



## PATTERN OF GEOPHAGY AMONG INHABITANTS OF OWERRI, NIGERIA

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### ABSTRACT

The aim of the study was to determine the pattern of geophagy among inhabitants of Owerri senatorial zone of Imo State, Nigeria. The study which adopted a descriptive survey design was guided by three specific objectives, three research questions and four null hypotheses. Multi-stage sampling procedure was utilized to draw a sample of 1,200 respondents from the population. A self-structured and validated questionnaire with a reliability index of 0.89 was used to collect data for the study. Data collected were analysed using percentage and Chi-square test-of-association statistics for answering the research questions and testing the hypotheses respectively. The findings of the study revealed that 81.32% of the respondents were geophageous. Kaolin chalk, locally called 'Nzu' was the most commonly consumed type of earth (66%). Twenty three percent were everyday consumers while 32.7% of the respondents had been geophageous for over 15 years. The study further established that age, sex, educational status and location of residence were significantly associated with geophagy: prevalence, type of soil, frequency of consumption and length of consumption of soil among the respondents. The study concluded that geophagy was a common practice in Owerri senatorial zone and that education interventions can play a role in curbing the practice. Thus, recommendations included that public health officers, health administrators should get involved in planning appropriate and educative programmes against the increasing trend in the consumption of geophagic materials in our society especially in the face of identified health risks of such practice.

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### INTRODUCTION

Eating earth or soil is an eating disorder that is globally practiced by people of all races, social classes, ages, and sexes. This practice of eating earth or soil by humans and animals which is called geophagy (Durable health, 2016) clearly negates the principle of good nutrition because of the inherent hygiene and other nutritional concerns. Although geophagy is practiced across continents, it has been found to be widespread in Africa and Asia. In fact it is believed that the practice spread from Africa to the United States with slavery (Rosenberg, 2017). Edible clay is sold in supermarkets in parts of America and Europe, and in most African markets, hence, though strange, eating it is an acceptable practice at least in most African cultures. The oldest evidence of geophagy by humans dates back to the pre-historic site at Kalambo falls situated

between Zambia and Tanzania (Kwong and Henry, 2003). Interestingly, it has been discovered that the clay commonly consumed in Africa contains important nutrients such as phosphorus, potassium, magnesium, copper, zinc, manganese, and iron (Rosenberg, 2017). However, despite their potential to supply micronutrients, Njiru, Elchalal and Paltiel (2011) cautioned that soils interfere with bioavailability of micronutrients leading to micronutrient deficiency and can also lead to ingestion of geohelminths and heavy metals, putting the consumers especially fetus, children and women at risk. On another hand, high levels of heavy metals of public health importance such as Lead, Arsenic, Mercury and Cadmium, have been found in geophagic materials sampled across some African countries and United States (Kutalek, Wewalka, Gundacker, Auer, Wilson, Haluba *et al.*, 2010). Hence, geophagy is also associated with some degree of mortality and morbidity (Obi, 2008). Although the practice is commonly found among poor countries and is considered by some to be a result of poverty and famine, the role of hunger in the practice of geophagy is still not well established. Rather,

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the practice in most parts of Africa is mainly associated with culture and religion (Njiru, Elchalal and Paltiel, 2011); and craving (Huebl, Leick, Guettl, Akello and Kutalek, 2016) which has been found to be the commonest reason for geophagy. The persistent craving and compulsive eating of soil is considered to be pica (Gabbatiss, 2016). Pica is a disorder characterized by craving and appetite for non-edible substances such as clay, dirt or sand. Health problems associated with pica include anemia, intestinal blockage and toxicity from heavy metals. Complications have been found to occur in the form of mental learning disabilities and brain damage in children. Geophagy in the context of this study refers to the willful and compulsive practice of eating soils and clays. In Igbo culture in Nigeria, geophagic practice was originally associated with pregnant women who experience craving and nursing mothers who serve kaolin chalk, to visitors who came to rejoice with them and welcome the new baby. Hence, geophagy is commonly associated with pregnant women, nursing mothers and infants. The prevalence of geophagy in pregnancy in Nigeria is estimated at 50% (Njiru, Elchalal and Paltiel, 2011).

