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A comparative study on the prevalence of intestinal helminths in dewormed and non-dewormed healthy persons in Ghana

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Abstract

Introduction: Helminthic infection is a significant public health concern in most developing countries. This study determined the prevalence of intestinal helminths in dewormed and non-dewormed health persons in Ghana.

Methods: A cross-sectional descriptive study was conducted from January, 2021 to August, 2021. A total of 336 students and adult participants within the Accra metropolis were recruited after informed consent was obtained. Structured questionnaires were used to collect data on socio-demographics and factors influencing the use of anthelminthic drugs. Additionally, stool samples were obtained and analyzed by standard microbiological methods.

Results: Out of 336 participants, 44.0% (148) reported to have acquired anthelminthic drugs as a regular deworming activity. While 22.0% (74) was due to nausea, 1.5% of the participants purchased the drug because it was prescribed to them by a health officer. Out of the 336 participants, 128 (38.1%) submitted their stool samples for analysis, of these, 59.7% were positive for Strongyloides stercoralis, followed by Ascaris lumbricoides (38.8%) and hookworm (1.5%). Participants who reported to have dewormed over a year had the highest prevalence of Strongyloides stercoralis (43.8%), followed by less than six months (35.0%), and over six months (20.0%).

Conclusion: Inappropriate and indiscriminate deworming can contribute to resistance to anthelminthic drugs. Therefore, the need for continuous education on deworming with more emphasis on personal hygiene, adequate sanitation, and use of potable water will aid in the control of helminthiasis.

Keywords: Anthelminthic drugs; Strongyloides stercoralis; Ascaris lumbricoides; hookworm; Ghana.

Introduction

Helminthes are a diverse group of parasitic worms, encompassing nematodes, cestodes, and trematodes that constitute a significant health problem in humans and animals in many parts of the world [1,2]. Globally, more than 1.5 billion of the world's population are infected with soil-transmitted helminthes [3]. Helminthiases are widely distributed in tropical and subtropical areas, with the greatest burden occurring in Sub-Saharan Africa, the Americas, China, and East Asia [3]. Helminthiasis can lead to malnutrition, organ damage, and internal bleeding [4,5].

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In 2019, helminthic infections accounted for 1.97 million disability-adjusted life years, of which 12% of the total disease burden was attributed to neglected transmitted diseases (NTDs) [2-5]. To mitigate and tackle the global helminthiasis-attributable morbidity, the World Health Organization (WHO) recommends mass drug administration (MDA) for helminthiasis twice yearly in high-risk communities (prevalence>50%) and annually in moderate-risk communities (prevalence 20–50%) [6]. Longer-term control measures include improved access to potable water and sanitation as well as behavioral changes in personal and community hygiene, including hand washes with soap with avoidance and safe disposal of human waste [7,8].

The World Health Organization (W.H.O) has prescribed a list of anthelminthics including albendazole, mebendazole, and praziquantel, which are effective in deworming [6,9]. However, indiscriminate and inappropriate usage of these drugs without prescription can lead to under-dosing or over-dosing [10] and eventually contribute to an increase in the prevalence of anthelmintic resistance in worm populations that were previously sensitive to these anthelmintic drugs [11]. The government of Ghana in collaboration with the Ministry of Health and the Ghana Education Service have proposed several measures such as deworming school aged children and also deworming of pregnant women [12]. These measures were instituted to curb the rate of helminthiasis in Ghana. However, despite the implementation of these mitigating measures, helminthiases infection is still prevalent in Ghana. Therefore, this study aimed to determine influencing factors for acquisition of anthelmintic drugs among adults in Accra, and evaluated the prevalence of helminthic infections among dewormed and non-dewormed health adults in Ghana,

Material and Methods

Study design

Sample collection and processing: This was a cross-sectional descriptive study conducted from January, 2021 to August, 2021. An approximated sample size of 336 was calculated using the formula N=Z2 P (1−P)/D2 where; N = sample size; Z=98% confidence interval; P = previously reported prevalence of anthelminthic among adults in Ghana (19.3%) [13] and D = allowable margin error of 0.05.

A total of 336 randomly selected adults and (over 18 years) in Accra metropolis were recruited into this study after informed consent was obtained.

Study setting and population: The study was conducted in the Accra metropolis (Korle-Bu environment) and involved adults attended tertiary institutions or inhabiting Korle-Bu environment in the Accra metropolis. The study site was also selected due to the proximity to the School of Biomedical and Allied Health Sciences, University of Ghana Microbiology Laboratory. This helped reduce transportation time and therefore enhanced the preservation of worms, ova, and cysts or helminths that may be present in the stool samples.

