

Geophagy in pregnancy and health risks in a suburban area in Nigeria

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Abstract

Background: Geophagy is the ingestion of earthy substances such as soil, clay or mud. It is a form of pica, which is the tendency or craving to eat substances other than normal food or substances of no nutritional value. Geophagy is practiced by humans globally but has been noticed to be commoner among pregnant women and children. Such a practice may have health implications. Hence the study aimed at determining if it conferred any health risks.

Method: The study was a cross-sectional study of 384 pregnant women in an antenatal clinic in a sub-urban cottage hospital in Katsina-Ala LG of Benue state Nigeria. Pregnant women who presented for ANC were recruited consecutively. Those who had taken anthelmintic during the pregnancy were excluded. An interviewer administered semi-structured questionnaire was used to collect data on social demographic characteristics and geophagic behaviour. Stool samples for stool microscopy

and blood samples for Packed Cell Volume were also taken.

Results: The prevalence of geophagy was 17.7%, helminthiasis was 12.2%, while anaemia was 15.9%. There was a significant relationship between the practice of geophagy and helminthiasis ($\chi^2 = 136.8$, $p < 0.0001$, Odds ratio 36.5, CI=16.6-80.5, $p < 0.0001$). However, geophagy had no statistical relationship with anaemia.

Conclusion: Geophagy is common and it is associated with helminthiasis. Screening for geophagy and deworming may be advantageous among pregnant women.

Keywords: geophagy, helminthiasis, anaemia and pregnant women.

Highland Med Res J 2023;24(1):23-26

Introduction

Geophagy is defined as the deliberate consumption of earth in the form of soil or clay by both human and animals and has been described as a complex eating behavior.^{1,2} It is a form of pica, which is the consumption of substances considered to be of no nutritional value.^{1,2} The practice of geophagy is done in different parts of the world for several reasons, which may include: as a natural craving during pregnancy, to stop excessive salivation and for perceived nutritional benefits.³ Others have considered geophagy as a craving developed in response to micronutrient deficiency, but for most people groups it has become a cultural norm.⁴ This study established the burden of geophagy among a people where it is not a cultural norm to practice geophagy, and health implications of this practice. The eating of soils is prevalent in many parts of the world; for instance, a study in the USA has reported the prevalence of geophagy to be 1.6%, while other forms of pica like pagophagia are higher.⁵ In Africa Mutura *et al* reported that 26.1% of pregnant women in Kenya have admitted to geophagy at some occasions.¹ Similarly, 31.8% of pregnant women in Zambia practice geophagy.² While in Nigeria, geophagy has been reported as 46.7% among pregnant women in Ebonyi.⁴

With the large number of pregnant women in Africa and Nigeria in particular practicing geophagy, the

unanswered question in the suburban region of our environment remain; which is the health implication of geophagy, hence the study.

Methods

Study area: The study was carried out in Nguher Clinic located in Katsina-Ala town, Benue State, in North Central Nigeria. It has a population of approximately 224,718.⁶ The clinic runs antenatal clinic twice weekly with 10-20 women in attendance at every clinic.

Study population: The Study was carried out among pregnant women presenting for antenatal care at the centre over a four month period (recruiting 10-15 participant per week)

Inclusion Criteria: All pregnant women

Exclusion Criteria: Women who had taken any anti-helminthic medication in the preceding three months or developed any emergency while in the ANC were excluded from the study.

Sample size calculation: Using the Leslie and Kish formula for descriptive studies with preferred precision of 0.05 and a previous prevalence of geophagy of 46.7%⁴ a minimum sample size of 382 was obtained, however, 384 women were recruited

Study Design and Sampling: This was a cross-sectional study of 384 pregnant women recruited consecutively.

Ethical Considerations: The study was approved by the ethical committee of the hospital (Ref. 2018-03-162). Informed consent was obtained from all participants

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prior to the interviews. Patient confidentiality was maintained.

Data collection: Women who consented to the study had data collected from them (interviews were conducted in a consulting room and documented anonymously), which included: age, duration of pregnancy, ethnicity, educational status and marital status in the questionnaire. Stool samples were collected in universal bottles marked with identification numbers corresponding to the serial numbers on the questionnaire. Capillary blood was collected into capillary tube after lancet pricks for packed cell volume (PCV). The questionnaire, stool and blood sample were sent to the laboratory for stool microscopy and PCV respectively. Stool microscopy and PCV were carried out as outlined by Monica Chessbrough' district laboratory practice in tropical countries (updated edition).⁷ Result were recorded in the space provided for them in the questionnaire.

Data analysis: Statistical Package for Social Sciences (SPSS) Version 20 was used to analyse the data. Social demographics were analysed using simple proportion and chi square was used to determine the relationship between geophagy and anaemia and helminthiasis.

