

Research article

Intestinal Helminthes Associated with Geophagy in Pregnancy in Afikpo North Ebonyi State

Elom, Michael O.,¹ Alo, Moses N.,² Ugah, Uchenna I.,³ and Ibiam, Gideon A.¹

¹Department of Medical Laboratory Science, Ebonyi State University, Abakaliki.

²Department of Biological Sciences, Federal University, Ndufu – Alike, Ikwo.

³Department of Medical Biochemistry, Federal University, Ndufu – Alike, Ikwo.

E-mail: ugahuchennaiyioku@gmail.com

ABSTRACT

Geophagy is the practice of eating earthy or soil – like substances such as clay and chalk. It exists in animals in the wild and in humans. It is recognized as the intentional ingestion of clay soils excavated from known sources, rather than the consumption of surface soils from residential properties. Geophagy is most common among pregnant women. In the United States, the most common parasitic infection associated with geophagy is toxocariasis, caused by *Toxocara canis*. However, among children in Nigeria, the most common parasitic infection associated with geophagy is ascariasis. The study was conducted among 200 pregnant geophagous women resident in Afikpo North Local Government Area, Ebonyi State, South Eastern Nigeria. Ova of helminth parasites were isolated from both the stool samples of the subjects and from the soil type they consume, using concentration techniques including saturated sodium chloride floatation, zinc sulphate centrifugal floatation, simple sedimentation and formalin – ether sedimentation. Three parasites were isolated directly from both the soil types consumed and from the stool of the subjects. They include; *Ascaris lumbricoides*, *Toxocara canis*, and *Trichuris trichiura* with the prevalence of 23%, 7.5% and 1% respectively. Among the subjects studied, the overall prevalence of parasitic infection was 30.5% and it was statistically significant ($p < 0.05$). This study underscores the risk of parasitic infections associated with geophagy especially among pregnant women. **Copyright © WJMMS, all rights reserved.**

Keywords: geophagy, geohelminths, intestinal parasites, cravings, geophagous

1. Introduction

Geophagy is the practice of eating earthy or soil – like substances such as clay and chalk. It exists in animals in the wild and in humans. It occurs most often in rural or preindustrial societies, among children and pregnant women (Peter, 2003). Human geophagy may be related to pica, a classified pathological eating disorder characterized by abnormal cravings for non – food items. Pica has been defined as the consumption of more than 500 mg of soil per day (Callahan, 2003). There are obvious risks to the consumption of earth that is contaminated by animal or human faeces. Parasite eggs such as roundworms that can stay dormant for years in the soil can present a problem. The predilection of children and pregnant women to engage in geophagy makes them more susceptible to worm infestations.

Geophagy is recognized as the intentional ingestion of clay soils excavated from known sources, rather than the consumption of surface soils from residential properties. It is associated with cultural practices and has been recorded from traditional human societies in all continents (Diamond, 1998).

The craving for geophagy reported by clay eaters has been attributed to feelings of misery, homesickness, depression and alienation by researchers who studied mainly pregnant and post partum women and their emotional state (Wiley and Solomon, 1998). For centuries, some people have used clay routinely in food preparation. The clays were used to remove toxins (e.g., in aboriginal acorn bread); as condiments or spices (in Philippines, New Guinea, Costa Rica, Guatemala, The Amazon and Orinoco Basins in South America); and as food during famine (Krishnamani and Mahaney, 2002). Clays have also been used in medications e.g., kaolin in kapectate. But the most common occasion for eating soil in many societies, like in Nigeria is pregnancy (Callahan, 2003). The timing of soil ingestion and amounts consumed vary with tribes and individual persons but soil comes consistently from certain sites. In some cultures, well-established trade routes and clay traders make rural clays available for geophagy in urban settings. Clays from termite mounds are especially popular among traded clays, perhaps because they are rich in calcium (Wiley and Solomon, 1998). Women engage in geophagy during the first, second and third trimesters of pregnancy (Wiley and Solomon, 1998), often throughout the day and about 30-50 mg are consumed a day (ATSDR, 2000).

