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Full Length Research Article

'IRREGULAR CDD' AND 'MOSAIC PATTERN OF WASH' ACTIVITIES TOWARDS 'STH' CONTROL: A CASE STUDY OF AGULERI, ANAMBRA-EAST LGA, ANAMBRA STATE, NIGERIA.

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Abstract
Persistence of Soil Transmitted Helminthiasis, usually due to *Ascaris lumbricoides,* in endemic communities has been attributed to gaps in intervention coverage and compliance, especially in rural communities. This study therefore evaluated 'Community Directed Distributors' (CDDs) activities and assessed 'Water, Sanitation and Hygiene' (WASH) indicators in Aguleri, Anambra-East LGA, Anambra state, Nigeria. The study was community based, with Cross-sectional design; a semi-structured and pre-tested questionnaires were used (as checklist and as in-depth interview (IDI) guide) for data collection. Mass Drug Administration by CDDs, reported to be less often (60.0%), had mostly Mebendazole given (55.0 %). Last distribution by CDDs was in September 2024, with Albendazole supplied by the state government to all Primary Health Centers. '*Unavailability of anthelminthic drugs from the government*' and '*limited drug supply by philanthropists*' were reported as a hindrance to continued and wider coverage distribution. Mosaic patterns of WASH conditions were observed for all the variables investigated: drinking water source, type of toilet use, hand washing facility and soap for hand wash. These research findings revealed non-uniform gaps in intervention coverage and compliance towards STH control. Strengthened community-based control measures are highly recommended in the study area.

Keywords: Soil Transmitted Helminth, *Ascaris lumbricoides,* Community Directed Distributors, Water, Sanitation, and Hygiene.

Introduction

Soil-transmitted helminth (STH) infections, is a neglected tropical disease, with the most reported aetiological agent being *Ascaris lumbricoides.* The parasite eggs, transmitted faeca-orally, usually thrive in the warm and moist soil of the world's tropical and subtropical countries (Bethony *et al*., 2006; WHO, 2017; WHO, 2022). Other parasites that cause STH include: *Trichuris trichiura,* Hookworms (*Ancylostoma duodenale* and *Necator americana*) and less frequently reported *Strongyloides stercoralis.* In Nigeria, a considerable amount of human waste is discharged daily into the soil, especially through open defecation, leading to the seeding of the soil with pathogenic organisms including eggs of soil transmitted helminthes (Nock *et al*., 2003).

Transmission of *Ascaris lumbricoides* infection may be direct, or indirect through secondary sources as: food, water, vegetables, fruits, contaminated hands and other objects (Singh and Idris, 2016; Onyido *et al*., 2016; Egbuche *et al*., 2024, Egbuche *et al.,* 2025). The transmission is closely linked to inadequate water, sanitation and hygiene (WASH) facilities and practices, limited health education in affected communities, low coverage and compliance in anthelminthic drug distribution and coverage (de Silver *et al*., 2003; Brooker *et al*., 2006; Strunz *et al*., 2014; Egbuche *et al.,* 2017; Jourdan *et al.,* 2018; Anunobi *et al*., 2019; Freeman *et al*., 2019; Egbuche *et al*., 2025). Health problems associated with *A. lumbricoides* infection include obstruction, anemia, and malnutrition, pancreatitis in children, cognitive disability and physical weaknesses, among others (Hotez *et al*., 2008, Hotez *et al*., 2006, Lee *et al*., 2012). To ameliorate these conditions, mass drug administration (MDA) and preventive chemotherapy (PC), complemented by health and hygiene education, and the provision of clean water and sanitary facilities to ensure the sustained impact of MDA (WHO, 2017; Aribordor *et al*., 2025; Egbuche *et al*., 2024) are utilized.

The Community Directed Distributors (CDDs) sometimes known as community health workers (CHWs) are trained in such drug distribution and administration (Gyapong *et al.*, 2001; Ndyomugyennyi *et al.,* 2003; Fleming *et al.,* 2016), in order to provide valuable extensions of the healthcare delivery system to millions of people living in both accessible and inaccessible areas. CDDs enquire when medicines for the next cycle of treatment will arrive, initiate mobilization for the collection of additional stocks of medicines (Katabarwa *et al.*, 2000) and assist in mobilizing the community to adopt by-laws that will ensure treatment compliance (Chami *et al.,* 2019).

