



Household caregivers' knowledge and control of helminthiasis in preschool children in a rural community of Enugu state, Nigeria

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Abstract

Helminthiasis causes iron deficiency anemia, pica, growth, and mental retardation in children. Deworming exercises are being included as part of various interventional programs to reduce the disease burden. However, the success or failure of such activities in terms of household caregivers' knowledge and practice of deworming is not usually adequately evaluated, thus this study. This was a cross-sectional descriptive study carried out in the rural community of Enugu State, Nigeria. Pretested semi-structured interviewer-administered questionnaire was used. Inferential statistics, χ^2 test, and *t*-test were also used in the analysis for categorical and continuous variables, respectively. A total of 294 preschool children and 250 caregivers were studied. Among the caregivers, 212 (71.9%) had good knowledge and 149 (50.5%) had good practice of deworming. There was a statistically significant association between the age of respondents and knowledge score ($\chi^2 = 6.471, p = 0.039$) and between the educational level of respondents and practice score ($\chi^2 = 30.632, p < 0.001$). Most respondents in the rural community had a good knowledge of worm infestation and only half had good practice of deworming. Also, there was a significant difference between the age of respondents and knowledge of

helminthiasis and between the educational level of respondents and deworming activities of respondents.

KEYWORDS

caregivers, deworming, helminthiasis, household caregivers' knowledge, preschool children, rural

1 | INTRODUCTION

Helminthiasis is one of the neglected tropical diseases (Ohuche et al., 2020). It has plagued humans for centuries with over one billion people living in developing regions of sub-Saharan Africa, Asia, and the Southern Americas (World Health Organization, 2020). Infestation with helminths results in health problems, such as iron deficiency anemia, growth retardation, and lack of concentration. School-age children (including adolescents) and preschool children harbor some of the most intense infections. In attempts to reduce the seemingly high burden of soil-transmitted intestinal helminthiasis (STH) among preschool and school-aged children in Nigeria, a lot of deworming exercises were included as part of various interventional programs like Maternal, Newborn, and Child Health Week as well as National Immunization Plus Days.

To highlight the importance of the control of helminthic infestation in children, some studies have been done on the knowledge of mothers on the effects of helminthiasis in their children. The lack or reduced level of knowledge among the caregivers about the STH infestation, its prevalence, and prevention tends to contribute to high STH prevalence among preschool and school children in rural areas (Socolo-Gwebu et al., 2019). In a study done in rural communities of China, it was found that lack of awareness and skepticism about STH, together with local myths about STH and deworming treatment, were among the major reasons for high STH prevalence in these communities (Lu et al., 2015). Another study done in rural Malaysia advocated a great need for a proper health education program and community mobilization to enhance prevention and instill better knowledge of STH transmission and prevention having revealed inadequate knowledge, attitude, and practices on STH infestations among caregivers in the rural communities of Malaysia (Nasri et al., 2013). In a study in Ethiopia, mothers of under-five children were found to have fairly good knowledge of the impact of infestations but limited knowledge of the mode of transmission of intestinal parasitic infestations (Nyantekyi et al. 2011). Lack of awareness about the mode of transmission of soil STH infestations increases the risk of infection (Ojja et al., 2018).

Furthermore, a study in Nigeria also showed a low level of knowledge, practice, and perception of mothers concerning STH and considered it a major cause of worry that required urgent consideration to periodically treat infested children. It proffered enlightening the caregivers about the mode of transmission as a means of reducing the rate of transmission (Oyebamiji et al., 2018). A better understanding of how social, cultural, behavioral, and community awareness affect the epidemiology and control of intestinal parasites may help to design effective control strategies of these diseases (Nyantekyi et al. 2014). Thus, understanding of knowledge, attitudes, and practices regarding STH in a community is critical for effective and sustainable prevention and control initiatives. In view of the above, this study assesses the knowledge and practice of household caregivers of preschool children in rural areas of Enugu State as regards helminthiasis and its prevention.

2 | METHODOLOGY

2.1 | Ethical issues

Before commencing this study ethical approval was sought and got from the Health Research and Ethics Committee of the University of Nigeria Teaching Hospital Ituku-Ozalla Enugu. Approval was also sought and obtained from the

Enugu State Ministry of Education and Parent Teachers Association of each selected preschool child. Written consent was obtained from the Caregiver of each eligible child before enrollment. All obtained information was treated as confidential. Data were treated with anonymity and the data collection instrument did not require the names of the children but serially labeled as they were being enrolled.