An estimate of 4600 species of prokaryote microorganisms were found per gram of natural soil using DNA hybridization analysis (Torsvik *et al.*, 1990; Kent and Triplett, 2002). However, all parasites that infest the soil do not readily infect people who practise geophagy (Callahan, 2003). In the United States, the most common parasitic infection associated with geophagy is toxocariasis, most often caused by *Toxocara canis* (Callahan, 2003). Among children in Nigeria, the most common parasitic infection associated with geophagy is ascariasis (Ozumba and Ozumba, 2009). Geophagy is most common among pregnant women (Diamond, 1998).

Geophagy can be a risk factor for geohelminths, because the eating of contaminated soil is among the major modes of transmission for helminth parasites. Geohelminths such as *Trichuris trichiura*, *Ascaris lumbricoides* and *Toxocara species* are the parasites which are most likely to be found in the soil mainly eaten by geophagists (Diamond, 1998).

This study aimed at identifying parasitic infections among pregnant women who practice geophagy in a rural area of Ebonyi State, South Eastern Nigeria.

2. Materials and Methods

Study Population

The study was conducted among pregnant women in their different trimesters of pregnancy. They were resident in Ozizza, Ugwuegu, Nkpogoro and Ohaisu villages in Afikpo North Local Government Area, Ebonyi State, South Eastern Nigeria.

Sample Collection

Two hundred geophagous pregnant women, 50 from each village were selected for the study by simple random sampling technique. A structured questionnaire was used to collect data on their geophagous practices. Only pregnant women who practised geophagy were included in the study. The subjects aged between 18 – 49 years, with a mean age of 32 years. The women identified the type of clay soil they preferred. Clay samples used for analysis, from which ova were recovered, were purchased from the traders from whom the pregnant women obtained theirs.

Stool samples were collected from the subjects into wide mouthed screw capped containers; aliquots of the samples were added to containers which had merthiolate – iodine – formalin preservative.

Detection of Helminth Ova in Soil

The samples of different soil types that were eaten by the pregnant women were placed in different labeled beakers and were carefully dissolved with distilled water and sieved through gauze to remove large particles and debris. Ova of helminth parasites were isolated using concentration techniques including saturated sodium chloride floatation, zinc sulphate centrifugal floatation, simple sedimentation and formal – ether sedimentation (Cheesebrough, 2009). Ova were identified by microscopy and recorded.

Detection of Helminth Ova in Stool Samples

Standard procedures for examination of fecal specimen were observed. Saline wet mount was examined following macroscopy. Concentration techniques as outlined above were also performed from aliquots of each of the samples. Ova that were isolated were identified using standard techniques (WHO, 2004).

Data Analysis

Data was analyzed using Chitest. p value of 0.05 was considered significant at 95% confidence interval. Data analysis was done with the aid of Statistical Programme for Social Sciences (SPSS) version 17.0

3. RESULTS

A total of 200 stool samples from geophagous pregnant women were examined after concentration techniques had been performed. Among the subjects, 153 (76.5%) had at least Secondary school education while 47 (23.5%) were either in tertiary school or had graduated. Different reasons were given by the subjects for their geophagous practice. One hundred and twenty three (61.5%) asserted that they ate soil because of geophagous cravings while 77 (38.5%) practised geophagy because of the taste and to prevent morning sickness. When asked if they sterilized the clay samples before consumption, all the subjects responded in the negative. One hundred and forty nine (74.5%) felt it was wholesome for consumption while 51 (25.5%) reported that they did not want to lose the taste, which may occur after sterilization. As for the risk of parasitic infections, 93 (46.5%) agreed that the soil may be a source of parasitic infection while 107 (53.5%) did not think that the soil they consume was a potential source of parasitic infection.

Among the overall population, 61 (30.5%) had parasitic infections. The prevalence of parasitic infections among the subjects was statistically significant ($p < 0.05$). The prevalence of the infections among the various communities studied was; 40%, 24%, 22% and 36% for Ozizza, Nkpogoro, Ugwuegu and Ohaisu respectively (table 1). Three parasites were isolated from both the soil and the subjects. They include; *Ascaris lumbricoides*, *Toxocara canis*, and *Trichuris trichiura* with the prevalence of 23%, 7.5% and 1% respectively (figure 1).