Despite the availability of STH control tools, *Ascaris lumbricoides* infection still persist and remains the most reported STH *infection*, with prevalence ranging from 3.9 to 36.6 % in Anambra state, Nigeria (Ukibe *et al*., 2018; Nwankwo *et al*., 2021; Nzeukwu *et al*., 2022; Ahanonu *et al*., 2023; Okafor *et al*., 2023; Egbuche *et al.* 2024; Aribodor *et al*., 2025). This reflects possible gaps in intervention coverage and compliance (Egbuche *et al.* 2024), or resilience of *A. lumbricoides* eggs in contaminated environment (Senecal *et al*., 2020). Noteworthy is WHO (2024) emphasis that several rounds of preventive chemotherapy may be needed before effective (i.e. ≥ 75%) coverage among pre-School Age Children (Pre-SAC) and SAC is reached. To understand this aspect of the disease dynamics in a local context, there is need to evaluate CDDs activities and WASH practices. Hence this study was conducted in

a selected town, Aguleri in Anambra state of Nigeria, where both rural and urban settlements exist.

Materials And Methods

Study Area

The study was conducted in Aguleri, the largest town in Anambra East Local Government Area, Anambra State, Nigeria with the coordinates 6°20′N and 6°53′E. The town has an estimated population of 900,000 people (Nigerian Census, 2006). Aguleri is currently divided into three main quarters: Igboezunu, Ivite, and 'Enugwu na Eziagulu' (Ugwu na Adegbe), with component families present in both Aguleri Uno and Aguleri Otu. Aguleri having both rural and urban settlements is an ancient town, and highly recognized as a significant agricultural hub within Anambra State. It is blessed with significant river systems: Omambala and Ezu rivers, having their confluence there. The rivers provide water for domestic use and serve as important transportation routes in that area. The river is susceptible to pollution from agricultural runoff, industrial discharge, faeces and domestic waste, which facilitates the transmission of parasitic diseases associated with conditions of poverty, poor sanitation and unavailability of clean water (Ndukwe *et al.,* 2019). There are a number of Government, mission and private health facilities in Aguleri. There are several basic schools and quite a number of secondary schools in Aguleri.

Study Design

A community-based, cross-sectional survey approach was used for this study, within December 2024 and May 2025. The study involved evaluation of CDDs activities through In-depth Interview (IDI), and assessment of some WASH conditions using an abridged checklist.

Study Population

Study population for WASH assessment were Basic schools within the study area. Another population targeted had the Community Directed Distributors across all the regions and quarters of Aguleri.

Ethical Considerations

Ethical approval (Reference number: COOUTH/HREC/ETH.C/VOL.1/FN:04/406) for this study was obtained from Health Research Ethics Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) Amaku, Awka, Anambra State Nigeria.

Advocacy Visit

Advocacy visits were made to Traditional Rulers of Aguleri communities, and Head Teachers of the selected schools, before the study commenced. During these meetings, the purpose, objectives, and procedures of the study were clearly explained, and the significance of the research for public health intervention emphasized.

Informed Consent

All study participants were fully informed about the nature of the research, including their right to decline participation or withdraw at any point without any negative consequences. To maintain ethical standards, oral informed consent was obtained from each Head Teacher and each Community Directed Distributor (CDD) before data collection. Identity of the respondents were kept highly confidential.

Selection of Participants for the Study

Total population sampling method was used to include all the Community Directed Distributors in all regions ('Aguleri Uno' and 'Aguleri Otu') and quarters (Ivite, Igboezunu, 'Enugwu na Eziagulu') of Aguleri for the study. For WASH assessment, the Basic schools were selected using stratified and random sampling methods. Each region ('Aguleri Uno' and 'Aguleri Otu') and quarter (Ivite, Igboezunu, 'Enugwu na Eziagulu') of Aguleri were considered thereby giving a total of six (6) strata for the study area (i. e. 3 quarters × 2 regions = 6 strata). For the purpose of this research, the strata were labelled as follows:

'Ivite Uno', 'Igboezunu Uno', 'Enugwu na Eziagulu Uno', 'Ivite Otu', 'Igboezunu Otu', and 'Enugwu na Eziagulu Otu'. In each strata, Four (4) schools (including at least 1 public school) were randomly selected from a list of public Basic and a list of private Basic schools within the study area.