Sample collection: Upon receipt of signed consent forms from participants, a self-administered structural questionnaire was used to gather information on socio-demographic characteristics and factors influencing the use of anthelminthics (Appendix 1). Additionally, participants were given clean wide mouth containers and instructed on how to provide stool samples without urine. Stool samples received were immediately transported on an ice chest to the microbiology laboratory for analysis.

Specimen processing and analysis

In the laboratory, stool samples were examined macroscopically for colour, consistency, presence of blood, mucus, pus, and large worms [14]. This was done with information on the type of parasitic infections that might be present. Consistency of the stool samples were also checked to determine whether there was any diarrheic stool or stools with unusual consistency. Stool samples were then fixed with 10% formalin. The parasites were examined by direct wet mount and formol-ether concentration as described by Demeke et al. [14].

Briefly, for the direct wet mount, a drop of the emulsified stool samples was transferred onto both ends of a glass slide, a drop of Lugol's iodine was added to one drop, leaving the other sample drop unstained. The samples on the slides were covered with a cover slip and examined first by a 10x objective lens, and then by 40x for detailed identification of intestinal parasites.

The remaining stool was formol ether concentrated by emulsifying approximately 1 gm with 3 ml of 10% formol saline in a test tube [14]. The emulsified sample was poured into another test tube over a layer of gauze and then 4 mls of diethyl ether was added to the filtrate from the stools. An additional 3 mls of 10% formol saline was added to the filtrates to reach the 10mls mark and this was mixed by inverting and shaking intermittently for 1 min. The preparation was then centrifuged at 5000 x g for 5 min. After centrifugation, the supernatant containing the debris, ether and formol saline was discarded and the sediment containing the parasites was resuspended in 1ml formol saline. Four slides were prepared for each concentrated sample. Two of the slides were prepared and one slide was observed directly unstained and the other stained with iodine.

Data analysis

Data was documented using Microsoft® Excel and cleaned before being analyzed with IBM® SPSS. The Independent-median test was used to analyze the difference between age groups. Categorical variables such as age group, gender, preference of prescription, last time dewormed, and their association with the presence of various helminths was analysed using Chi-square test, and the independent sample Kruskal-Wallis test. The Shapiro-Wilk test was used to test for the normality of continuous data. For all analyses performed, a p-value of less than 0.05 was considered statistically significant.

Results

Socio-demographic characteristics and factors influencing anthelminthic drug acquisition

In this study, out of 336 participants, 186 (55.4%) were males and 150 (44.6%) were females (Table 1). The age range 18-26 years (87.5%) recorded the highest count of participants while the over 54 years (1.5%) recorded the lowest count of participants. The overall mean age was 23.6 ± 0.4 years (mean ± Standard Error), while the median was 22.0 years.

In this study, out of 336 participants, 131 (39.0%) had dewormed less than six months prior to the study, 91 (27.1%) over six months, 112 (33.3%) over a year and 2 participants (0.6%) did not remember when they last dewormed (Table 1). One hundred and forty-eight (44.0%) participants reported they dewormed because it was a regular process, 68 (20.2%) was due to body itch, 34 (10.1%) dewormed because they felt nauseous, and 74 (22.0%) participants dewormed because they had changes in diet. Six (1.8%) participants did not remember the reason they took a dewormer and 5 (1.5%) participants took the dewormer because it was prescribed by a health officer.

Most of the female [48.6% (73/150)] respondents dewormed over 6 months, and 50.6 % (76/150) dewormed less than six months prior to the study. In males however, 69.9% (130/186) dewormed over 6 months and 29.6% (55/186) had dewormed in less than 6 months. There was a significant difference between the different sexes and various categories of last time dewormed ($\chi2$ =18.869, $p<0.001$).

Prevalence of Helminthic parasites and frequency of deworming

A total of 90 out of the 336 respondents (26.79%) were positive for at least a single helminth (Table 2). Among the different ages, the most infected was 18-26 years (21.1%). However, low prevalence was detected in age groups 27 - 35 (1.8%), 36 - 44 (1.5%), 45-53 (1.2%), and over 53 (1.2%) years. The highest single occurring helminth infection was Strongyloides stercoralis [41.1% (37/90)], and A. lumbricoides [11.1% (10/90)] in participants who claimed to have dewormed in less than 6 months prior to the study. Co-infection with S. stercoralis and A. lumbricoides was detected in 44% (40/90) of the respondent and 2 (2.2%) respondents had co-infection with two helminths.

