

The Impact of WASH Interventions in the control of Soil Transmitted Helminthiasis in Primary Schools in Ihitte Uboma Local Government Area, Imo State, Nigeria

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ABSTRACT:

A study on the impact of wash interventions in the control of soil transmitted helminthes in primary school pupils in relation to the type of toilet facilities, source of water, sex, age group as well as parental occupation was carried out in Ihitte Uboma LGA, Imo State, Nigeria between May to September, 2023. The study designs adopted for this study were the cross sectional survey and experimental analysis. Twelve primary schools were randomly selected and a total of 745 pupils were recruited. The pupils age ranged from 9 to 16 years and included primary 3,4 and 5 classes. Stool samples were collected at 4 weeks interval from the participants and a clean specimen bottle was given to the participants to take home. Standard parasitological procedures as well as structured questionnaires for collections of other relevant data. Out of the 745 stool sample collected 35.43% were infected with either one of two soil transmitted helminthes represented thus 79.17% *Ascaris lumbricoides*, 32.95% Hookworm and 4.55% *Trichuris trichiura*. There were prevalence variations among schools and mixed infections involving *Ascaris* and Hookworms, 15.15%, *Ascaris* and *trichuris*, 1.89% and that between Hookworm and *Trichuris*, 0.39%. Male were slightly more infected than female pupils, while age group 10-12 had highest infection of 35.5%. Those who defecate in the bush had the highest infection rate of 37.89%, those that use water closet had the least infection of 33.12% while 85% of those who use stream as their main source of water were infected. Those whose parents are artesian were more infected 40% than the others. Generally, poor personal, environmental hygienes and lack of essential amenities had been attributed to the prevalence of the parasites, transmission and spread in the area. The prevalence level of 35.43% is worrisome, hence morbidity and or mortality rate could be reduce by improving on personal and environmental hygiene, provision of essential amenities and massive education of the people on the danger of the disease.

Keywords: Impact, WASH, Soil Transmitted Helminthiasis, Primary Schools, Ihitte-Uboma

INTRODUCTION:

Soil transmitted helminth (STH) infection is the most widespread neglected tropical diseases (NTDS) in Nigeria Finkestein *et al.*, 2008; Teshale *et al.*, 2018) and are among the most common infections worldwide and it affects the poorest and most deprived communities. It is found mainly in areas with warm and moist climates where sanitation and hygiene are poor, including in temperate zone during warmer months. They do not have intermediate hosts thus their life cycles are completely direct by either fecal oral route or by skin penetration. The juvenile (larvae) forms migrate round the body of the host while the adult forms inhabit the host intestines where they release their eggs, (ova). These eggs are specific or peculiar to specific helminthes which aid in

their diagnosis (Hawdon, J.M. and Hotez, 1996). Four have been identified and approved by the World Health Organization (WHO) as soil transmitted helminthes which include *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus* and *strongyloides stercoralis* (Bethony *et al.*, 2006) disease cause by these helminthes often results in malnutrition, diarrhea, impaired cognitive function, stomach bloating, intestinal obstruction, fever and headache with increased susceptibility. These species are some of the most common infections among human affecting over 1.6 billion individuals globally (Pullan *et al.*, 2014). Children are mostly prone to the risk of the infection, especially those in rural areas lacking clean water and sanitation infrastructures are the most affected (Campbell *et al.*, 2014). These helminthes cause diseases recently grouped among the neglected tropical diseases

(NTD) prevalent in tropical African countries. They are referred to as forgotten diseases among the neglected people mainly due to poverty and poor hygiene. They multiple rapidly and spread rapidly, thereby causing significant public health problems. Millions of these poor forgotten people are cut off from the main stream of socio-economic projects by combination of harsh economic circumstances, poor nutrition and living conditions as well as poor environmental heavy burden of diseases. "The wormy people" which are the major source of environmental contamination are only about 15% of the host population which harbour about 70% of the infection while the remaining large population harbor only 30% of the infection. These minority groups with heavy infection continue to seed the environment with the eggs of the helminthes. Estimated number of about 4.5 billion people are affected with soil transmitted helminthes and 350 million are ill as a result of the infections, majority of who are children. About 33 million pregnant women have hookworm infection which results in chronic blood loss and further predisposes them to iron deficiency anemia. Some indigenous researchers such as Amadi, A.N. Iwuala M.O.W, (1999) Anoaikw, J.C. Nwoke, B.E.B, Ukaga, C.N. *et al* (2004), in their reports concluded that unhygienic environment, poverty, lack of good toilet facilities, inadequate water supply and type of parental occupation are the major causes of the existence of these parasites. Children between the age of 5 and 15 years are known to acquire heminthes infection, often with high intensity values. The predisposition of children to heavy infection is highly critical in clinical medicine and public health, especially since many helminthes infection are often asymptomatic leading to neglect until serious clinical stages are reached Blacklock, C.J and Southwell, F.U (1993). The potential for water, sanitation and Hygiene (wash) as strategies to reduce soil transmitted Helminthes is supported by observational studies that report lower risk of soil transmitted Helminthes infection associated with improved wash access and practices 2014 systematic review and meta-analysis found that improved WASH, including piped water access, access to sanitation facilities, wearing shoes, and hand washing with soap were associated with a 33-70% lower odds of soil transmitted Helminthes infection (Strunz *et al.*, 2014).

