



**REASONS PREGNANT WOMEN WHO ATTEND ANTENATAL
CARE IN MECKLENBURG HOSPITAL EAT SOIL**

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By

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DECLARATION

I, Dr A.O Nwafor, hereby declare that this dissertation is my own original work and that it has not been submitted for examination for the award at any other university.

Signed:

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A Nwafor

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Abstract

Objective: To determine what proportion of pregnant women attending antenatal care in Mecklenburg Hospital eat soil.

Study Design: A cross-sectional descriptive study was conducted at Mecklenburg Hospital.

Results: A total 273 pregnant women participated in the study, of which 85% eat soil. The majority (74%) were single, mean age of 26 years. About seventy-eight percent had secondary education. Most of the women were unemployed. The majority of women believed that soil eating gives energy, taste nice, makes women feel strong, and makes stomach feel full. The other reason given by these women is that soil eating protects unborn baby from poison, gives nutrients to unborn baby, prevent prolonged labor, stops morning sickness.

Conclusion: We conclude that the majority of pregnant women seen at Mecklenburg Hospital eat soil. There was not direct relationship between education level and nutritional reasons for eating soil. Furthermore, fetal and maternal reasons for eating soil were not associated with education level.

PART I
INTRODUCTION

CHAPTER 1

INTRODUCTION

The researcher had observed with concern the result of hemoglobin estimation of woman who attends antenatal care in Mecklenburg Hospital. Most of the pregnant women in the antenatal clinic of our hospital have hemoglobin level of less than 8g / dl. The researcher was encouraging them to supplement their diet with fruits and vegetables when one of the nurses made a statement and said "Doctor they are anemic because they eat soil"; the researcher then asked in detail what she meant by eating of soil, then she explained that it was customary for pregnant women in this locality to eat certain form of soil, the belief being that it would enable them to have a healthy baby while remaining healthy themselves throughout pregnancy period. The encouragement she maintained always came from their mothers or their grandmothers. Being armed with this information, the researcher decided to ask every pregnant woman whose hemoglobin level was low whether she was taking soil. The response was surprising. All the women asked agreed that they took soil.

STUDY PROBLEM.

The native names of the two kinds of soil they usually took are Mohlwa - this soil is usually associated with termites, and Mataga which is white stones by literal translation. Soil eating is an established practice among pregnant women in this area just as it is in other parts of the world, it is true that that there is an association between this practice and anemia, what is seemingly lacking is the reasons that sustain this practice especially in this

locality. It is hoped that the results of this study would provide answers to this.

RESEARCH QUESTION

Why do pregnant women who attend antenatal care in Mecklenburg Hospital eat soil?

AIM OF THE STUDY

To determine the reasons given by pregnant women who attend the antenatal care in Mecklenburg Hospital for eating soil.

OBJECTIVES

- To determine what proportion of pregnant women attending antenatal care in Mecklenburg Hospital eat soil.
- To describe this population with regard to soil eating using descriptive statistics.
- To identify the reasons for ingestion of soil during pregnancy

PART II
LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW:

INTRODUCTION

The purpose of this chapter is to examine published articles that are relevant to the reasons people eat soil globally. Looking at both local and international publications, they cover a number of themes related to this research including, soil eating in children men and women ,factors which influence soil eating, the role of culture in the practice of soil eating and related complications.

The literature review was done initially by visiting the central library in Pretoria to search for local publications relating to this topic, some relevant articles were found. Other articles were obtained from the MEDUNSA Campus Library of the University of Limpopo. Articles were also obtained from the internet using numerous journals and websites, databases and search engines like pub med, Cochrane and science direct. The key words used were pica, soil eating and pregnancy.

The quality of the studies varied, some carefully explained their methods which gave rise to meaningful conclusions. Others used inappropriate methods to answer their research question resulting in findings that were not relevant.

SOIL EATING----- ORIGIN

The term pica comes from the Latin word meaning magpie, presumably named after the bird's peculiar eating behaviours; the magpie shows an indiscriminate preference

for foods and non foods. Pica of dirt and clay was known to the Greeks and the Romans and was recorded in a 13th century Latin work. Pica was first addressed in a medical book in 1563 where geophagia was described in pregnant women and in children. The subdivision geophagia, involves the consumption of earth, usually clay.

Pagophagia which is the consumption of ice or iced drinks is a novel manifestation of pica. (Aneli, B 1958.)

Early descriptions of the habit were given in Aristotle and Hippocrates. Interestingly, one of their concerns was the danger of consuming excessive quantities of cold or iced water and snow. (A.R.P. Walker 1997)

The Roman physician Soranus described how pica was used for the alleviation of subsequent symptoms and the unpredictable appetite in pregnancy, which can include a strong desire for extraordinary items of food. He noted that the need began around the fortieth day of pregnancy and persisted for some four months or more. He reasoned that the damage from substances which satisfies the desires in an unreasonable way could harm the foetus as well as the stomach (Jackson, 1988). During the 6th century AD, Aelius, Royal Physician to Justinian I, presented the first documented description of pica associated with pregnancy (Coltman, 1969).