Among pregnant women, geophagy was practiced usually to satisfy craving and alleviate gastrointestinal upsets (Huebl, Leick, Guettl, Akello and Kutalek, 2016), nausea and to promote adequate bone formation in foetus. It is, nevertheless, not uncommon to encounter non-pregnant males and females who complain of craving for clay consumption. In Nigeria, two major types of earth are commonly consumed by geophagous individuals: a grayish clay – locally known as 'Egbukere' in Igbo dialect, which is a mineral substance made up of small crystals of silica and alumina that is ductile when moist; and Kaolin chalk which is whitish or pinkish. Kaolin clay also known as white clay or China clay is a naturally occurring clay substance mostly found in soils that have developed from the chemical weathering of rocks in hot, moist climates such as the tropical rain forest (Durable health, 2016). Kaolin chalk goes by different names among the various tribes in Nigeria. It is called 'Nzu' by the Igbos, 'Ore' by Urhobo people, 'Ndom' in Efik and Ibibio, and 'Efunile' by Yorubas. The mineral kaolinite is the main component of kaolin, though it often contains other minerals that add slight colour to the clay (Wallace, 2017).

It often has a pinkish hue due to the presence of iron oxide or a greenish color acquired from decomposing plant materials. They are usually made into paste after adding a little salt to it and then molded into different shapes. Kaolin chalks are also used in traditional African religion especially to perform divination and in the production of skin and hair cosmetics. Studies have recorded high prevalence of geophagy among Africans: Peter (2008), 97.7%; De Jager and Ekosse (2008), 96.7%. According to Davies, Solomon, Lar and Abrahams (2008), geophagy is most commonly seen among the Ibo, Tiv and Birom tribes. Daily consumption of soil was recorded among majority of respondents from South Africa (De Jager and Ekosse, 2008; Simelane, 2008) and an average length of geophagia recorded was twelve years (Simelane, 2008). Some factors have been related to geophagy such as gender, age educational status and area of residence and pregnancy. Geophagy has been reported among primary school pupils in northern KwaZulu-Natal, South Africa (Simelane, 2008) and Oyi, Anambra, Nigeria, (Okereke *et al.*, 2015). The phenomenon is said to increase in female children after puberty, while decreasing in boys of the same age group.

Whereas Byron (2008) established that most geophagic practices were more prevalent in rural areas, Peter (2008) found that there was no significant difference in the frequency of eating soil between rural and sub-urban dwellers in South Africa. Peter (2008) also found that those in rural areas ate soil more regularly compared to those in sub-urban areas, and frequency of eating soil among the rural and urban dwellers was not significant. It was further discovered that prevalence is higher among women with lower education levels (Lachlan and Katherine, 2011). Geophagy was reported by 155 (45.6%) pregnant women in Tanzania, with 85 (54.8%) initiating the practice in the first trimester. A total of 101 (65%) pregnant women reported eating soil 2 to 3 times per day while 20 (13%) ate soil more than 3 times per day (Nyanza, Joseph, Premji, Thomas and Mannion, 2014). Owerri senatorial zone where the present study was conducted is in Imo state, South East zone and Igbo speaking part of Nigeria. The people are predominantly farmers, businessmen and civil servants. Different types of edible clay are sold in markets in Owerri senatorial zone of Imo state and for different reasons people buy and consume them. Edible clay is easily available in the zone because they are found in large quantity in various parts of the zone and in Okigwe zone which shares common boundary with it. The researchers have on some occasions encountered adults especially females who expressed serious concerns about the craving for either 'egbukere' or 'nzu', expressing their desire to stop the practice which they considered crude.

### Statement of the Problem

Researches have proved that geophagy is a global practice that involved people of all races. Soil and clay are consumed for various reasons including craving, culture and health reasons. Though studies have found that certain edible clay provides valuable nutrients, other studies have proved that not all, do. The potential risks accompanying the consumption of geophagic materials outweighs the benefits. The periodic consumption of geophagic materials at high dosages might be problematic particularly during pregnancy because it might affect the central nervous systems of developing foetus, hence, the necessity to put the practice in check. To do this effectively, it is pertinent to understand and document the pattern of clay consumption particularly in the study area where there is a cultural history of clay consumption and edible clay deposit. This will ensure that appropriate evidence-based interventions are developed. Few studies have been carried out on the pattern of geophagy in Nigeria but none has yet been carried out in Owerri senatorial zone, hence, a further need for the present study.