METHODOLOGY:

Study Site and Population:

This study was carried out in Ihitte Uboma local government area of Imo State, South Eastern Nigeria. The headquarter of the L.G.A is Isinweke, which has an area of 104km² and a population of 120, 744 at the 2006 census. Ihitte Uboma is one of the twenty seven local Government area in Imo state as high and low lands, sandy/loamy soil in the rain forest zone as well as

clay/muddy soil with rich savanna vegetation in the entire state. These geographical feature together with economic and socio-cultural factors favour the survival, transmission as well as spread of soil transmitted helminthes in the area. There are 46 primary schools in the local government area with a total pupil's enrolment of 37, 545. Most of the indigenes are civil servants, farmers, and traders.

Study Population:

All pupils who were in grade three to five in 2022/2023 academic year constituted the target group. A total of 745 pupils from randomly selected twelve schools consented and were enrolled in the study.

Ethical clearance from appropriated authority:

Visitations were made to the local government health/education authorities, state universal basic education board heads of schools and their class teachers with an introductory letter from the head of department of Animal and Environmental Biology. Interactive were held with the people through the special help of their heads and class teachers to explain the aims and objectives of the research and to obtain their consent. Their parents consents were also sort through an item in the structured questionnaire issued to them.

Sample Analysis/Collection:

Stool samples were collected at 4 weeks interval from 745 school children who voluntarily agreed to take part throughout the period of the study. Each child in the study was given a clean specimen bottle to take home. The pupils were adequately instructed on how to collect the stool specimen. A well-labeled screw capped bottles, applicators sticks and tissue paper were distributed. Basically two methods of parasitological stool analysis; direct normal saline, wet mount and formal either concentration techniques were adopted, Ukaga, C.N. and Nwoke B.E.B. (2007).

The presence of mucous and blood were noted in the faecal samples the specimen were carefully emulsified with the saline, covered with coverslip and examined immediately using x10 and x40 objectives lens.

Following the above examination stool sample from which give clear results were not obtained to formal ether concentration technique for confirmation. About one (1g) of stool was added to 10ml of 10% formalin in a test tube, stirred with applicator stick until a good suspension was made. The suspension was then filtered directly into centrifuge tube through two layered surgical gauze, 3ml of ether was thoroughly mixed with the suspension and centrifuged at 1500rpm for 2mins. Fecal debris on the ether formalin interface was loosened with an applicator stick and the supernatant decanted leaving only the sediment at the decanted leaving only the sediment at the

bottom of the centrifuge tube. This was then mixed by finger tapping. Examination was carried out by dropping the mixture with Pasteur pipette on a clean slide covered with a cover slip and examined using x10 and x10 objectives. Analysis of all data were made using chi-square statistic with significant level ($P>0.05$).

RESULTS:

Out of 745 pupils whose stool samples were examined 264 (35.43%) were infected (Table 1) of this number, 209 (79.17%) were infected with *Ascaris lumbricoides*, 87 (32.95%) were infected with Hookworm while 12(4.5%) were infected with *Trichuris trichuria*. Results from the individual school shows that central school Ihitte has the highest overall soil transmitted infection of 60.52% while community school Umuderim had the highest overall *Ascaris* infection of 92% (Table 2). *Ascaris lumbricoides* was found to have 62.12% single infection while 15.15% double infection with Hookworm and 1.89% double infection with *Trichuris* (Table 3). Overall sex related infection (Table 4) showed that males were slightly more

infected than the females 37.7%. Males also had highest hookworm infection of 36.6% while females had the highest *Ascaris* infection of 79.25%. Age related prevalence in (table 5) show age group 10-12 of having highest overall infection of 37.5%. 84% *Ascaris* infection was observed among age group 7-9 while age group 13 and above had highest Hookworm infection of 89%. Those whose parents are Artesians farmers and in business were more infected with 40%, 38.75% and 36.27% respectively than those whose parents are civil servants 26.77% (Table 6) infection rate of 54.725 was recorded among those pupils who share food with others while those who do not eat at school and those who come to school with their own food had least infections of 28.22% and 28.57% respectively. (Table 7). 85% of those who use stream water were infected while 25.75% rate infection was observed among those that use pipe borne water, (Table 8). Infection rate (Table 9), in relation to toilet facilities available to the pupils showed those who defecate in the bush of having highest infection rate of 37.39%.