2.2 | Design

It was a cross-sectional descriptive study.

2.3 | Study area and participants

The study was carried out at Obinofia Ndi-Uno in the Ezeagu Local Government Area (LGA) of Enugu State. A total of 294 preschool children and 250 parents/caregivers participated in the study out of a calculated 600 giving a response rate of 98%. Preschool children (aged 2–5 years) who attend kindergarten and nursery schools together with their caregivers formed the study population. Participants were included in this study using the following criteria: caregivers with children aged 2–5 years who gave consent, children who had not taken anthelmintic in the past 3 months, caregivers with children that had not been involved in anthelmintic in the past 3 months, and children and their caregivers who did not meet up with the stated inclusion criteria were excluded. The formula for calculating the minimum sample size in a cross-sectional study (Onwasigwe, 2010) was used to obtain a representative sample size of 300. A multistage approach was used to select the participants.

Stage 1: All the LGAs in Enugu State were grouped into rural and urban LGAs.

The rural LGAs were listed alphabetically, and Ezeagu LGA was selected through a simple random sampling method by balloting.

Stage 2: All the towns in Ezeagu LGA were listed and Obinofia Ndi-Uno was selected using a simple random technique.

Stage 3: A list of all the nursery schools was obtained in the selected town and five schools were selected from the town using a simple random technique. Sixty children were selected from each of the five selected schools using a simple random technique. The class register was used where their names were listed alphabetically and all the children who met the inclusion criteria were selected in succession till the sample size was reached. Where the number of children is less than 60 in any school the remaining numbers were completed from another selected school.

Stage 4: All the caregivers (i.e., the parent or any other person who majorly helps in taking care of these preschool children) of the selected children were enrolled as well.

Pretested, semi-structured interviewer-administered questionnaires were used.

2.4 | Survey instruments

Helminthiasis Knowledge and Practice Questionnaires: It was developed by the researchers. Interviewer administered to the selected children's caregivers to obtain data on demographic, socioeconomic, knowledge, and practice of household caregivers as well as associated factors in the transmission of STH in preschool children.

Worm Infestation Checklist (WIC): It was developed by the researchers to inspect the compound looking out for the type of sewage and waste disposal, condition of the structure and sanitary nature, adequacy in terms of number, and separate for gender. It also aimed at inspecting the water supply and liquid soap for washing hands after using the toilets or urinals, hand towels for cleaning hands, surroundings of the entire compound, and whether or not they wear shoes, especially when engaged in agricultural activities. WIC has 13 items with three different response

options. Out of the 13 items, six items have 3 Likert scale, six items have 2 Likert scale, and one item has 1 Likert scale.

2.5 | Field work

Advocacy visits to relevant authorities and groups were made, with permission obtained as well recruitment of research assistants carried out. We trained eight postgraduate students who served as research assistants (interviewers) to aid the administration of the questionnaire. The questionnaires were administered to the parents/caregivers during the PTA meeting, and those who were unable to attend the meeting were interviewed at their homes. Research assistants also aided in collating the questionnaires after the questionnaires were tested for validation in one of the other schools, far apart from all the selected schools, and some corrections and additions were made before the collection of data proper. Having certified that the instruments were good enough for the study, the pretested questionnaire administered to the caregivers of the selected children after obtaining informed consent was used to get demographic, socioeconomic, and health-related behavior data.

Data were analyzed using the IBM SPSS statistics version 19. Inferential statistics, χ^2 test, and *t*-test were also used in the analysis for categorical and continuous variables, respectively. All analysis was at a 95% confidence interval while the *p*-value was 0.05 level of significance.

2.6 | Knowledge score

The questionnaire covered each relevant aspect of the epidemiology of helminthiasis. Each correct answer was scored 1 while the wrong answer was scored 0. Knowledge score was obtained from total correct options divided by the total possible correct options. The result is then multiplied by 100% to obtain the knowledge score in percentage.

2.7 | Practice score

There are five practice questions with correct answers coded as 1. These were computed to get a percentage value, which was recoded into two categories <50% as poor and \geq 50% as good. Thereafter good and poor were used for further analysis.

