu/Renovated | 128 | 31(24.2) | 7.0 | | |
| Uke/No renovated | 102 | 55(53.9) | 12.3 | | |
| Total | 444 | 124 | 27.9 | | |

Discussion

The poor environment and the socio-cultural habit of the people could be attributable to the high prevalence of intestinal parasitic infections in the developing countries (Mbanugo and Onyebuchi, 2002).

The prevalence of intestinal parasites obtained in this study was 27.9%. This finding is in agreement with the previous study conducted in two villages of Chitwan District of Philippines, Cambodia and Turkey by Kim *et al* (2003) and Ulukanligil and Seyrek (2003). This may be due to low socio-economic status, poor hygienic habits, and lack of environmental sanitation prevailing in the rural schools. It may also be attributed to the differences in the geographical location and timing of the study.

Hookworm spp. and *Ascaris lumbricoides*, were the commonest intestinal parasites recovered in the work. This finding was similar to the previous report of Kim *et al.* (2003) and Lee *et al.* (2002) who had earlier observed higher prevalence of helminths in Philippines and Cambodia. However, this was in contrast to the study of Tai-Soon *et al.* (2002) who stated that soil-borne parasitic infections are very common

among school children in Southern Nigeria which reflects the poor sanitary conditions existing in the schools. The highest percentage prevalence observed for *Hookworm spp.* infection in this study may be due to the fact that *Hookworm spp.* occurs mostly in tropical and subtropical regions of the world usually involving school children associated with unsanitary conditions such as lack of sanitation facilities especially latrines. This results in the contamination of the soil with eggs and larva of the parasite to which these children are exposed; in addition to the common habit of walking on barefoot which result in the exposure of children to the infective larva. The sandy soil and rainfall in this region contribute to the development of ova and larva stages of the parasite and its possible transmission to man. It has been shown that sandy soil allows oxygen needed for the development and movement of larvae in the soil. And that rainfall provides soil moisture which aid migration of infective larvae to the soil surface and subsequently enhances the penetration of the host's skin. It has also been established that the optimum temperature for the development of hookworm larvae is between 7 ° C and 31° C which is observed in the study area.

This study has shown that children between the age ranges 3 – 7 and 8 – 12 years had the highest percentage prevalence of parasitic infections. This may be due to the fact that at this age, the children immunity to parasitic infections has not been fully developed as opined by Stephenson *et al.* (2000). This observation was in line with that of Asaolu *et al.* (1992) who recorded high prevalence of parasitic infections in younger children. However, the prevalence of parasitic infections reduces with age as earlier reported by Bundy *et al.* (1992). This may probably be the reason why lower percentage prevalence was observed in the age range 13-16 years in this study. Thus, the occurrences of parasitic infections maybe age dependent.

Findings from this study also indicate that intestinal helminths infections were more common in the female than in the male subjects. This shows that parasitic infections were gender-dependent as earlier reported by Narain *et al.* (2000) who observed that these differences may be related to levels of exposure of the female subjects.

Furthermore, this study shows the highest percentage prevalence of parasitic infection in rural schools than urban schools. This may be attributed to low socio-economic status and lack of proper sanitation in rural schools.

Conclusion and recommendations

In conclusion, the study has revealed a high prevalence of intestinal infections among school children in Esan West Local Government Area, Edo State, Nigeria. Although assessment of the medical and public health implications of these parasitic intestinal diseases were not part of the current study, there is urgent need for provision of basic amenities like good and portable drinking water, adequate safe waste disposal and the training of the populace to maintain strict sanitary status. This will limit the possibility of further environmental contamination in addition to public enlightenment programme that will change the behavioural practice of the inhabitants.

Acknowledgement

We highly appreciate our volunteers who agreed to take part in this study and the management and staffs of the four primary schools in Esan West Local Government area, Ekpoma, Edo State.