Results

Table 1 (showing the bio-social demographics) shows that most participants were between 25-43years old (46.9%), 142 (37%) were in the 2nd trimester, 208 (54.2%) had secondary level education. Most were married 371 (96.4%) and 369 (70%) were of Tiv extraction. Tables 2 and 3 are contingency table showing the relationship between geophagy and helminthiasis and anaemia respectively. They demonstrate that geophagy is associated with helminthiasis but not with anaemia in pregnancy.

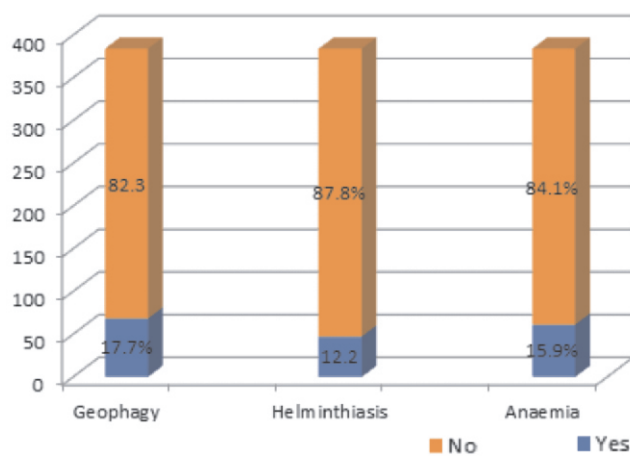


Fig 1: Showing the prevalence of geophagy, anaemia and helminthiasis among the study participants

Figure 1 shows the prevalence of geophagy, helminthiasis and anaemia among the participants while Figure 2 shows the distribution of helminthes among those infested.

Table 1. A frequency table showing the distribution of bio-social demographic characteristics of participants (N=384)

Characteristics	Frequency	Percentage (%)
Age:		
15-24	178	46.4
25-34	180	46.9
>35	26	6.8
Gestational Age:		
1st trimester	140	36.5
2nd trimester	142	37
3rd trimester	102	26.5
Educational Status:		
Non-formal	34	8.9
Primary	112	29.2
Secondary	208	54.2
Tertiary	30	7.8
Marital Status:		
Married	371	96.6
No spouse	13	3.4
Ethnicity:		
Tiv	269	70
Igbo	26	6.8
Hausa	41	10.7
Idoma	17	4.5
Others	31	8

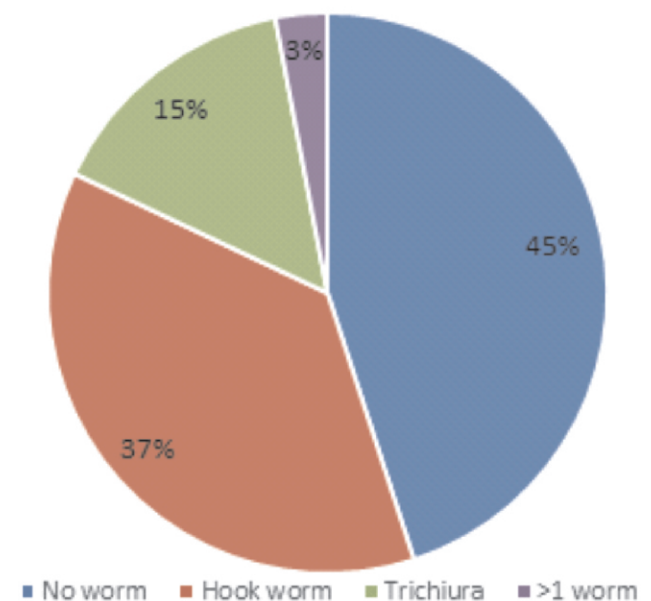


Fig 2. Pie chart showing the distribution of helminthiasis among geophagic women N=68

The prevalence of geophagy, heminthiasis and anaemia among the participants were 17.7%, 12.2% and 15.9% respectively

Among the participants that practice geophagy; 37% had hookworm infestation, 15% had trichiura while 3% had more than one worm isolated from their samples. Majority (45%) had no infestation.

Table 2. A contingency table showing the relationship between geophagy and helminthiasis among study participants

Geophagy	Yes Helminthiasis	No Helminthiasis	Total
Yes Geophagy	37	31	68
No Geophagy	10	306	316
Total	47	337	384

$\chi^2=136.8$, $p<0.000$ Odds ratio 36.5 (CI=16.6-80.5) $p<0.0001$ Geophagy is associated with helminthiasis

Table 3: A contingency table showing the relationship between geophagy and anaemia in pregnancy

	Yes Anaemia	No Anaemia	Total
Yes Geophagy	8	61	68
No Geophagy	53	263	316
Total	61	323	384

$\chi^2=1.05$, $p>0.05$ Odds ratio 0.661, (CI-0.30-1.46), $p<0.305$ Thus, geophagy is not associated with anaemia

Discussion

The eating of soil among animals and the inadvertent ingestion of soil by human has being documented and accepted over generations. However, the deliberate consumption of soil by humans has been received with mixed reactions that stem from cultural and health concerns.⁸ Hence, the need to explore the validity of such concerns.