### Aim and Objectives of the Study

The aim of the study was to determine the pattern of geophagy among the inhabitants of Owerri Senatorial Zone.

### Specifically, the study was set to achieve the following objectives

- Ascertain the prevalence of geophagy among inhabitants of Owerri senatorial zone;
- Examine the practice of geophagy among inhabitants of Owerri senatorial zone with regards to type of soil, frequency and duration of consumption;

- Determine the practice of geophagy among the inhabitants of Owerri zone with regards to age, sex, educational qualification and location of residence.

### Research Questions

The following research questions were answered in the study

- What is the prevalence of geophagy among inhabitants of Owerri senatorial zone?
- What is the prevalence of geophagy based on age, educational qualification, sex and location?
- What is the practice of geophagy among the respondents with regards to type of soil, frequency and duration of consumption?

### Hypotheses

The following null hypotheses were tested at  $\alpha = 0.05$

- There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to age.
- There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to sex.
- There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to educational qualification.
- There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to location of residence.

## MATERIALS AND METHODS

The descriptive survey design was adopted for the study. This design permits the investigation of the current status of the phenomenon from a population in their natural setting. It was successfully employed by Simelane (2008) to study the socio-cultural aspects of geophagia in southern Africa. The sample for the present study consisted of 1,200 inhabitants of Owerri senatorial zone selected through multi-stage sampling procedure. The sampling stages involved the selection of Local Government Areas using stratified random sampling technique; selection of communities from the LGA's using systematic random sampling technique and finally, the selection of respondents from each sampled community using non-proportionate and accidental sampling techniques. The instrument for data collection was a self-structured questionnaire on the prevalence of geophagy otherwise called POGQ. The instrument comprised of two sections. Section 'A' consist of six (6) items dealing with demographic variables. Section B was designed to collect data on the prevalence of geophagy. Copies of the POGQ returned were cross-checked for completeness of responses. All the copies not duly completed were rejected, consequently, 1,124 duly completed copies of the questionnaire were used for analysis. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 21. Percentage was employed in answering the research questions, and the hypotheses were tested using chi-square at 0.05 level of significance and appropriate degrees of freedom.

## RESULTS

Data in Table 1 above shows the percentage distributions of the respondents according to clay consumption. It shows that majority of the respondents (914), representing 81.32%, consumed geophagic materials while 210, representing 18.68 % of the respondents, did not consume geophagic materials.

**Research Question One:** What is the prevalence of geophagy among inhabitants of Owerri zone?

**Table 1. Percentage of the respondents that are geophageous. (n=1124)**

Earth consumption	f	%
Yes	914	81.32
No	210	18.68
Total	1124	100

Information contained in table 2 showed that 92.7% of respondents aged 40 and above were geophageous closely followed by those 30-39 years (79.8%), and 20 – 29 years (71.5%). Also, 83.0% of respondents with no formal education, 81.5% with primary education, 81.2 % with tertiary education indicated that they consumed soil; and more rural dwellers (87.4%) practiced geophagy as against 75.3% of urban dwellers. Finally, the table revealed that female respondents (83.3%) were more geophageous than male respondents (78.1%). A breakdown of the type of geophagic material consumed as shown in table 3 indicated that kaolin chalk (nzu) had the highest number of consumers 742 (66.0%), followed by egbukere clay, 293 (26.1%); and sand, 89 (7.9%). The result showed that 643 (57.2%) of the respondents rarely consumed geophagic materials; 221 (19.7%), consumed occasionally, whereas 260 (23.1%) consumed it everyday. The table also showed that 383 (30.1%) of the respondents had been eating earth for 1-5yrs, followed by 299 (32.7%) who had consumed earth for more than 15yrs; 206 (18.3%) had consumed for 11-15yrs, and 176 (15.7%), for 6 -10yrs. Data in table 4 showed that obtained  $\chi^2$  cal value for type of clay was 96.91 ( $> \chi^2$  crit = 1.24). The table also showed that Kaolin chalk was consumed more by respondents between 20 and 29 years (47.2%), while more respondents below 20 years (59.2%) and above 40 years (58.1%) consumed more egbukere clay. The cal  $\chi^2$  for frequency of consumption was 43.82 ( $> \chi^2$  crit = 1.24). More respondents above 40 years (39.5%) were everyday consumers of soil. Finally, for length of clay consumption,  $\chi^2$  cal = 336.77 ( $> \chi^2$  crit = 3.33). All the obtained Chi-square values were significant at probability value of 0.05 ( $p < 0.00$ ). The null hypothesis was, hence, rejected for age with regards to type of earth, frequency and length of consumption.