Table 1: Over prevalence of soil transmitted helminthes

No examined	No infected (%)	Ascaris (%)	Hookworm	Trichuris
745	264 (35.45%)	209(79.17)	87(37.95)	12(4.55)

Table 2: Prevalence of soil Transmitted Helminthes in each of the twelve schools surveyed

School visited	No of pupils examined	No of pupils infected (%)	No of pupils with Ascaris (%)	No of pupil with Hookworm (%)	No of pupils with Trichuris (%)
Central School Ihitte (CS1)	62	23(37.09)	20(74.07)	5(18.52)	2(7.41)
Ekwereocha Community School (ESS)	61	31(50.81)	123(34.21)	23(60.520)	2(5.26)
Community School Umunoha (CSU)	63	21(33.33)	19(73.08)	7(26.92)	0(0.00)
Community School Amakohia (CSA)	60	18(30.00)	17(85.00)	3(15.000)	0(0.00)
Community School Umuezegwu (CSU)	64	20(32.25)	19(76.00)	6(24.00)	0(0.00)
Central School Lowa (CSL)	63	25(39.68)	16(80.00)	4(20.00)	0(0.00)
Community School Odenkume (CSO)	64	20(31.25)	14(46.66)	16(53.00)	0(0.00)
Community School Umuderim (CSU)	62	(40.32)	23(92.00)	2(8.00)	0(0.00)
Community School Ikperere (CSI)	63	21(31.25)	19(76.00)	6(24.00)	0(0.00)

Central School Abueke (CSA)	62	18(29.03)	17(70.63)	4(16.67)	3(12.00)
Community School Amaenyikwu (CSA)	62	19(30.64)	17(68.00)	5(20.00)	39(12.00)
Community School OnishaUboma (CSOU)	59	23(38.98)	15(65.22)	6(26.08)	29(8.96)
Total	745	264	87	87	12

Table 3: Prevalence in relation to the distribution of single and or double infections of the helminthes among the infected subjected

Species single/double infection	No of pupils infected	Prevalence (%)
Ascarislumbricoides	164	61.12
Hookworm	46	17.42
Trichuria	6	2.27
Ascaris and hookworm	40	15.15
Trichuris and trichuria	5	1.89
Hookworm and Trichuria	1	0.39
Total	264	100

Table 4: Prevalence in relation to the gender of the pupils

Gender	No of Pupils examined	No of pupils infected (%)	No of pupils infected with hookworm (%)	No of pupils infected with Ascaris (%)	No of pupils infected with Trichuris (%)
Male	389	139(35.73)	5(36.69)	110(79.1)	4(2.87)
Female	356	125(35)	36(28.8)	99(79.2)	8(6.4)
Total	745	264	87	209	12

Table 5: Prevalence in relation to age group

Age Group	No. of pupils examined	No of pupils infected (%)	No of pupils infected with Hookworms (%)	No of pupils infected with Ascaris (%)	No of pupils infected with Trichuris (%)
7 – 9	153	50(32.68)	10(11.49)	42(20.10)	4(33.33)
10 – 12	496	186(37.5)	56(64.34)	142(67.94)	5(41.67)
13 and above	96	28(20.17)	21(24.38)	25(11.98)	3(25)
Total	745	264	87	209	12

Table 6: Prevalence in relation to parental occupation

Parental occupation	No of pupils examined	No of pupils infected (%)	No of pupils is infected with hookworm (%)	No of pupils infected with Ascaris (%)	No of pupils infected with Trichurias (%)
Business	408	148(36.27)	35(40.22)	126(60.29)	5(41.67)
Civil servant	127	34(26.77)	15(17.24)	21(10.05)	3(25.00)
Farmers	160	62(38.75)	25(28.74)	48(22.96)	3(25.00)
Artesian	50	20(40.0)	12(13.79)	14(6.70)	1(8.33)
Total	745	264	87	209	12

Table 7: Infectivity rate in relation to the source of food eaten at school

Source of food eaten at school	No of pupils examined	No of pupils infected (%)	No of pupils infected with hookworms (%)	No of pupils infected with <i>Ascaris</i> (%)	No of pupils infected with <i>Trichuris</i> (%)
Food from the house	182	52(28.57)	18(9.89)	44(24.18)	3(1.65)
Buy food from school	209	84(40.19)	26(12.44)	58(27.75)	4(1.91)
Share food with others	106	58(54.72)	28(26.42)	56(52.83)	2(1.89)
No eating at school	248	70(28.22)	25(10.08)	51(20.82)	3(1.21)
Total	745	264	87	209	12

