African Journal of Pure & Applied Sciences

ISSN: 2710-0758
URL: https://journal.ku.ac.ke/index.php/AJPAS/article/view/648

Journal homepage: http://journal.ku.ac.ke/index.php/AJPAS

Research Article Open Access

The effect of Water sanitation and hygiene on the occurrence of Helminthiasis Infection in Tropical Communities of Nigeria

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Received 5th February 2025; Accepted 30th April 2025; Published online; 30th June 2025

How to Cite:
Oluwaseun, A. M., Ekesiobi, A. O., Olarewaju, S. O., & Akinleye, C. The Effect of Water Sanitation and Hygiene on the Occurrence of Helminthiasis Infection in Tropical Communities of Nigeria. *African Journal of Pure and Applied Sciences, 6(1),* 84–89. Retrieved from https://journal.ku.ac.ke/index.php/AJPAS/article/view/648

ABSTRACT

Intestinal parasitic helminthic infections posed a major public health challenge in an undeveloped countries like Nigeria over years, with an increasing in sustaining risk factors which include open defecation, poor personal and food hygiene, and poor environment sanitation. This study aimed at the assessment of impact of water sanitation with hygiene intervention undertaken by EU and UNICEF and the occurrence of helminthiasis infection among inhabitants of Local Government Area of Aguata in Anambra State area of Nigeria. Informed consent was sought from the respondents, structured questionnaires were administered and fecal specimens were collected from 650 individuals. Direct wet mount with iodine solution and formal- ethyl ether concentration method were utilized in analyze the fecal specimens. The result indicated that out of 650 people that was examined 119(18.31%) were infected. The highest prevalence rate was recorded in *Ascaris lumbricoides* 27(4.15%), followed by Hookworm 11(1.69%), *Trichuris trichiura* 8(1.23%) and the least being *Strongloides stercoralis* 2(0.31%). Gastrointestinal helminthes infections not sex related as females 61(18.65%) were insignificantly infected more than the males 58(17.96%) ($p \geq 0.05$).Age range of 31 – 40 years recorded highest prevalence rate of 21(25.93%) followed by 11 – 20 years, 36(19.35%); > 40 years 11(18.97), 21 – 30 years 28(16.97) whereas 0 – 10 years recorded the least prevalence of 23 (14.38%). This study reveals that water sanitation and hygiene intervention exerted a significant positive impact due to the low overall prevalence of helminthes infections recorded. Sustainability of this program with adequate funding from both government and individual in the communities are recommended

Keywords: *W*ater sanitation and hygiene, Gastrointestinal, Helminthes, Prevalence, Environmental sanitation, EU. UNI

INTRODUCTION

In most of the underdeveloped countries, intestinal parasitic infection is a primary people fitness hassle that was frequently omitted due to poor environmental and private hygiene practice, negative nutrition,, overpopulation and climatic situations that prefer the development and survival of those parasites are some of the elements contributing to the high degree of intestinal parasites transmission (Hassan, *et.al,*2018). School kids bears the highest burden of the morbidity associated (Nematian, *et al.,* 20014), because of their dirty conduct when playing or eating with soiled palms, irregularly uncleaned rest room used attitude, ingesting and consuming of contaminated food and water (Abiodun, 2024).It's been evident that soil transmitted helminthes infected 1,050 million, 1,300 million and 1,450 million humans international, respectively, whilst Schistosome infects more than 250

million humans population (WHO, 2017). Worldwide, 2 billion people has been implicated with intestinal parasitic infestation; among this number the young ones has the majority because of their mode of nutrition out of those majorities had been youngsters because of malnutrition (WHO, 2017).

MATERIALS AND METHODS

Study Area

Aguata, is located on co-ordinates $7^{0}10'0$East and $5^{0}10'0$North, as a largest local government Area of the State Anambra with its headquarters in Aguata location of the headquarter office building part of which falls into the city of Ekwulobia while the other part falls within Aguluezechukwu Town). Aguata is in a tropical rainforest belt of Nigeria and in the south eastern part of Nigeria. Its total landed area is 19,906,256 with a total population of 369,972 people with male population of 187,262 and female density population of 182710 according to the Nigeria population census figure of 2006. (FRNOG 2010)

Figure 2: Map of Aguata Local Government Area (The Study Area)

Figure 3.1: Map of Aguata Local Government Area (the Study Area)
Source: Constitution of the Federal Republic of Nigeria (2007)

STUDY POPULATION

The study population were individuals of all ages randomly selected from six (6) towns declared open-defecation-free in Aguata LGA. A total of 650 individuals (323 males and 327 females) were selected and examined using the Yaro Yamane's formular given by $n = N/1+N(e^2)$ according to Uzoagulu, (2011) .