As shown in table 5, obtained  $\chi^2$  value for type of clay was 39.51 ( $> \chi^2$  crit = .352). The table also reveals that a higher percentage of male respondents (69.8) consumed kaolin chalk than did the female respondents who consumed more egbukere (30.8%). The obtained  $\chi^2$  for frequency of consumption was 87.97 ( $> \chi^2$  crit = .103) as shown in the table. More females (134) representing 19.3 percent were everyday consumers as against ten males representing 2.3 percent. For length of consumption, the  $\chi^2$  cal = 41.55 ( $> \chi^2$  crit = .352). The results also showed that whereas male respondents had the highest number of consumers (85) representing 19.7 percent being on the practice for over 15 years, more females (350) representing

**Research Question two:** What is the prevalence of geophagy based on age, educational qualification, sex and location?

**Table 2. Percentage of respondents that are geophageous according to age, educational status, sex and location**

	Yes		No		Total
	f	%	f	%	
<b>Age (Yrs)</b>					
< 20	127	75.1	42	24.9	169
20 – 29	168	71.5	67	28.5	235
30 – 39	300	79.8	76	20.2	376
≥ 40	319	92.7	25	7.3	344
<b>Education</b>					
No formal education	137	83.0	28	27.0	165
FSLC	190	81.5	43	18.5	233
WAEC	219	80.2	54	19.8	273
Tertiary	368	81.2	85	18.8	453
<b>Location</b>					
Urban	423	75.3	139	24.7	562
Rural	491	87.4	71	22.6	562
<b>Sex</b>					
Male	336	78.1	94	21.9	430
Female	578	83.3	116	16.7	694

**Research Question Three:** What is the practice of geophagy among the inhabitants of Owerri with regards to type of soil, frequency and duration of soil consumption?

**Table 3. Percentage response on the type of soil, frequency and duration of soil consumption among the inhabitants of Owerri (n = 1124)**

Geophagic practices	f	%
<b>Type of soil consumed</b>		
Kaolin (Nzu)	742	66.0
Clay (“Egbukere”)	293	26.1
Sand	89	7.9
Other soil	0	0.0
<b>Frequency of consumption</b>		
Everyday	260	23.1
Occasionally	221	19.7
Rarely	643	57.2
<b>Duration of practice</b>		
1-5yrs	383	30.1
6-10yrs	176	15.7
11-15yrs	206	18.3
Above 15yrs	359	31.9

**Hypothesis One:** There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to age.

**Table 4. Summary of Chi-square analysis of difference in practice of geophagy based on age**

Geophagy	Age (yrs)								df	Cal $\chi^2$	Crit $\chi^2$	P-value	Decision
	< 20		20-29		30-39		>40						
Type of earth	F	%	F	%	F	%	F	%					
Nzu	69	40.8	111	47.2	126	33.5	140	40.7	6	96.71	1.24	0.00	Reject H <sub>0</sub>
Egbukere	100	59.2	100	42.6	180	47.9	200	58.1					
Sand	0	0.0	24	10.2	70	18.6	4	1.2					
Others	0	0.0	0	0.0	0	0.0	0	0.0					
<b>Frequency of consumption</b>													
Everyday	45	26.6	80	34.0	99	26.3	136	39.5	6	43.82	1.24	0.00	Reject H <sub>0</sub>
Occasional	25	14.8	49	20.9	100	26.6	99	28.8					
Rarely	99	58.6	106	45.1	177	47.1	106	31.7					
<b>Length of consumption</b>													
1-5yrs	36	21.3	90	38.3	106	28.2	152	44.2	9	336.77	3.33	0.00	Reject H <sub>0</sub>
6-10yrs	10	5.9	26	11.1	211	56.1	81	23.5					
11-15yrs	49	29.0	60	25.5	9	2.4	79	23.0					
Above 15yrs	74	43.8	59	25.1	50	13.3	32	9.3					