Table 1: Prevalence of Parasitic Infections among the Studied Communities

communities	Number examined	Number infected (%)
Ozizza	50	20 (40.00)
Nkpogoro	50	12 (24.00)

Ugwuegu	50	11 (22.00)
Ohaisu	50	18 (36.00)
Total	200	61 (30.50)

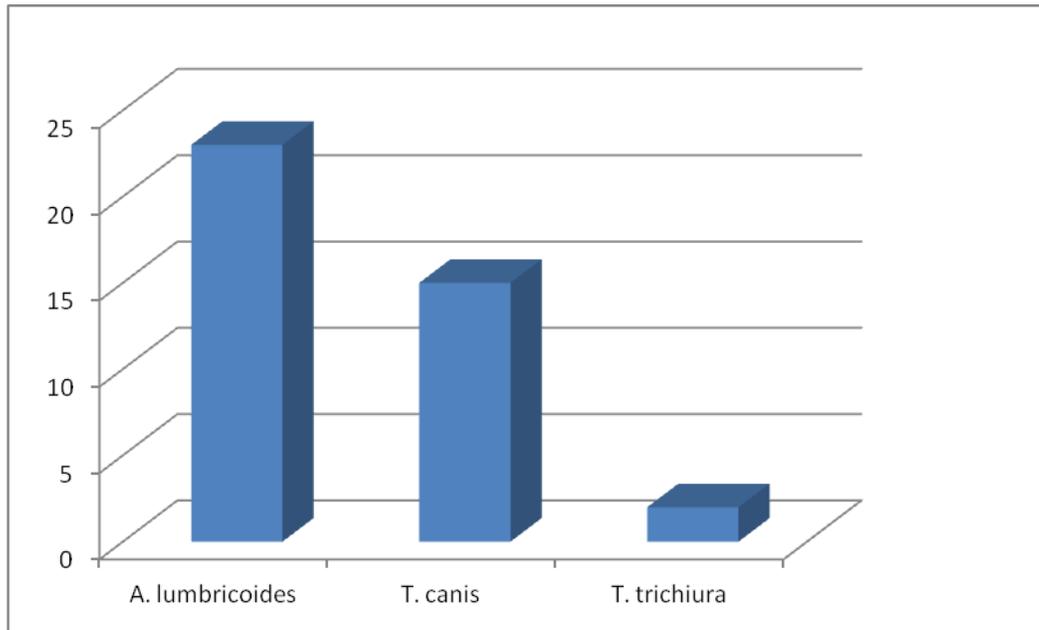


Figure 1: The prevalence of geohelminths among the subjects

4. Discussion

There was a prevalence of 30.50% of parasitic infections among pregnant women who practised geophagy in the study areas. Three helminths were recovered using different faecal concentration techniques for ova of parasites. They include; *A. lumbricoides*, *T. canis* and *T. trichiura*. The parasites were also isolated from the baked clay soil samples that were consumed by the subjects. The isolation of the parasites from both the soil and from the subjects is an indicator that the soil is the source of the infection.

The prevalence of 30.50% as found in this study is in contrast to the findings of Shinondo and Mwikuma (Shinondo and Mwikuma, 2008), who did not isolate ova of helminth from the soil and did not associate the risk of parasitic infections with geophagy. The difference between the findings might have risen from the difference in the soil samples consumed by the subjects in both studies. Unlike in Nigeria, where the soils ingested are not sterilized after excavation, the soils consumed in their study were sterilized by heat. The finding of *Ascaris lumbricoides* having the highest prevalence of geohelminths in this study is consistent with another study in Nigeria (Ozumba and Ozumba, 2009).

This study was conducted among subjects in rural areas. The sites of excavation of the soil samples consumed were characterized by the presence of fecal deposits from both humans and animals. This implies that the clay soil might be contaminated by geohelminths from the primary sites of excavation. The soil samples were always sold unsterilized to the consumers and such could encourage high transmission potential of ova of parasites when present. The handling process of the soil by the traders might also be a source of contamination especially for clay soils that are baked after excavation.