3 | RESULTS

Table 1 shows the sociodemographic information of the school children that participated in the study. Age distribution of the children showed that over half of pupils in the study were of age range 4–5 years. The average age of the pupil was 3.69 ± 1.09 . Females were more than males according to the sex distribution.

The mean age of the caregivers was 33.46 ± 7.73 years. About 67% of the caregivers were female. The majority attained at least primary education and married with no occupational predominance among them. The majority of the caregivers, 193 (77.0%), used nonsanitary methods of sewage disposal like bush (open defecation), bucket, and so forth in their homes (Tables 2–5).

A total of 207 (70.2%) of the children in the study washed their hands with soap always after using the toilet. The majority of the caregivers have heard of worm infestation, 280 (95.2%). Also, 126 (44.5%) of the caregivers in the study knew that the pupil infested with worms eat without gaining weight. Similarly, 127 (43.1%) of the caregivers in the study knew that worms can be contracted by contaminated hand to mouth while 184 (63.7%) of

TABLE 1 Sociodemographic characteristics of the pupils

Sociodemographic characteristics	Study group (n = 294) freq. (%)
Sex	
Male	119 (40.4)
Female	175 (59.6)
Age in years	
Mean (SD)	3.69 (1.09)
Children who always washed their hands with soap after using the toilet	
Yes	206 (70.2)
No	88 (29.8)
Children who always played and walked around outside without footwears	
Yes	94 (32.1)
No	200 (67.9)

them attributed it to eating sweet-tasting food, such as bananas. Furthermore, 214 (76.7%) of the caregivers in the study have been practicing deworming. Moreover, 212 (71.9%) of them had good knowledge, while 149 (50.5%) of the caregivers in the study had good practice of deworming.

4 | DISCUSSION

The majority of the caregivers were aged between 26 and 45 years, with their mean ages being 33.46 years. Two-thirds of the caregivers were female. This is as expected since it is a general belief that mothers are closer to the children, overseeing their general wellbeing. More than 95% of the caregivers in the study acquired formal education, majorly up to secondary education. The literacy level among the parents was good compared with the Nigerian national average for adults aged 15–24 years and above (65% for females and 78% for males; Jombo et al., 2007). There was no obvious occupational predominance among the caregivers, though farmers, traders, and artisans appeared higher with 38.0%, 25.1%, and 23.4%, respectively. Predictably, there are no government establishments, factories/industries, nor agencies where they can work to earn their living. Hence most resort to subsistence farming and petty trading.

Intestinal infestation depends on the hygiene and sanitation of people involved: water contamination, health education status, and so forth. In this study, 47.5% of the caregivers used the bush method and 23.4% used the pit latrine method, both are nonsanitary means of sewage disposal, while 23% of them used a water closet, which is hygienic. Conversely, a study in Egypt showed that 81.0% of the caregivers used the ordinary toilet and 19.0% used the modern toilet (Naglaa et al., 2014). In terms of water supply, it was noted that more respondents used bore-hole (32.6%) followed by hand-dug well (26.5%) and stream (25.8%). The proportion is good for a typical rural setting in Nigeria owing to the dominance of hand-dug wells and boreholes as alternate sources of water supply. Nevertheless, a similar study was done on intestinal parasitism, potable water availability, and methods of sewage disposal in three communities in Benue State, Nigeria. It can be noted that environmental sanitation and hygienic practices were associated with the incidence of intestinal infestations, improved water supply, as well as adequate use of toilet facilities that contributed to the reduction of intestinal infestations (Jombo et al., 2007).

Our study observed that over 95% of caregivers have heard of worm infestation. This is in keeping with findings from studies on the healthcare program for soil-transmitted helminthiasis done among school children along the Mekong River Basin, which showed that the caregivers had fair levels of knowledge regarding