**Hypothesis Two:** There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to gender.

**Table 5. Summary of Chi-square analysis of difference in practice of geophagy based on gender**

Geophagy	Male		Female		Df	Cal $\chi^2$	Crit $\chi^2$	P-value	Decision
	F	%	F	%					
Type of earth									
<b>Kaolin (Nzu)</b>	300	69.8	416	60.0	3	39.51	.352	0.00	Reject H <sub>0</sub>
<b>Egbukere</b>	100	23.2	214	30.8					
<b>Sand</b>	30	7.0	64	9.2					
<b>Others</b>	0	0.0	0	0.0					
Frequency of consumption									
<b>Everyday</b>	10	2.3	134	19.3	2	87.97	.103	0.00	Reject H <sub>0</sub>
<b>Occasionally</b>	14	3.3	60	8.6					
<b>Rarely</b>	406	94.4	500	72.1					
Length of consumption									
<b>1-5yrs</b>	80	18.6	68	9.8	3	41.55	.352	0.00	Reject H <sub>0</sub>
<b>6-10yrs</b>	100	23.3	200	28.8					
<b>11-15yrs</b>	165	38.4	350	50.4					
<b>Above 15yrs</b>	85	19.7	76	11.0					

**Hypothesis Three:** There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to educational status.

**Table 6. Summary of Chi-square analysis of difference in practice of geophagy based on educational status.**

Geophagy	NFE		PRI		SEC		TERT		df	Cal $\chi^2$	Crit $\chi^2$	P-value	Decisin
	F	%	F	%	F	%	F	%					
<b>Type of earth</b>													
<b>Kaolin</b>	100	60.6	140	60.1	200	73.3	300	66.2	6	105.91	1.24	0.00	Reject H <sub>0</sub>
<b>Egbukere</b>	65	39.4	93	39.9	73	26.7	100	22.1					
<b>Sand</b>	0	0.0	0	0.0	0	11.7	53	4.7					
<b>Others</b>	0	0.0	0	0.0	0	0.0	0	0.0					
<b>Frequency of consumption</b>													
<b>Everyday</b>	30	18.2	110	47.2	120	44.0	200	44.2	6	172.77	1.24	0.00	Reject H <sub>0</sub>
<b>Occasionall</b>	39	23.6	80	34.3	14	5.1	150	33.1					
<b>Rarely</b>	96	58.2	43	18.5	139	50.9	103	22.7					
<b>Length of consumption</b>													
<b>1 – 5 yrs</b>	45	27.3	69	29.6	46	16.8	150	33.1	9	236.36	3.33	0.00	Reject H <sub>0</sub>
<b>6 – 10 yrs</b>	20	12.1	48	20.6	100	36.6	99	21.1					
<b>11 – 15yr</b>	30	18.2	10	4.3	50	18.3	200	44.1					
<b>&gt; 15 yrs</b>	70	42.4	106	45.5	77	28.2	4	0.9					

NFE = No Formal Education

PRI = Primary Education

SEC = Secondary Education

TERT = Tertiary Education

**Hypothesis Four:** There is no significant difference in the practice of geophagy among inhabitants of Owerri senatorial zone with regards to location of residence

**Table 7. Summary of Chi-square analysis of difference in practice of geophagy based on location of residence**

	Urban (562)		Rural (557)		Df	Cal $\chi^2$	Crit $\chi^2$	P-value	Decision
	F	%	F	%					
<b>Type of earth</b>									
<b>Kaolin chalk</b>	400	71.2	335	53.4	3	116.25	.352	0.00	Reject H <sub>0</sub>
<b>Egbukere</b>	100	17.8	147	19.9					
<b>Sand</b>	62	11.0	80	8.9					
<b>Others</b>	0	0.0	0	0.0					
<b>Frequency</b>									
<b>Everyday</b>	200	35.6	62	11.0	2	419.97	.103	0.00	Reject H <sub>0</sub>
<b>Occasionally</b>	300	53.4	100	17.8					
<b>Rarely</b>	62	11.0	400	71.2					
<b>Length of consumption</b>									
<b>1 – 5 yrs</b>	400	71.2	210	37.4	3	200.73	.352	0.00	Reject H <sub>0</sub>
<b>6 – 10 yrs</b>	100	17.8	90	16.0					
<b>11 – 15yr</b>	60	11.7	162	28.8					
<b>&gt; 15 yrs</b>	2	0.3	100	17.8					