Infected respondents with S. stercoralis and A. lumbricoides was widely distributed from 18 years to 56 years (Figure 1). The respondents with two co-infections were concentrated within 18-30 years, while coinfection with three helminths was observed between 18-34 years. Overall, in relation to the helminth status, respondents who had not dewormed for more than 12 months recorded the highest positive cases for the presence of helminths [28.91% (37)]. Participants who had dewormed in less than 6 months, and those between 6 months and 12 months also recorded a rate of 24.22% (31) and 16.41% (21) respectively. The difference in helminth status across the various categories of the last time respondents dewormed was however not statistically significant ($\chi2$ =7.09, $p<0.052$). The highest prevalence of Strongyloides stercoralis (43.8%) infection was detected in respondents who had dewormed over a year, followed by less than six months (35.0%), and over six months (20.0%). The highest prevalence of Ascaris lumbricoides was recorded in participants who dewormed less than six months (38.5%) and over six months (38.5%).

Discussion

In this present study, the prevalence of helminthiases, the use of anthelminthic drugs, and the effect of consumption of anthelminthic drugs on the prevalence of helminthic infections amongst adults in Accra was evaluated. Previous studies have tackled intestinal parasitism in Ghanaian children [13,15,16]; however, this is the first study to comparatively investigate the prevalence of intestinal helminthes in dewormed and non-dewormed health adults in a study population in Accra, Ghana. The overall prevalence rate of helminthiasis was 26.79% (90/336) which is similar to the 27.7% prevalence reported in Southern Ethiopia [17]. However, the results are higher than the 19.5% and 18.3 % reported in Eastern Cote de' Ivoire and Sierra Leone, respectively [18,19], but lower than the 75.6% reported in Pradesh, India [20]. According to de Silva [3], the intensity of helminthiases increases with age, and this suggests that deworming programs should be extended to all individuals regardless of their age group. Majority of free deworming programs carried out in sub-Saharan countries are targeted at school-aged children [15,16,27]. This study findings have shown that deworming should not be for only school-aged children but rather for all age groups.

In this study, co-infection was observed in 47.8% (43/90) of the participants. This finding is similar to the 45.4% reported in Ethiopia and Cambodia, respectively [22,23]. The prevalent helminth detected in this study was Strongyloides stercoralis (62.5%), and this finding is similar to the 59% prevalence reported in Australia [24]. However, it is lower than the 76% prevalence reported in Argentina [25], but higher than the 16.3% and 23.7% prevalence reported in India and Thailand, respectively [20,27]. According to Aramendia et al., [17], Strongyloides stercoralis infection is more prevalent in adults than children. The least prevalent parasitic infection observed in this study was hookworm (1.6%). This study finding is lower than the 4.5%, 8.7%, and 22.6% prevalence documented earlier in Ghana, Nigeria, and India [11,20,27]. In this study, a prevalence of 38.8% was detected for Ascaris lumbricoides. This finding is lower than the 28.5% recorded in Nigeria [28]. However, a higher Ascaris lumbricoides prevalence of 69.6% was reported in India [20]. This variation in prevalence may be due to the level of sanitation, presence of potable water, personal and community hygiene as well as means of human waste disposal in the study settings [7].

In the present study, 44.0% of the participants dewormed regularly. This finding is lower than the 54.2% (133/254) reported in Nigeria [28]. Moreover, less than 1% of the participants bought anthelminthic drugs on prescription. This may be attributed to the fact that anthelminthic drugs are sold over-the-counter drugs without any restrictions. Changes in diet [22.0% (74/336)], body itch [20.2% (68/336)], and nausea [10.1% (34/336)] were some of the major reasons reported by the participants for self-medication. Donkor et al., [29] defined self-medication as the use of drugs to treat symptoms or disorders that were self-diagnosed. According to the WHO, one of the major factors that contribute to the emergence of drug resistance is the inappropriate and indiscriminate use of drugs [3], therefore, self-medication should be discouraged.