Table 8: Prevalence in relation to the major source of water (portable) available to the pupils

Source of water	No examined	No infected	Prevalence
Pipe borne	260	68	26.15
Bore hole	478	190	39.75
Stream	7	6	85.71
Total	745	264	

Table 9: Infection rate in relation to toilet facilities available

Type of toilet	No of pupils examined	No of pupils infected (%)	No of pupils infected with hookworm (%)	No of pupils infected with <i>Ascaris</i> (%)	No of pupils infected with <i>Trichuris</i> (%)
Water closet	314	104(33.12)	26(29.89)	80(38.28)	5(41.67)
Pit latrine	336	124(36.90)	30(34.48)	90(43.06)	5(41.67)
Bush defecation	96	36(37.89)	31(35.63)	31(35.63)	2(16.67)
Total	745	264	87	209	12

DISCUSSION:

The total sample population infected (35.4%) could be said to be moderate in accordance with the previous reports. In another report this could be described as high infection which may indicate that majority of the pupil may suffer the infection overtime. The three soil transmitted helminthes (*Ascaris lumbricoides*, hookworm and *Trichuris trichuria* identified in this study are in line with the works of other eminent researchers like B.E.B Nwoke, Ukaga, C.N. et al., In this report the prevalence survival and transmission of these helminthes were attributed to life cycle pattern and mode of transmission which often include fecal oral and cutaneous routes. The

infection rate were also attributed to the poor environmental and personal hygiene, geophagia, insufficient provision of essential amenities, indiscriminate defecation and disposal of refuse (waste). The highest *Ascaris* prevalence of recorded could be attributed to its high survival strategies which is conferred on it by the outerchitinous layer of the egg shell and the laying of numerous eggs of about 2000 per day by the female. Hookworm prevalence (32.9%) was slightly higher when compared with the reports. However, hookworm transmission is highly seasonal and occurs mostly during the raining/wet season when their eggs hatch and make quick penetration of their host intact skin.

This result is in line with assumptions presented by the present study was carried out here during the raining/wet season, most of the pupils walked around barefooted although they claimed to have come to school with foot wear. Gender related prevalence showed that males were slightly more infected (35.7%) than the female (35.0%), but this was statistically different $P < 0.05$. This result was different from the previous report where the difference in gender infection was attributed to the exposure rather than the real sex issue since males are mostly exposed to outdoor cores than their female counterparts with little or no preventive measure. The peak of the infections observed within the age group 10-12 years which gradually declined towards age 13 and above only reflect active nature of that group indicating that they are more exposed to contaminated sites outdoor through food and poor sanitary measure. On the contrary, age group 13 and above are more selective in their choice of food and activities thereby reducing infection risks through good health habits. Infection rate in relation to source of water in the study area difficult to source of water in the study area difficult to evaluate since most of these are used as water source by the community. However, general methods of collection handling and storage could be attributable factors for subsequent contamination.

The reasons for specific school variation, in infection among the schools in this study could be associated with various factors involving pupils themselves, school and home environments. Most of the schools enrolled in this study lack potable water the transmission and spread of the helminthes since water is necessary for primary health habit of washing and cleaning especially after defecation. The absence of modern and clean toilet environment necessitated and indiscriminate defecation around the schools which also contributed to the prevalence of infection in the areas.

Generally, education/occupational statuses of the parents indirectly affect the health status of the entire family, this maybe a justification for the study. Hence, the pupils whose parents are civil servants had obtained the least infection (26.7%) compared to those of artisans (40.0%). It is not impossible that most of low class workers were ignorant of proper way to take care of their children. It is very to see a mason drinking water from the same source he dips cement bucket. A toilet excavator eating and drinking on the very spot where he is excavating without considering the after effect of his action which indirectly affects his household members. The result on the source of food also agrees with the work Amah, IG Onah, J.A., Amaro, who stated that the act of collective eating or sharing food together promote cross infection.

CONCLUSION:

Soil transmitted Helminthes (STH) infection is a major public health problem among school/children in the study

area as the result revealed in a high prevalence soil transmitted helminthes among school aged children. The habits of not wearing shoes and washing hands before eating as well as being in the 10-16 years of age were associated with increased odds of (STH) infections among children in the study area improvement of sanitation and hygiene maintains reduced level of infection produced by the chemotherapy and eventually contributes to elimination of the helminth infections in the study area.

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