Inclusion Criteria

Basic schools with functional administrative heads willing to participate, CDDs officially recognized by the Primary Health Centers, and participants who provided informed oral consent were included in the study.

Exclusion Criteria

Schools that declined permission for assessment, individuals who withheld their consent, schools closed during the period of data collection, and community directed distributors who were not recognized by the Primary Health Centers, were excluded from the study.

In-Depth Interview for Evaluation of the Community Directed Distributors (CDDs) Activities.

The activities of Community Directed Distributors (CDDs) were evaluated using a semi-structured and pre-tested IDI guide. To obtain deeper qualitative insights, In-Depth Interviews were conducted with all qualified Community Directed Distributors, and a total of 20 CDDs were engaged. Each interview explored the knowledge and expertise of the CDDs including their coverage location within the study area, socio-demographics, anthelminthic drug distributed, frequency of anthelminthic drug distribution, Public awareness for Mass Drug Administration, Venue for Community engagements and challenges encountered. Interviews were conducted face-to-face in locations convenient for the CDDs (at the Primary Health Centers), each interview lasted for about 20minutes and responses, transcribed verbatim were recorded in detailed field note. Quotes from CDDs were extracted to support key findings.

Assessment of Water, Sanitation and Hygiene (WASH) Indicators.

This was carried out to determine the condition of some WASH indicators in the study area. The tool used was an abridged checklist of WASH indicators, modified from Egbuche *et al.,* (2024) and Egbuche *et al.,* (2025). The checklist served as a questionnaire which was administered in schools within the study area. Key Information addressed in the questionnaire were: Drinking water sources, type of toilet use in school, Hand washing facility and soap availability for hand washing, as regards *A. lumbricoides* transmission. Through the Head teachers (or class teacher assigned), and with the aid of in situ observation, information required in the checklist were obtained.

Data Summary and Statistical Analysis

The data obtained from this study were summarized using descriptive statistics. The data summary tools used were: Tables and Charts. Also, some responses from participants were presented as quotes.

Results

Distribution of Deworming Drugs in the Study Area Through Community Directed Distributors.

The 20 CDDs interviewed in the study area comprised 95.0 % females and 5.0 % males (Table 1). Majority (45.0 %) of them were in the age brackets (15 – 30) years and (31 – 50) years respectively. Their main occupation are listed in Table 2, with 45.0 % of them being Health workers. Their educational qualification included: Registered Nurse (RN) qualification (5.0 %), Community Health Extension Worker (CHEW) qualification (15.0 %) and the most occurring 'O-Level' qualification (60.0 %)

Table 1: Characteristics of the Community Directed Distributors

Variables	Categories	Number of CDDs	% values
Gender	Male	1	5.0
	Female	19	95.0
Age range (in years)	15 – 30	9	45.0
	31 – 49	9	45.0
	≥ 50	2	10.0
Occupation	Health personnel	9	45.0
	Trader	4	20.0
	House wife	3	15.0
	Student	1	5.0
	None / Freelance	3	15.0
Educational qualification	Primary	2	10.0
	O – Level	12	60.0
	OND	2	10.0
	CHEW	3	15.0
	RN	1	5.0

The anthelminthic drug distributed by the CDDs for Mass Drug Administration as reported in Figures 1 were in the following order: Mebendazole (55.0 %), Albendazole (40.0 %) and Combantrin that contain Pyrantel pamoate (5.0 %). Major sources of medicines are from the government while '*sometimes NGOs and philanthropists donate*'.