Although most of the participants have knowledge about deworming, active health promotion program has to be instituted by the Ministry of Health to improve the compliance with intermittent deworming [15,16]. In this study, 31 (57.4%) of the participants reported to have dewormed less than six months prior to the study, but their stool sample analyses were positive for helminths. This raises some concerns of anthelminthic drug resistance or the possibility of continuous re-infection. Studies carried out by Humphries et al., [11] in Ghana on hookworm infestation found that 39% of participants remain infected following administration of albendazole. Another factor that may be attributed to this study finding may be due to the lack of potable water, poor personal hygiene of the participants [17,20]. Although one may deworm successfully, however, there is a probability of reinfection if any of these preventive measures are not adhered to [7,17]. The basic and necessary measures needed for the control of helminthiasis include adequate sanitary and access to potable drinking water as previously reported in an earlier study in school children in Accra [30].

Conclusion

This study revealed that inappropriate and indiscriminate deworming may be contributing to resistance to anthelminthic drugs. Therefore, a need for continuous education on deworming and more emphasis on personal hygiene, adequate sanitation, and use of potable water in the quest to control the rate of helminthiasis is needed.

Limitations

Our study had a few limitations; only one stool sample was examined instead of the ideal three consecutive stool samples due to poor co-operation of the participants. Nevertheless, our study provides new insight on the use of anthelminthic drugs and corresponding prevalence of helminthic infections in Ghanaians. A bigger multiregional survey to assess the resistance to anthelminthic drugs in different seasons, or among ethnic groups in their geographic and socio-economic in the general populace and other variables is planned pending appropriate funding.

Declarations

Ethics approval and consent to participate: This study was approved by the Ethical and Protocol Review Committee of the School of Biomedical and Allied Health Sciences (SBAHS), College of Health Sciences, University of Ghana (Ethics approval number: SBAHS/AA/MLAB/10664309/2020-2021). Participation was voluntary and written consent was taken from each participant following the ethical committee's guidelines.

Consent to publish: Not applicable.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions: AOF conceived, designed, supervised the field and laboratory work, analyzed the data, and drafted the manuscript. IAB supervised the study, analyzed the data, and revised the manuscript. SAB and MOT performed the field and laboratory work, analyzed the data, and supervised the, revised manuscript.

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References

1. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, et al. Globalburden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study, 2019. Lancet. 2020; 396: 1204-1222.
2. World Health Organization. 2030 targets for soil-transmitted helminthiases control programmes. Geneva, Switzerland: WHO, 2019.
3. de Silva NR, Brooker S, Hotez PJ, Montresor A, Engels D, et al. Soil-transmitted helminth infections: Updating the global picture. In Trends in Parasitol, 2003; 19: 547-551.
4. Schluth CG, Standley CJ, Bansal S, Carlson CJ. Mapping the human helminthiases: advances and gaps in neglected disease surveillance. MedRxiv, 2020; 10: 1-26.
5. Masaku J, Njomo DW, Njoka A, Okoyo C, Mutungi FM, et al. Soil-transmitted helminths and schistosomiasis among pre-school age children in a rural setting of Busia County, Western Kenya: a cross-sectional study of prevalence and associated exposures. BMC Public Health. 2020; 20.
6. World Health Organization. Soil-transmitted halminthiases: STH: eliminating soil-transmitted helminthiases as a public health problem in children: progress report 2001-2010 and strategic plan 2011-2020 Geneva: WHO, 2012.
7. Hedley L, Serafino WLR. Helminth infections: diagnosis and treatment-The Pharmaceutical Journal. 2012; 2857882: 295.
8. Taylor-Robinson DC, Maayan N, Soares-Weiser K, Donegan S, Garner P. Deworming drugs for soil-transmitted intestinal worms in children: Effects on nutritional indicators, haemoglobin, and school performance. Cochrane Database of Syst Rev. 2015; 7: CD000371.
9. Shalaby HA. Anthelmintics resistance; how to overcome it? Ira J Parasitol. 2013; 8: 18-32.
10. Vercruysse J, Albonico M, Behnke JM, Kotze AC, Prichard RK, et al. Is anthelmintic resistance a concern for the control of human soil-transmitted helminths? Int J Parasitol Drugs and Drug Resist. 2011; 1: 14-27.
11. Humphries D, Mosites E, Otchere J, Twum WA, Woo L, et al. Epidemiology of Hookworm Infection in Kintampo North Municipality, Ghana: Patterns of Malaria Coinfection, Anemia, and Albendazole Treatment Failure. Am J Trop Med Hyg. 2011; 84: 792-800.
12. Ahiadorme M, Morhe E. Soil transmitted helminth infections in Ghana: a ten-year review. Pan Afr Med J. 2020; 35: 131.
13. Adu-Gyasi D, Asante KP, Frempong MT, Gyasi DK, Iddrisu LF, et al. Epidemiology of soil-transmitted Helminth infections in the middle belt of Ghana, Africa Parasite Epidemiol Control. 2018; 3: e00071.
14. Demeke G, Fenta A, Dilnessa T. Evaluation of Wet Mount and Concentration Techniques of Stool Examination for Intestinal Parasites Identification at Debre Markos Comprehensive Specialized Hospital, Ethiopia. Infect Drug Resist. 2021; 14: 1357-136.
15. Forson AO, Arthur I, Olu-Taiwo M, Glover KK, Pappoe-Ashong PJ, et al. Intestinal parasitic infections and risk factors: a cross-sectional survey of some school children in a suburb in Accra, Ghana. BMC Research Notes, 2017; 10: 485.
16. Osarfo J, Ampofo GD, Tagbor H. Trends of malaria infection in pregnancy in Ghana over the past two decades: a review. Malar J. 2022; 2: 3.
17. Aramendia AA, Anegagri M, Zewdie D, Dacal E, Saugar JM, et al. Epidemiology of intestinal helminthiases in a rural community of Ethiopia: Is it time to expand control programs to include Strongyloides stercoralis and the entire community? PLOS Neglected Trop Dis, 2020; 14: e0008315.
18. Bah YM, Bah MS, Paye J, Conteh A, Saffa S, et al. Soil-transmitted helminth infection in school age children in Sierra Leone after a decade of preventive chemotherapy interventions. Infect Dis Poverty. 2019; 8.