50 percent had been geophagic for between 11 and 15 years. All the obtained Chi-square values were significant at probability value of 0.05 ( $p < 0.00$ ). The null hypothesis was, therefore, rejected for gender with regards to type of earth, frequency and length of consumption. Table 6 showed that obtained value of  $\chi^2_{cal} = 105.91 (> \chi^2_{crit} = 1.24)$  for type of earth consumed. Further details reveal that respondents with secondary (73.3%) and tertiary education (66.2%) consumed more of kaolin chalk while respondents with primary (39.9%) and no formal education (39.4%) consumed more of egbukere.  $\chi^2_{cal}$  for frequency of consumption = 172.77 ( $> \chi^2_{crit} = 1.24$ ). Everyday consumers were more among respondents who had primary education (47.2%). For length of earth consumption,  $\chi^2_{cal} = 236.36 (> \chi^2_{crit} = 3.33)$ . Data from the table also reveals that those with primary education (45.5%) and no formal education (42.4%) have lasted more in the practice ( $> 15$  years) than those with secondary (28.2%) and tertiary education (0.9%). All the Chi-values were significant at probability value of .05 ( $p < 0.00$ ). The null hypothesis was rejected for educational status with regards to type of earth, frequency and length of consumption. Information in table 7 showed that obtained Chi-value for type of earth consumed was  $\chi^2_{cal} = 116.25 (> \chi^2_{crit} = .352)$  with urban respondents consuming more kaolin chalk than rural respondents (53.4%). The  $\chi^2_{cal}$  for frequency of consumption was 419.97 ( $> \chi^2_{crit} = .103$ ). Also, the data show that more urban respondents (35.6%) ate soil everyday than rural respondents (11.0%). For length of consumption, the  $\chi^2_{cal}$  was 200.73 ( $> \chi^2_{crit} = .352$ ) with more rural respondents (17.8%) maintaining the practice for a longer period of above 15 years. All the obtained Chi-value were significant at probability value of .05 ( $p < 0.00$ ). The null hypothesis was rejected; implying that there was significant difference in the practice of geophagy by urban and rural inhabitants with regards to the type, frequency and length of earth consumption in Owerri.

## DISCUSSION OF FINDINGS

The high prevalence of geophagy in Owerri zone is consistent with other findings in most African countries like South Africa (Dikko and Dikko, 2008), Madagascar (Golden, Rasolofoniaina, Benjamin and Young, 2012) and Tanzania (Nyanza, Joseph, Premji, Thomas and Mannion, 2014). This finding raises concern considering the health implications of the practice as have been revealed by experts. It is also worrisome that bringing an end to the practice may not be easily achieved because of the craving factor which calls for medical or psychiatric intervention. On another hand, if there are nutritional benefits from the practice, what may be needed could be an enlightenment of the public on how to safely put geophagic materials to good use. Inasmuch as different types of geophagic materials are available, people opt for a particular type at a time. In this study, kaolin chalk locally known as nzu was consumed more than other types with percentage value of 66.0%. Reasons behind such choice may include: craving, taste, cultural practices (Agola, 2008), and supposed nutritional value, (Lem *et al.*, 2013). In the same vein, Simelane (2008) found that in South Africa, soil is preferred to other geophagic materials. Contrary to the findings of this work that only few (23.3%) were daily consumers of soil, Simelane, (2008) reported that the frequency of soil ingestion was high in South Africa with majority eating more than seven times daily. Majority of the respondents in Owerri (31.9%) had practiced geophagy for over 15 years. While this is somewhat alarming, it is not different from the situation in