SAMPLE COLLECTION

The individuals selected were educated on how to collect the fecal. Samples and labeled appropriately and then transported to the Laboratory parasitological examinations. Oral interview and structured questionnaire were administered to each individual respondent. **The** fecal samples were collected in a clean and grease free universal specimen container of size 23 x19x 0.5mm with cap and transported to the laboratory at room temperature under clinical sample condition of transportation of suspected pathological sample within 24hours after collection (WHO, 2017)

Macroscopic examination

All fecal specimens were examined macroscopically for appearance, consistency, color, and presence of mucus, blood, adult worms, or segment.

Microscopic examination

Direct stool smear

A drop of physiological saline was placed on one end of the grease free clean glass slide and a drop of iodine on the other end . Using an applicator stick, a small amount of the fecal sample was collected from different sides and mixed with the saline and the iodine drop separately. This was covered with cover slip and examined under the microscope for larvae, eggs, cysts. The results obtained were recorded. (Chioma, *et.al.,*2015)

Concentration technique

Formol ether concentration technique as described by Cheesbrough (1998) was used. Using a rod or stick about 1g of fecal specimen will be emulsified in 4ml of 10% formol water contained in screw cap bottle or tube. A further 3-4ml of the formol water was added and mixed well by shaking. The emulsified fecal sample was sieved into a beaker. The fecal suspension was transferred into a centrifuge tube and 3-4ml of ethyl acetate added and mixed very well.

It was centrifuged at 750-1000g for I minute using a stick, the layer of faecal debris from the side of the tube was loosen and inverted to discard the ether, faecal debris and formol water such that the sediment remained in the tube. The bottom of the tube was tapped to re- suspended and mixed with the sediment.

The sediment was transferred to a slide and covered with a cover slip.

This was examined microscopically using 10x and 40x objective lens. (WHO,2017)

ETHICAL CONSIDERATIONS

Letter of introduction was secured from the department of Biological sciences Anambra state university. Approval was sought from the Igwe and the President General of the towns. Verbal and written informed consent was sought from all recruited individuals/respondents' those people positive for gastrointestinal helminthes and protozoan parasites were assisted in procurement of anti-helminthic drugs.

STATISTICAL ANALYSIS

The data obtained were analyzed with SPSS software version 25.0. Chi-square (χ^2) test and t-test of distribution was also used to determine the percentage of infection and any statistical significant difference between prevalence of parasites in relation to the sex and age of the individual at $p \geq 0.05$ significant level.

RESULT

Table 1: Prevalence rate of Gastro Intestinal parasitic helminthes in Aguata L.G.A. of the state in relation to Towns and Sex

	Number examined			Number Positive (%)		
Town	Male	Female	Total	Male	Female	Total (%)
Ekwulobia	78	72	150	11(14.10)	10(13.89)	21(14.00)
Ezinifite	36	44	80	8(22.22)	14(31.82)	22(27.50)
Igboukwu	52	48	100	15(28.35)	9(18.75)	24(24.00)
Uga	59	61	120	7(11.86)	9(14.75)	16(13.33)
Achina	58	62	120	8(13.79)	14(22.58)	22(18.33)
Amesi	40	40	80	9(22.50)	5(12.50)	14(17.50)
Total	323	327	650	58(17.96)	61(18.65)	119(18.31)

Table1 show the prevalence and distribution of gastrointestinal helminth and protozoan parasites in Aguata Local Government Area in relation to sex and towns. Ezinifite town recorded the highest prevalence, 27.50% followed by Igboukwu town, 24.00%, Achina town, 18.33%, Amesi town, 17.50% Uga town, 13.33%; and the least being Ekwulobia town, 14.00%. The disparity in the prevalence was statistically not significant at 5% ($\bar{x}^2$ = 6.818, p>0.05).

Table 2: Prevalence and distribution of gastrointestinal helminthes Parasites in Aguata L.G.A. in relation to Age Group

Age groups in years	Number examined	Number Positive (%)				
		Helminthes Parasites (%)				Total
		AS	HW	TR	ST	
0-10	160	7(4.38)	0(0.00)	1(0.63)	0(0.00)	8(5.00)
11-20	186	5(2.69)	5(2.69)	4(2.15)	1(0.54)	15(8.06)
21-30	165	13(7.88)	3(1.82)	3(1.82)	1(0.61)	20(12.12)
31-40	81	2(2.47)	3(3.79)	0(0.00)	0(0.00)	5(6.17)
>40	58	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Total	650	27(4.15)	11(1.69)	8(1.23)	2(0.31)	48(7.38)

Key: AS = *Ascaris lumbricoides*; HW = Hookworm; TR = *Trichuris trichiura*; ST = *Strongyloides stercoralis*; Table 2 shows the prevalence and distribution of gastrointestinal helminth and protozoa parasites in Aguata L.G.A. in relation to Age groups. Age group 31 – 40 years recorded the highest prevalence 25.93%, followed by 11 = 20 years that recorded 19.35%, >40 years (18.97%) 21 – 30 years (16.97%) and the least being 0 – 10 years (14.38%). No helminth parasites were recorded among the age group >40 years. The disparity in the prevalence among the age group was statistically significant p(<0.05).