The study showed that approximately 1 in 5 women that presented for antenatal clinic in a suburban area of Benue State practiced geophagy. It also showed that over 1 in 10 of the participants had helminthiasis and that there is a significant relationship between the practice of geophagy and helminthiasis. There was however no relationship between geophagic practice and anaemia in pregnancy even though 15.9% of the study participants were anaemic with a PCV less than 30%.

The prevalence of geophagy demonstrated in this study is low when compared to that reported by Griessler et al in Kenya and Machaka et al in South- Africa where a prevalence of 56% and 54% were reported respectively.^{9,10} While those studies were community surveys with large sample sizes of over a thousand women, this study was a hospital based. The differences in location of the study

could account for the differences. Although Ivoke et al have reported a prevalence of 46.7% in hospital-based research in South-East Nigeria.⁴ The study was carried out in a population that traditionally recommends geophagy in pregnancy among women, while this study was among people without such traditions. Similarly, a hospital-based study in Panama where geophagy was not a culturally acceptable behaviour, a prevalence of 22.5% was reported which is similar to that reported in this work.¹¹ This shows that apart from the several reasons advanced for the practice of geophagy, culture places a prominent role in its prevalence hence any advocacy against geophagy must aim at modifying cultural beliefs.

Gastrointestinal parasites are a health concern when contaminated material is ingested as it happens in geophagy. Though bacterial infections can also be gotten from the feaco-oral route, helminthes are the source of concern when it comes to pregnant women (because of the association between helminths with anaemia). Foremost among helminthes gotten from feaco-oral route include *Ascaris lumbricoides* (roundworm), *Trichiuris trichiura* (whipworm), *Ancylostoma duodenale*, and *Necator americanicus* (hookworms). Hence, the study sought to a relationship between geophagy and helminthiasis.

A relationship was demonstrated between geophagy and helminthiasis in this study. It showed that the odds of being infected with helminths was 36.5 times higher among women that practice geophagy when compared to those that did not. This is similar to the finding by Shinondo et al among pregnant geophagic women in Lusaka, Zambia where geophagy was seen to be associated with helminthiasis.² A related study by Ivoke et al demonstrated that *A lumbricoides* and hook worms were associated with geophagy but not *S Stercoralis* and *T trichiura*⁴ which were the most prevalent worm ova found among this study's participants. On the contrary researchers in Zanzibar Tanzania found no association with infection with hook worm and *T trichiura*.¹² Kawai et al also showed no association between geophagy and hookworm and *T trichiura*.¹³ It is obvious that the report on the association between geophagy and helminthiasis are conflicting.

Even though there are divergent views that geophagy is a risk factor for anaemia there was no association between geophagy and anaemia observed in this study. This finding is similar to what Mireku et al found in Benin, where no relationship was found between prenatal geophagy and haematological indices.¹⁴ This may partly be because this study as the one in Benin are hospital-based study where pregnant women are prescribed heamatoinics as prevention of anaemia in pregnancy. More so that most of the women were in their

2nd and 3rd trimesters and hence could have been on haematinics for a considerable period. More so that haematinics (iron, folic acid) are beneficial for the treatment and prevention of anaemia in pregnancy. Furthermore, it's been shown that 500-800mg of elemental iron raises the haemoglobin by 2-3g/dl.¹⁵

Other studies have demonstrated that geophagy could be one of the risk factors for anaemia among pregnant geophagist, for instance Greissler et al found an association between geophagy and anaemia and concluded that geophagy was the cause of anaemia among pregnant women, however, they did not proffer the mechanism by which geophagy led to anaemia.¹⁶ Similarly, other researchers including Kawai et al and Adehossi et al have identified geophagy as a possible risk factor for anaemia.^{13,17} This finding differs from results in this research because they were not hospital based studies hence, the confounding effect of haematinics given to the population used in this study was absent.

In concluding, It is worthy of note that; though soil consumption in pregnancy could be a cultural norm, the associated risk of helminthiasis could place the women in danger of helminthic infection. Hence it may be beneficial for routine screening and deworming to be done at ANCs. Nevertheless, the fact that geophagy could be a source of micronutrients and electrolytes is still a worthy research idea to be explored.

Acknowledgement

The contributions of Midwives and laboratory assistants at the Nguher Clinic and Maternity Katsina-ala is worthy of mention.

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