South Africa where an average of 12 years was the length of time among those who practiced geophagy (Simelane, 2008). This shows the depth of helplessness faced by geophagous individuals in stopping the practice. It emphasizes the role of craving in sustaining the practice and perhaps the lack of knowledge about the negative health effects of geophagy. Age was significantly associated with soil consumption among inhabitants of Owerri senatorial zone. It is surprising that respondents who were 40 years and above were the highest consumers of geophagic materials (92.7%). It runs contrary to previous reports that prevalence of geophagy was more among school children in African countries (Anyangwe, 2008; Gabbatiss, 2016) and pregnant women (Njiru, Elchalal and Paltiel, 2011; Huebl, Leick, Guetl, Akello and Kutalek, 2016). Respondents between the ages of 20 and 29 years preferred kaolin chalk, but those below 20 years and above 40 years preferred 'egbukere'. Again, the study found that the frequency of soil consumption was higher among respondents who were above 40 years. However, the finding that more respondents below the age of 20 (43.3%) had been geophagous for over 15 years points to the fact that they probably started the act as school children. The danger lies in the revelation that infectious diseases acquired through eating dirt are associated with childhood geophagy which routinely involves top soils rather than deep clays. Sex was found to have some roles in geophagy among the inhabitants of Owerri as there were statistically significant differences in the type of soil consumed, frequency and duration of consumption. While male consumers preferred 'nzu', females preferred 'egbukere'. Daily consumers were more of females. Interestingly, although more male respondents (19.7%) had been in the practice for over 15 years, over half of the female consumers (50.4%) had practiced geophagy for 11 – 15 years. This finding corroborates the assertion of Davis *et al.* (2008) that geophagy is commonly seen among pregnant and secondary school girls. Anyangwe (2008) reported that consumption of some form of earthy materials are prevalent among female children after puberty, while decreasing in boys of the same age group. This implies that both sexes consume clay but it is higher among the females. The traditional consumption of 'egbukere' by women during pregnancy for the prevention of nausea, strengthening the bones of the foetus and to satisfy craving may be responsible for this finding.

This study reveals that educational status was significantly associated with geophagy. The level of literacy in Imo State is generally high especially in Owerri zone. The state frequently has the highest number of candidates seeking admissions into the higher institutions in the country. The findings established that educational qualification generally influenced the type of geophagic material consumed, the frequency of consumption as well as the length of time these materials have been consumed among the populace. More respondents with secondary education (73.3%) consumed Nzu while majority with primary education preferred Egbukere. Nzu is more fanciful and better packaged than Egbukere which looks dirty and unattractive. This may explain the reason for Nzu being preferred by those with higher education. Whereas daily consumers were mostly those with primary education, it was surprising to find that majority of respondents with no formal education were rare consumers. This is contrary to the findings of Lachlan and Katherine (2011), who stated that geophagy is prevalent among women with lower educational qualifications. However, addiction and craving are key factors among geophagous people as these factors may likely supercede the

influence of education (De Jager and Ekosse, 2008). The investigation reveals that location is significantly associated with geophagy among inhabitants of Owerri zone. This disagrees with the findings of Peter (2008), who established that there was no significant difference in the frequency of eating soil between rural and sub-urban dwellers. In Owerri, as the result of this study shows, urban and rural dwellers preferred nzu, however, more urban dwellers preferred nzu, while more rural dwellers preferred egbukere. Again this may be as a result of the urban dwellers finding nzu neat and attractive compared to egbukere. Another unexpected finding was that everyday consumers of earth were found more among urban dwellers while rural dwellers were more of rare consumers. Contrary to this finding, those in rural areas ate soil more regularly compared to those in sub-urban area in South Africa (Peter, 2008). Finally, and expectedly, the study found that more rural dwellers have been in the practice of earth eating for over 15 years. A related study conducted by Byron (2008) revealed that most geophagia practices were more prevalent in rural areas. He however stated that urbanized areas such as Johnneburg, Cape Town, and Harare, for example, have high incidence of urban dwellers practicing geophagia. In spite of this, the eating habit of an individual can be generally influenced by other factors such as availability and affordability other than location.

## Conclusion

Consequent upon the above findings, it was concluded that geophagy is a common practice among the inhabitants of Owerri senatorial zone irrespective of age, sex, educational status and location of residence. However, these variables influenced the pattern of geophagic practices among the people of Owerri zone an indication that interventions to control the practice should factor in these variables.

## Recommendation

**Based on the conclusions, the following recommendations were made**

- Government and voluntary health agencies should sponsor intensive enlightenment campaign through print and electronic media in order to reveal some of the health risks factors associated with geophagy and the craving which has predisposed inhabitants of Owerri to geophagic practices.
- Public health officers, health administrators, medical and paramedical professionals should inform and educate pregnant women on the health implications of geophagy on the development and health of their unborn babies. They may use it in planning appropriate and educative programmes against the increasing trend in the consumption of geophagic materials in the society.

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