In the 10th century AD Avicenna 'prince of physicians', considered that the abnormal need by some was benefited by 'iron steeped in fine wine and strained through a Hippocrates sleeve' (Coltman 1969). In the 18th century, when it was learned that the sultan of Turkey ate special

clay from the island of Lemnos, the Europeans quickly adopted the product as health food (Deutsch, 1977)

Soil eating though more prevalent within African Countries is practiced globally, this is the view of Beatrice Trum hunter(2007), as she puts it, In Nepal women in the villages, especially pregnant women, commonly consume some of the mud used to plaster their houses. Other mud is red, and is used for the lower parts of the houses. The women eat both types.

Although soil eating is usually associated with pregnant women in the southern states of America it is mostly found among descendants of African slaves who brought the custom to America, this behaviour is found throughout the world. Soil or clay eating has been reported among women, especially among pregnant women. It continues among Native Americans, too. In various parts of the world, and at different periods in history, entire populations have been known to consume soil.(Anderson, M.(2001)

Both in Sardinia and in Northern California, clay was added to a corn flour and water, to make traditional breads.

In earlier times, in Germany, a paste of very fine clay was substituted for butter and used to spread on bread by poor people.

In China, and elsewhere during times of severe food shortages, clay was eaten by large segments of the population. Some clays swell in water. Samples of such clays were identified in the "famine foods" in China.

In certain areas of northeast Brazil, the prevalence of anaemia in school-age children was reduced by having them eat clay. Chemical analysis revealed a high iron content in the clay they ate. (Today, iron supplements are added to their diet) The clays eaten by people in Tunisia and in the Congo were also found to contain high levels of iron.

Members of a tribe in Nigeria were known to make long journeys to a special area near Lake Chad to obtain kanwa, a certain type of soil that they ate and fed to their cattle. Nursing mothers were given a double ration. Infants from the age of eighteen months sucked lumps of kanwa.

Some individuals with pellagra, a deficiency of niacin (vitamin B3) and protein in the diet, obtained clay from special areas and carved it into sticks. They licked it as we lick candy. (Beatrice Trum Hunter 2007)

SOIL CONSUMPTION IN ANIMALS

Soil consumption is widespread among animals, too. Many bird species, herbivores and omnivores, but not carnivores consume soil. Bird carnivores, like humans who consume an abundance of animal products, do not practice geophagia. However, carnivorous animals may be seen at places where others assemble to seek soils for eating, because such sites offer good hunting opportunities.

Soil consumption among animals appears to be an instinctive means of overcoming nutrient deficit, and/or to remove

toxins from their foods. These features, too, appear in parallel with human experience. (Wong 1991)

Like humans, animals are very discriminating in the choice of soils that they select to eat. Gorillas and elephants may concentrate on favoured sites and return to them repeatedly. East African elephants are known to return to certain hillsides for iodine-rich deposits in the soils. Scientists have observed them and claim that these elephants are especially at risk of iodine deficiency. Even their mud-wallowing practice and habit of throwing mud on their hides may be an attempt to absorb some iodine through the rich blood supply in their skin. (Rainsville 1998)

Whole troops of Rwandan mountain gorillas visit sites several times a year to dig up and eat soil located high up on the side of a volcano. The area is rich in iron and sodium, two elements that generally are very low in mountain vegetation. Like all mammals living at high altitudes, gorillas need a good supply of iron to produce adequate numbers of red cells in their blood to maintain good health.

Many animals that eat clay can tolerate plants that contain naturally occurring toxins. The clay absorbs most of the toxins. Clays are ideal antitoxins because the very fine particles of the clay give them a large surface area to come into contact with the food toxins. The crystalline structure of the clay is layered with positively charged ions-mainly silicon and aluminium. Because many organic toxins also are composed of positively charged ions, they can exchange places with the ions in the clays and be

passed harmlessly through and out of the digestive system.
(Rose EA2000)

In many parts of Africa, domesticated animals commonly lick and eat soil. The farmers consider this practice natural and necessary for the good health and fertility of their livestock. If the animals do not eat earth in their own locality, the farmers herd them to other areas that have edible soils, or carry the soils to their animals.

Schatz (2006) reported that in experiments, several different clays were fed to rats. Some clay was able to compensate for deficiencies of calcium and other nutrients in the diet of nutrient-deprived rats. The clay-fed rats gained more weight than the control group. Also, they had stronger bones and suffered less tooth decay. The beneficial effects were due primarily to the calcium present in the clay. The effects varied depending on the type of clay

ETHIOLOGY OF PICA

The cause of pica behaviour has eluded researchers for centuries. Sayetta (1986), describes several theoretical approaches that attempt to explain the etiology from Nutritional, sensory, physiology, neuropsychiatric , culture, or psychosocial perspectives. Nutritional theories are most commonly cited, which attribute pica to specific deficiencies of minerals, such as iron or zinc levels whose pica behaviour diminishes with iron or zinc replacement, although the empiric evidence for zinc is less convincing than it is for iron. It is postulated that the red clay in

southern United States is used because of its high iron content, although clay has been shown to be an iron chelator and can aggravate the problem .Fisher et al (1994)

The sensory and physiologic theories centre on the finding that many patients with pica say they just enjoy the taste, texture, or smell of the item they are eating. Geophagia has been used to alleviate nausea by some patients and can give sense of fullness to patients who are trying to lose weight.