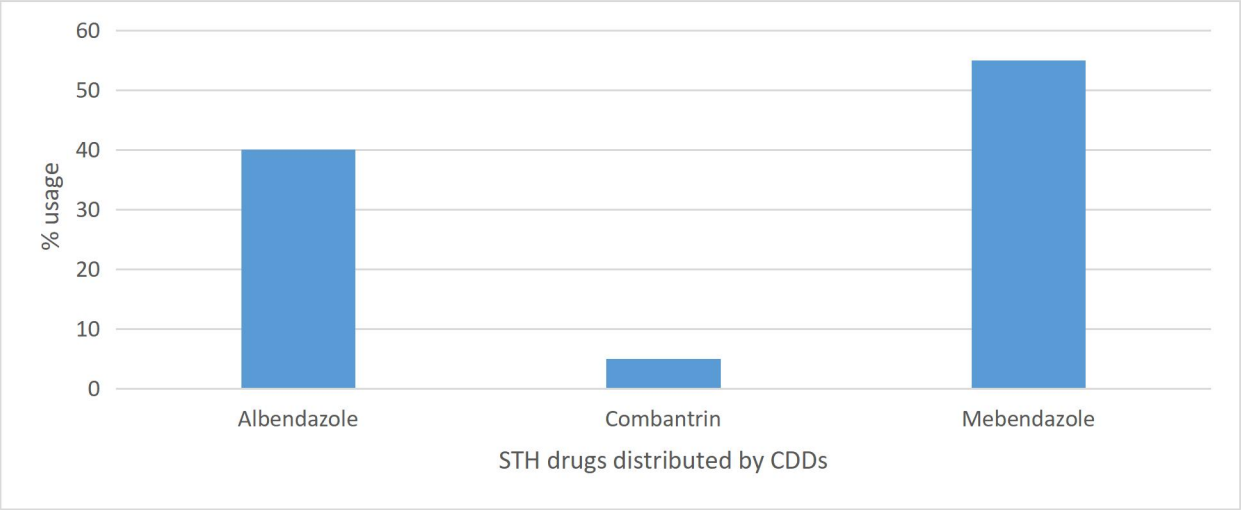


Figure 1: Anthelminthic drug distributed by the CDDs in the study area.

Figure 2 shows the frequency of anthelminthic drug distribution by the CDDs. Varying responses ranged from *'None'* (30.0 %), '*Less often*' (60.0 %) to '*Often*' (10.0 %). Last distribution by CDDs was in September 2024, with Albendazole supplied by the state government to all Primary Health Centers. '*Unavailability of anthelminthic drugs from the government*' was reported as a hindrance to the 2025 distribution. Some also added that '*few drug were supplied by philanthropists, but was not enough for all communities to benefit from*'. Other keynotes from the in-depth interview had public awareness for Mass Drug Administration through the town announcer (100 %); and Community engagements were mainly in schools, markets, churches (worship centers).