Source of funding: None

Conflict of interest: None

References

- Asaolu, S.O., Holland, C.V., Jegede, J.O. (1992): The prevalence and intensity of soil-transmitted helminthiasis in rural communities in Southern Nigeria. *Annals of Tropical Medicine and Parasitology*; **86**:279-287.
- Beers, M.H. and Berkow, R. (1999): Parasitic infections. *The Merck Manual of Diagnosis and Therapy*; **17**:31-42.
- Bundi, D.A.P., Hall, A., Medley, G.F. (1992): Evaluating measures to control intestinal parasitic infections. *World Health Statistics Quarterly*; **45**:168-179.
- Cheesbrough, M. (2006): Intestinal Nematodes. In; District Laboratory Practices in Tropical Countries Volume 1. Low priced edition. *Cambridge University Press, United Kingdom*:184-215.
- Crampton, D.W. and Nesheim, M.C. (2002): Nutritional impact of intestinal helminthiasis during the human life cycle. *Annual Review Nutrition*; **22**:35-39.
- Ijagbone, I.F. and Olagunju, T.F. (2006): Intestinal Helminths Parasites in School Children in Iragbiji, Boripe Local Government, Osun State, Nigeria. *African Journal of Biomedical Research*; **9**(1):63-65.



- Kim, B.J., Ock, M.S. and Chung, D.I. (2003): The intestinal parasite infection status of inhabitants in the Roxas City, The Philippines. *Korean Journal of Parasitology*; **41(2)**:113-115.
- Lee, K.J., Bae, Y.T., Kim, D.H. (2002): Status of intestinal parasites infection among primary school children in Kampongcham, Cambodia. *Korean Journal of Parasitology*; **40(3)**: 153-155.
- Mbanugo, J.I. and Onyebuchi, C.J. (2002): Prevalence of intestinal parasites in Ezinifite community, Aguata Local Government Area of Anambra State. *Nigerian Journal of Parasitology*; **23**:27-34.
- Montessor, M. (2002): World Health Organization, *Helminth Control in school age children: A Guide for Managers of Control Programs*. <http://www.who.int/wormcontrol/documents/en/001to011.pdf>.
- Nairan, K., Rajguru, S.K. and Mahanta, J. (2000): Prevalence of Trichuris trichuria in relation to socio-economic and behavioural determinants of exposure to infection in rural Assam. *Indian Journal of Medical Research*; **112**:140-146
- Oyewole, F., Ariyo, F., Oyibo, W.A. (2007): Helminthic Reduction with Albendazole among School Children in Riverine Communities of Nigeria. *Journal of Rural Tropical Public Health*; **6**:6-10.
- Stephenson, L.S., Latham, M.C., Ottesen, E.A. (2000): Malnutrition and parasitic helminth infections. *Parasitology*; **121**:23-38.
- Tai-Soon, Y., Seobo, S., Jongweon, L. (2000): A small-scale survey on the status of intestinal parasite infections in rural villages in Nepal. *Korean Journal of Parasitology*; **38(4)**: 275-257.
- Tarver, J.D. (1996): *Demography of Africa*, Westport, CT: Praeger:91-98.
- The Carter Centre (2008): Schistosomiasis Control Program. <http://www.cartercenter.org/health/schistosomiasis/index.html>.
- Ulukanligil, M. and Seyrek, A. (2003): Demographic and parasitic infection status of school-children and sanitary conditions of schools in Sanliuifa, Turkey. *BMC Public Health*; **3(1)**:29.
- United Nations, (1990): *Human Development Report*: Oxford University Press. **3**:106-112.
- World Health Organisation (1998). It's a Wormy World. Geneva, *World Health Organization (Document WHO/CTD/SIP/98:4)*.
- World Organisation (2003). Report of the WHO informal consultation on the use of praziquantel during pregnancy/lactation and albendazole/mebendazole in children; **41**:33-36.

Citation: Jemikalajah, Daniel Johnson. *Effect of Environmental Modification and Renewal on Prevalence of Parasitic Infections Among Primary School Pupils in Esan West Local Government Area of Edo State, Nigeria. Sokoto Journal of Medical Laboratory Science*;2(3): 127 – 133.

Copyright. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.