Table 3: Prevalence rate of gastrointestinal parasitic helminthes in Aguata LGA of the state based on relation to hygiene practices

Hygiene practices	Responses	No. Examined n = 650	No infected n = 119	No Uninfected n = 531
Washing of hands with clean water and soap before eating	Yes	529(81.38)	41(6.31)	488(75.08)
	No	121(18.62)	78(12.00)	43(6.62)
Washing of fruits/vegetable before eating/prepared for consumption	Yes	515(79.23)	36(5.54)	479(73.69)
	No	135(20.77)	83(12/77)	52(8.00)
Hand washing immediately after use of toilet	Yes	502(77.23)	48(7.38)	454(69.85)
	No	148(22.77)	71(10.92)	77(11.85)
Vectors/rodents seen in kitchen and food storage areas	Yes	334(51.38)	63(9.69)	271(41.69)
	No	316(48.62)	56(8.62)	260(40.00)
Wear foot wears at home	Yes	346(53.23)	61(9.38)	285(43.85)
	No	304(46.77)	58(8.92)	246(37.85)
Wear foot wears during farming activities	Yes	187(28.77)	31(4.77)	156(24.00)
	No	463(71.23)	88(13.54)	375(57.69)

Table 3 shows the prevalence and distribution of gastrointestinal helminth and protozoan parasites in Aguata L.G.A. in relation to hygiene practices. Of the 119 infected individuals, 41(6.31%) did wash their hands with clean water and soap before eating while 78 (12.00%) did not wash their hands before eating. Among those not infected 488 (75.08%) did was their hands before eating while 43 (6.62%) did not. This disparity in the rate of infection was significant x^2= 0.00 ($p<0.05$). Those that did was fruits and vegetables before eating or prepared for consumption significantly differ in the rate of infection from those that did not ($p<0.05$).

DISCUSSION

Gastrointestinal parasitic infestation in human is an important public health problem in underdeveloped countries like Nigeria. The socio-cultural, poor environment sanitation, poverty and poor hygiene practices of the people, lack of save drinking water and indiscriminate defecation in open places may account for the high prevalence rate of intestinal parasitic infections in most developing countries (Mbanugo *et al*., 2002). This study revealed an overall prevalence of 18.31% as shown in far lower than recorded in previous studies which reported high prevalence: 49.7% (Emmy-Egbe *et al*., 2012); 30.6% (Mbanugo and Onyebuchi, 2002); 42.7% Michael *et al*., 2017). 48.7% in Imo State, (Udensi *et al*., 2015) 48.40% in South=Western Nigeria, Awolajie *et al*, 2009), 44.71% in Uga Aguata LGA (Chioma *et al*., 2015), 52.5% in Uzzo-Uwani Local Government Area of Enugu State, Odo *et al*., 2016). Such high prevalence has been attributed to ignorance, poverty, poor environmental sanitation, poor personal hygiene, shortage of clean portable water and indiscriminate defecation. Various helminths recorded in this study were *Ascaris lumbricoides* 27(4.15%), Hookwrm 11(1.69%), *Trichuris trichiura* 8(1.23%), *Stronglyloides stercoralis*, 0.31%) The low prevalence recorded against the individual parasites may be indicative of the improved water availability, food and personal hygiene and environmental sanitation as advocated and executed by the European Union and Unicef in partnership with Anambra State government through the WASH programme that started in 2015.

CONCLUSION

Water sanitation and hygiene intervention program undertaken by the European Union, Unicef and in partnership with Anambra state government targeted to reduce drastically the diseases associated with WASH has impacted positively on the prevalence of gastrointestinal Helminthes infections in Aguata local government area as indicated by the low prevalence recorded in this study. Sustainability of this program is very important which will not only eliminate the parasite in the environment and host with time but also control or eliminate other diseases associated with poor access and availability to safe water, poor hygiene status (personal and food) and poor environmental sanitation. Therefore, Anambra state government of Nigeria need to intensify the wash programs in other local government's area of the state .in other to reduce the burden of intestinal helmithiasis infection in the state from the community base level.

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