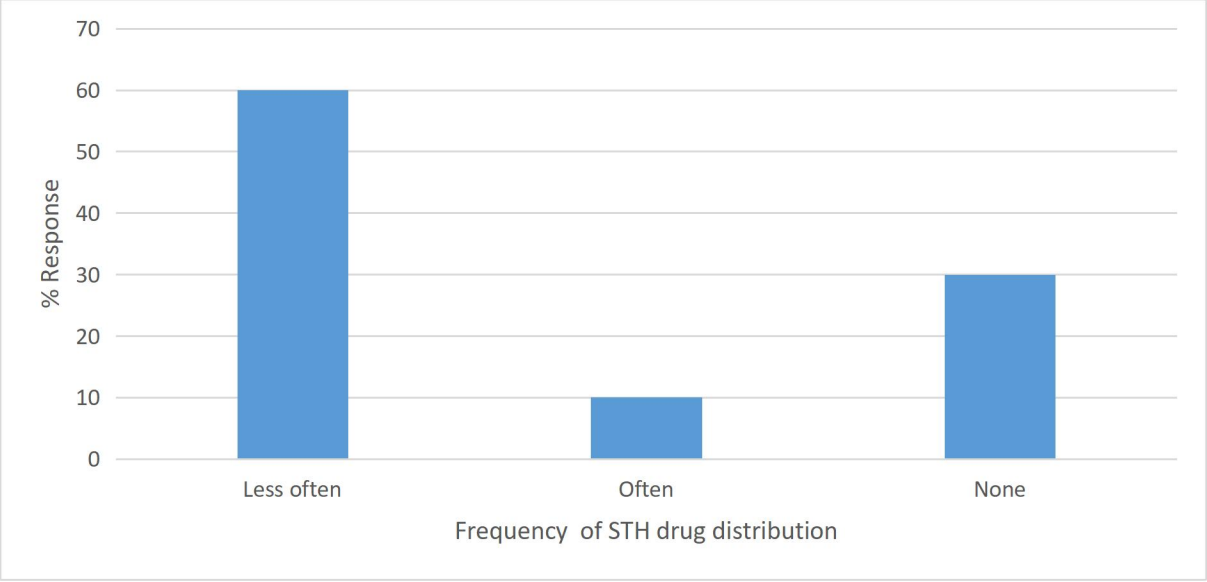


Figure 2: Frequency of anthelminthic drug distribution by the CDDs

Conditions of Some Wash Indicators in the Study Area

Conditions of the WASH indicators assessed in this study are shown in Table 2. All possible sources of drinking water: '*Brought from home*', Borehole and '*Bucket water in class*' are found among pupils in 'Igboezunu Uno'. Communal sharing from '*Bucket water in class*' is also found among pupils in 'Ivite Uno' and 'Enugwu na Eziagulu Uno'. Pupils from 'Ivite Otu', 'Igboezunu Otu' and 'Enugwu na Eziagulu Otu' utilized either of the following sources: '*Brought from home*' or Borehole.

Regarding the type of toilet use in school, '*Water closet*' only, was reported in 'Ivite Out' and 'Igboezunu Otu'. Reports from 'Enugwu na Eziagulu Otu' showed '*Water closet*' and / or VIP Pit toilets use. Open defecation was reported among pupils in 'Ivite Uno', 'Igboezunu Uno' and 'Enugwu na Eziagulu Uno'.

Hand washing facility was absent in 'Ivite Uno' and 'Igboezunu Uno'. In other sites (strata) studied, some schools had hand washing facility. Soap for hand wash was present in some schools found in only two sites: 'Igboezunu Otu' and 'Enugwu na Eziagulu Otu'.

Table 2: Condition of some WASH indicators in primary schools within the study area

Variables	Categories	Study sites / strata					
		Ivite Otu	Ivite Uno	Igboez unu Otu	Igboez unu Uno	Enugwu / Eziagulu Otu	Enugwu / Eziagulu Uno
Drinking water source for pupils	Brought from home	✓	-	✓	✓	✓	✓
	Borehole	✓	✓	✓	✓	✓	-
	Bucket water in class	-	✓	-	✓	-	✓
Type of toilet use in school	Water closet	✓	-	✓	-	✓	-
	Open defecation	-	✓	-	✓	-	✓
	VIP Pit	-	-	-	-	✓	-
Hand washing facility	Present	✓	-	✓	-	✓	✓
	Absent	✓	✓	✓	✓	✓	✓
Soap for hand Wash	Present	-	-	✓	-	✓	-
	Absent	✓	✓	✓	✓	✓	✓

Discussion

This study evaluated the CDDs activities and equally assessed the conditions of some WASH indicators in Aguleri, Anambra State, Nigeria.

Characteristics and Activities of Community Directed Distributors (CDDs) Regarding STH Control

The study revealed that CDDs in Aguleri are predominantly female (95.0%), relatively young (majority between 15–49 years), and primarily health workers (45.0%). This

profile reflects the community-based nature of CDD programs, which often rely on literate, trusted members of the community to deliver health interventions (Amazigo *et al*., 2021). However, the predominance of those with O-Level education (60.0%) suggests a limited level of formal health training, which could affect knowledge and communication about STH prevention beyond drug distribution.

Mebendazole (55.0%) and Albendazole (40.0%) were the most frequently distributed drugs, consistent with WHO-recommended regimens for preventive chemotherapy. The reliance on government supply, with occasional NGO/philanthropist contributions, is in line with the national deworming strategy but underscores the vulnerability of the program to stock-outs and irregular supply chains. This is evident in this study as '*Less often'* was reported by more than fifty percent (.> 50 %) of the CDDs in the question on '*Frequency of anthelminthic drug distribution*'. Unavailability of anthelminthic drugs from the government and limited drug supply by philanthropists were reported as a hindrance to continued and wider coverage distribution. Previous studies in Nigeria (Aribodor *et al*., 2025; Egbuche *et al*., 2025) have similarly opined supply inconsistency as a barrier to achieving WHO's target of ≥75% coverage.