19. Loukouri A, Méité A, Kouadio OK, Djè NN, Trayé-Bi G, et al. Prevalence, Intensity of Soil-Transmitted Helminths, and Factors Associated with Infection: Importance of Control Program with Ivermectin and Albendazole in Eastern Côte d'Ivoire. J Trop Med. 2019; 7658594.

20. Ganguly S, Barkataki S, Karmakar S, Sanga P, Boopathi K, et al. High prevalence of soil-transmitted helminth infections among primary school children, Uttar Pradesh, India. Infect Dis Poverty. 2017; 6: 139.

21. Stanley CN, Oreh NC, Johnson-Ajinwo RO. Knowledge, Attitudes and Practices of intermittent deworming in Alakahia Community, Rivers State, Nigeria. Intl Res J Med Sci. 2013; 1: 1-7.

22. Atakorah EA, Afranie BO, Addy KD, Sarfo AD, Okyere BA. Assessment of intestinal and blood protozoan infections among pregnant women visiting ante-natal care at Tafo Hospital, Ghana. Heliyon. 2022; 8: e09968.

23. Khieu V, Schar F, Forrer A, Hattendorf J, Marti H, et al. High prevalence and spatial distribution of Strongyloides stercoralis in rural Cambodia. PLoS Negl Trop Dis. 2014; 8: e2854.

24. Gordon CA, Kurscheid J, Jones MK, Gray DJ, McManus DP. Soil-Transmitted Helminths in Tropical Australia and Asia. Trop Med Infect Dis. 2017; 2: 56.

25. Krolewiecki AJ, Koukounari A, Romano M, Caro RN, Scott AL, et al. Transrenal DNA-based diagnosis of Strongyloides stercoralis (Grassi, 1879) infection: Bayesian latent class modeling of test accuracy. PLoS Negl Trop Dis. 2018; 12: e0006550.

26. Schär F, Trostdorf U, Giardina F, Khieu V, Muth S, et al. Strongyloides stercoralis: Global Distribution and Risk Factors. PLoS Negl Trop Dis. 2013; 7: e2288.

27. Ibrahim S, Zubairu M. Prevalence of hookworm infection among patients attending Aminu Kano Teaching Hospital, Kano, Nigeria. Bajopas, 2011; 3: 84-86.

28. Damen JG, Lar P, Mershak P, Mbaawuga EM, Nyary BW. A Comparative Study on the Prevalence of Intestinal Helminthes in Dewormed and Non-Dewormed Students in a Rural Area of North-Central Nigeria. Lab. Medici. 2010; 41: 585-589.

29. Donkor ES, Tetteh-Quarcoo PB, Nartey P, Agyemanb IO. Self-Medication Practices with Antibiotics among Tertiary Level Students in Accra, Ghana: A Cross-Sectional Study. Int. J. Environ Res. Public Health. 2012; 9: 3519-3529.

30. Forson AO, Arthur I, Ayeh-Kumi PF. The role of family size, employment and education of parents in the prevalence of intestinal parasitic infections in school children in Accra. PLoS One. 2018; 13: e0192303.