TABLE 2 Demographic variables of caregivers' of pupils

Sociodemographic characteristics	Study group (n = 250) freq. (%)
Age group (years)	
≤25	19 (7.5)
26–35	134 (53.6)
36–45	81 (32.5)
46 And above	16 (6.4)
Mean age (SD)	33.46 (7.73)
Sex	
Male	75 (29.8)
Female	175 (70.2)
Education level	
No formal education	7 (2.7)
Primary	106 (42.4)
Secondary	109 (43.4)
Tertiary	28 (11.5)
Occupation	
Farmer	95 (38.0)
Artisan	59 (23.4)
Trader	63 (25.1)
Civil/public servant	24 (9.8)
Others	9 (3.7)
Marital status	
Married	170 (67.9)
Others (single, widow, widower)	80 (32.1)
Relationship to the child	
Father	61 (24.4)
Mother	161 (64.4)
Caretaker	13 (5.4)
Other (sibling, cousin, neighbor)	15 (5.8)

soil-transmitted helminthiasis (Kaewpitoon et al., 2015). A similar study on an effective control program of soil-transmitted helminth infestations among Orang Asli in rural Malaysia also reported that 61.4% of the caregivers who were interviewed had prior knowledge about intestinal helminths with a lack of knowledge of the transmission (28.8%), signs and symptoms (29.3%), and prevention (16.3%). Half of the respondents considered STH as harmful (Nasa, 2013). Conversely, it was found in a study in Egypt that only 24.0% of the caregivers knew about intestinal infestation and 40.0% of the caregivers did not know any symptom of the worm infestation (Naglaa et al., 2014).

Less than half (44.5%) of the caregivers in this study group knew that the pupil infested with worm eat without gaining weight while 42.0% of them knew that abdominal discomfort is a feature of intestinal helminthiasis. Most of them also had

TABLE 3 Sociodemographic and environmental characteristics of the caregivers

Sociodemographic characteristics	Study group (n = 250) freq. (%)
Sewage disposal method	
Sanitary (water closet)	57 (23.0)
Nonsanitary (bush, bucket, pit, flowing stream)	193 (77.0)
Source of water supply	
Pipe-borne water	19 (7.6)
Borehole	82 (32.6)
Hand-dug well	66 (26.5)
Stream	64 (25.7)
Tankers	19 (7.6)

TABLE 4 Caregivers' knowledge, source of worm infestation, and prevention

Variables	Response (n = 250) correct freq. (%)
Ever heard of worm infestation	238 (95.2)
Features of worm infestation	
Abdominal discomfort/pain	105 (42.0)
Eating without gaining weight	111 (44.5)
Diarrhea	61 (24.2)
Coughing	17 (6.8)
Rashes	8 (3.2)
Mode of transmission	
Drinking water	181 (72.2)
Flies that perch on food	218 (87.0)
Eating sweet food, e.g., banana	159 (63.7)
Contaminated hand to mouth	108 (43.1)
From bad air	13 (5.2)
Ways of prevention	
Washing food items properly, especially ones taken raw	93 (37.1)
Washing hands after defecating	138 (55.2)
Covering food properly	213 (85.1)
By washing your hands after cleaning a child who has just defecated	155 (61.8)
Others	34 (13.6)

Note: Greater numbers of the caregivers in the study, 180 (71.9%), have poor mean knowledge grade score of deworming.

TABLE 5 Assessment of their caregivers' practice of deworming

Variables	Response	
	Frequency (n = 250)	%
Those that have been practicing deworming		
Yes	192 (76.7)	76.7
No	58 (23.3)	23.3
If yes, frequency of deworming		
More than once yearly	83	43.4
Once yearly	90	47.0
Over 1 year	19	9.6
A most important reason for caregivers not practicing deworming in the study group		
	N = 58	Freq (%)
Never deemed it necessary as my children are not infected	20	35.1
Cost of the drugs	34	57.9
Cannot see the drugs to buy	0	0
Tried it and my child had a problem after the drug	2	3.5
Others	2	3.5

poor knowledge of other features of worm infestation, including, diarrhea, rashes, and cough. However, a study done on environmental sanitation, hygienic practices, and the prevalence of intestinal parasites recorded that most worm-infested children reported cough as a symptom, (92.3%), manifested abdominal pain (61.54%), and had body mass index below the normal range (30.77%) based on the Philippine body mass index standards (Abordo et al. 2010). Some of the caregivers in the present study had poor knowledge of the mode of transmission of worms with 43.1% of them knowing that worms can be contracted by contaminated hand to mouth. Quite a sizeable number, 33.2% of them, believed that the worm is transmitted through eating sweet food like bananas. The study done in Egypt on knowledge and practice of caregivers about intestinal parasitic infestations at EL-Minia City revealed that 84.0% of the caregivers did not know any mode of transmission, 14.0% knew feco-oral transmission, and also the same number were aware of flies and 29.0% knew that it was transmitted through contaminated food (Naglaa et al., 2014). These results further agree with other findings from a study on soil-transmitted helminths and other intestinal parasitic infestations among school children in indigenous people communities in Davao del Norte, Philippines where it was found that poor food handling hygienic measures, presence of flies, feco-oral route, and contaminated water encouraged and increased the mode of transmission of parasitic infestation (Belizario et al., 2011). A similar study conducted on *Ascaris* and ascariasis microbes infestation indicated that *Ascaris lumbricoides* is transmitted by the feco-oral route and infests school children (Dold & Holland, 2011).