Despite these challenges, CDDs remain a vital mechanism for extending health services to hard-to-reach areas such as 'Aguleri Otu' ('Ivite Out', 'Igboezunu Otu' and 'Enugu na Eziagulu Otu' Aguleri). Traditional town announcer is still much used in disseminating information concerning ongoing drug distribution; and community members are normally mobilized in schools, markets, churches (worship centers). Findings from this study showcased integration of CDDs in the community health delivery, and aligns with their role which is to mobilize households and maintain treatment coverage where formal health facilities are either absent or far from households and farm settlements. However, issues such as lack of incentives, weak supervision, and inadequate training may reduce motivation and performance. This observation agrees with Chami *et al*. (2019), who found that CDD effectiveness is significantly influenced by program support and community trust.

Aside Mass Drug Administration through the CDDs, WASH practices which was also investigated are suboptimal and uneven within and across the study sites. Although some pupils had access to borehole water and brought water from home, reliance on communal bucket water in classrooms—observed in 'Ivite Uno', 'Igboezunu Uno,' and 'Enugwu na Eziagulu Uno' poses a high risk of fecal-oral route of transmission, required for *A. lumbricoides* infection, due to possible contamination during use. This finding aligns with previous studies in Anambra State (Ukibe *et al*., 2018; Nwankwo *et al*., 2021), which reported similar risks from communal water use and poor hygiene practices. In terms of sanitation, open defecation was still practiced in some schools within 'Ivite Uno', 'Igboezunu Uno', and 'Enugwu na Eziagulu Uno', reflecting the persistence of poor sanitation practices in both rural and urban communities. These findings agree with WHO (2022) reports that open defecation remains a major driver of STH transmission in endemic areas, particularly in Sub-Saharan Africa. The absence of hand washing facilities in some schools within 'Ivite Uno' and 'Igboezunu Uno', and the very limited use of soap for hand washing (reported only in 'Igboezunu Otu' and 'Enugwu na Eziagulu Otu'), highlight critical hygiene gaps. Hand hygiene is one of the most effective measures against STH transmission (Chopra *et al*., 2022), yet this study demonstrates that the infrastructure and practices remain inadequate. The variation between sites (strata) suggests that WASH access is influenced by local resource availability and school-level

infrastructure, emphasizing the need for uniform interventions.

These results suggest that persistent infection and reinfection after deworming is likely in Aguleri, since the environmental and behavioral conditions that sustain STH transmission: collection of drinking water from central bucket, poor sanitation, open defecation, and limited hand washing with soap forms a mosaic across the study strata. This indicates that risk of exposure to STH infection would be uniformly distributed, and high within Aguleri. This observation aligns with findings by Egbuche *et al*. (2024), who reported a widespread, but non-significant spatial variation, in STH infection prevalence among school-aged children in seven schools within Mgbakwu, Awka North LGA, Anambra State. Studies such as those by Karshima (2018) and Yaro *et al.,* (2018) noted similar patterns of non-significant variation in disease distribution within closely linked communities, emphasizing the importance of implementing area-wide deworming and sanitation interventions rather than targeting only perceived high-prevalence zones. Added to the opinion just mentioned above is WHO (2017) position that MDA alone cannot achieve sustained control without parallel WASH improvements.

Conclusion

This study showed that while CDDs remain vital for delivering deworming medicines in Aguleri, their effectiveness is limited by low and / or irregular drug supply. It equally established gaps in WASH facilities and practices. Findings from this study will help to tailor interventions (Mass drug administration and WASH facilities / practices) to hotspots where they are lacking or inadequate, rather than applying uniform strategies in a given area. It is recommended that Community Drug Distribution be Strengthened and integrated with WASH education in the study area, as they are essential for sustaining high treatment coverage and reducing reinfection of STH, specifically of *A. lumbricoides* origin.

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