Geophagy is a common practice in South-Eastern Nigeria. However, pregnant women practise it more, when compared to their non-gravid counterparts. The risk of parasitic infections among geophagous persons might arise from the contamination of the consumable soil by the excavators and traders and from fecal contamination of the soils at the site of excavation by both humans and domestic pets. In rural settings with very low sanitary conditions, fecal matter are deposited in the environment indiscriminately.

Conclusion

Most geohelminth ova require moisture to remain viable and when the soil ingested is recently contaminated by viable helminth eggs, the risk of infection becomes inevitable. Also, the immune status of pregnant women is not competent and such renders them susceptible to a myriad of infections after exposure. The recovery of ova of parasites from both the soil and the subjects indicates that geophagy is a risk of parasitic infection and should be discouraged especially among pregnant women in developing countries. Extensive and intensive public health education is however advocated.

REFERENCES

- [1] Peter, A. Human Geophagy: a review of its distribution, causes and implications. In: Catherine, H., Skinner, W., Berger, A. R. *geology and Health: closing the gap*. Oxford University press, USA. 2003. ISBN 0-19-516204-8.
- [2] Callahan, G. N. Eating Dirt, *Emerging Infectious Diseases*. 2003; 9(8): 1016 – 1021.
- [3] Diamond, J. "Eat Dirt." *Discover*. 1998; Pp70-75
- [4] Wiley, A. S., Solomon, H. K. Geophagy in pregnancy: a test of a hypothesis. *Current Anthropology* 1998; 39(4): 532 – 545. Doi: 10.1086/204769
- [5] Krishnamani, R., Mahaney, W. C. Geophagy among primates: adaptive significance and ecological consequences. *Animal Behaviour*. 2002; 59: 899 – 915.
- [6] Summary report for the ATSDR soil – pica workshop, Atlanta, Georgia. 2000. Available from URL: <http://www.atsdr.cdc.gov/NEWS/soilpica.html>.
- [7] Torsvik, V., Salte, K., Sorheim, R., Goksoyr, J. Comparison of phenotypic diversity and DNA heterogeneity in population of soil bacteria. *Applied Environmental Microbiology*. 1990; 56: 776 – 781.
- [8] Kent, A., Triplett, E. W. Microbial communities and their interactions in soil and rhizosphere ecosystems. *Annual Review of Microbiology* 2002; 56: 211 – 236.
- [9] Callahan, G. N. Eating Dirt. *Emerging Infectious Disease* (serial online). 2003; 9(8). Available from URL: <http://www.nc.cdc.gov/eid/article/9/8/03-033.html>. doi: 10.3201/eid0908.030033.
- [10] Ozumba, U. C., Ozumba, N. Patterns of helminth infection in the human gut at the university of Nigeria teaching Hospital, Enugu, Nigeria. *Journal of Health Sciences*. 2002; 48: 263 – 268.
- [11] Cheesebrough, M. *District Laboratory practice in Tropical Countries*. Part 1. 2nd ed. Cambridge University Press, Cambridge. 2009; Pp191 – 200.
- [12] World Health Organisation. *Training Manual on Diagnosis of Intestinal Parasites*. World Health Organisation, Geneva. WHO/CTD/SIP/98.2 CD ROM. 2004; Pp1-48.
- [13] Shinondo, C. J. and Mwikuma, G. Geophagy as a risk factor for helminth infections in pregnant women in Lusaka, Zambia. *Medical Journal of Zambia*. 2008; 35(2): 48 – 52.

World Journal of Medicine and Medical Science

Vol. 1, No. 5, September 2013, PP: 92 - 97, ISSN: 2330-1341 (Online)

Available online at <http://www.wjmms.com/>

Corresponding author:

Ugah Uchenna, I.

Department of Medical Biochemistry, Federal University, Ndufu – Alike, Ikwo.

E-mail: ugahuchennaiyioku@gmail.com Mobile Number: +2347062154353