In the same vein, another study on parasitic etiology of blood hypereosinophilia noticed that caregivers should wash their hands thoroughly after a bowel movement or changing a diaper and before eating to reduce the risk of getting or spreading worm infestation (Anane, 2006). A study on prevalence, risk factors, and impacts of schistosomal and intestinal parasitic infestations among rural school children in Sohag Governorate of Egypt recorded that hands and bedsheets contamination can cause auto infections, and assist in the secondary transmission of infestation among the caregivers for school children in rural areas (El-Masry et al., 2011).

In this study, caregivers were found to have a fairly correct knowledge of ways to prevent worm infestation except that a good number of them (64%) did not know that worm infestation can be prevented to a great extent by the washing of hands after cleaning a child who had just defecated (El-Masry et al., 2011). Also, 55.2% of the

caregivers in the current study knew that worm infestation can be prevented by the washing of hands after defecating. A study done in Egypt illustrated that 27.0% of the caregivers did not know any method of prevention (Naglaa et al., 2014). Another study found out that handwashing with soap may be one of the most cost-effective means of preventing intestinal infestations in developing countries (Fung & Cairncross, 2009).

Over two-thirds of caregivers in this study have been practicing deworming. This finding is in line with the report from a similar study, which showed that more than half of the caregivers (57.0%) give medication when their children are infected with worms. However, 26.6% of the caregivers in this study among those aware of deworming did not practice deworming. Among those practicing deworming, it was found that more than two-thirds deworm at least once yearly, which is good. Among the caregivers who knew of deworming but have not been practicing it, 35.1% of them never deemed it necessary as they believed their children were not infected. This study was equally reported in a similar study that 21.8% of the caregivers were not practicing deworming due to socioeconomic causes and 78.2.0% of the caregivers were not also practice it due to reinfestation (Naglaa et al., 2014).

There is a fairly good practice of giving drugs by caregivers in this study group (81.1%). However, the mean knowledge 6.07 and mean practice 2.36 in the study by the caregivers translates to better knowledge with poorer practice. This agrees with findings in another study, which stated that despite fairly good knowledge exhibited by the caregivers (61.4%) practices remained inadequate.

4.1 | Conclusions and recommendations

Most of the caregivers had good knowledge of worm infestation and deworming, fair knowledge of features of worm infestation, and poor knowledge of the mode of transmission. Equally, they have a fairly good knowledge of ways to prevent worm infestation. A very high proportion has been practicing deworming correctly. The main reason for not practicing deworming was that the caregivers never deemed it necessary as they believed their children were not infected and also because of the cost of the drugs. To improve the nutritional status and ultimately wellbeing of children in schools, the following recommendations are made:

1. Caregivers should be given health education, especially on STH and its prevention and control. This can be done during regular Parents Teachers Association (PTA) meetings in which health workers should be invited to discuss a disease endemic in the area, especially the ones affecting the pupils like worm infestation.
2. Deworming of children should be complemented with the health education of the pupil and caregivers, as it brings about better knowledge and practice on worm infestation, prevention, and control.
3. Enlightenment programs should be embarked on to create awareness on the ravaging effect of worm infestation, ages infected, need for regular deworming, and general nutrition of the children.

4.2 | Limitations

Getting the parents to fill their questionnaires as some did not attend the PTA meetings. The fact that the parents were mostly farmers and petty traders, getting them in their homes was a bit difficult. Children that were excluded from the study could affect the true prevalence. To overcome the constraints, we suggest the following: trained interviewers from the communities to be recruited; wide publicity for the PTA meeting to be done using the pupils and churches; visiting the parents at an odd time, for example, early hours before they went out for the day, late evenings when they have returned, local market days, and even on Sundays.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

Data are available from the corresponding author upon reasonable request.

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