The neuropsychiatric theory is supported by evidence that certain brain lesions in laboratory animals have been associated with abnormal eating behaviours, and it is postulated that pica might be associated with certain patterns of brain disorder in humans.(Bateson, E. and Leroy 1978)

Iron deficiency and pica have been reported in association with celiac disease in children. Santos and Werlin (1996) describe four patients who each complained of vague abdominal symptoms of intermittent pain and loose stools. All patients required biopsy to confirm the diagnosis of celiac disease. The gastrointestinal symptoms, Pica symptoms, and anaemia all resolved with institution of a gluten-free diet. The authors believed that, in these cases, the pica was secondary to the iron deficiency, and the anaemia was due to malabsorption . Cases such as these lend support to the theory that pica results from a low iron state.

Psychosocial theories surrounding pica have described an association with family stress. Edwards et al (1964) found that pagophagia was associated with a smaller social support net work, and they hypothesized the behaviour to be a method of alleviating stress, In addition, many pregnant women in that study stated that eating freezer frost or ice helped during stressful times

Addiction or addictive behaviour has also been suggested as one possible explanation for pica behaviour in some patients. The evidence to support this view is that pica often persists after the physiologic cause is alleviated. If iron deficiency leads to pica, the pica behaviour should cease once iron is replaced. Cessation of pica behaviour with iron replacement does not happen often, however whether continued pica behaviour constitutes an addiction or simply a learned pattern of behaviour is unclear.

Recently, there has been some evidence that pica is a part of the obsessive-compulsive disorder (OCD) spectrum of diseases, which would lend support to neuropsychiatric theories. Case reports describe patients with severe mental retardation and obsessive-compulsive disorder patterns as well as patients of normal intelligence with obsessive compulsive disorder .Geisler et al 1999 describe five patients who were examined at outpatient anxiety disorder and obsessive compulsive disorder clinics.

These patients described their pica behaviour as one of the ritualistic behaviour they were compelled to carry out, and that eating the substance led to relief of tension or anxiety. Patients were treated with traditional therapy for

OCD, which consisted primarily of psychotherapy, although the effects on pica were variable. Four of the five cases responded to selective serotonin reuptake inhibitors.

Neurobiologic testing results (decreased serotonin metabolite concentration in cerebral spinal fluid and frontal lobe hypoactivity on SPECT (single photon emission computed tomography) for 2 of the patients were more consistent with problems with impulse control part of the spectrum of disorders in the OCD category. These case reports lend support to the concept that, in some patients, pica might be a manifestation of obsessive compulsive disorder.

In 1958, a global study of geophagia titled Geophagical Custom was presented by Swedish researchers Anell and Legerrantz . Their book presents another account of soil eating's relation to lack of minerals and to poverty. Their four categories of soil eating do include hunger as one factor but other three address soil as a spice and as a delicacy; as a medicine; and as the substance of ritual ingestion.

Anell and Lagerkrantz claimed that in Africa specifically, geophagia was widespread and fulfilled a variety of functions. It is thought to cure syphilis and diarrhoea; in some regions, young girls eat soil at the onset of puberty; pregnant women eat soil to guarantee a painless birth and dark skin for the child. In certain areas, criminals are forced to eat soil. The sacred earth is supposed to administer justice-if the condemned criminal is in fact guilty, he will fall sick or go mad.

From the bio logistic point of view, a diagnosed disease means a whole chain of preventive measures and consequences. The phenomenon is placed within a clinical universe. Traditions, rites and psychological factors are transformed into the consequences of physical disturbances.

If an extreme socio-anthropological point is integrated within culture, myths, rites, and traditions .the behaviour will be stamped as cultural. From a third perspective-which we could call Jacob Hold's perspective-the entire phenomenon can be reduced to hunger, which is itself a result of poverty.

Social existence determines all of a person's existence. Eating soil-in a strange way a very basic activity - eludes all these definitions. It is the hungry's last desperate attempt at assuaging their hunger. At the same time, extreme hunger does not automatically trigger a reflex to eat soil.

In descriptions of the origins of geophagia, there is a complicated weave of sociology (traditions, rites) psychology (hand to mouth behaviour), politics (poverty), and biologism (manifestation of deficiency). We are in the space where culture and disease overlap.

While walking through the streets of Johannesburg in 2002, Doctors Alexander Woywodt and Akos kiss were surprised to find small briquettes of red soil being sold among food items at the market. The soil was bought by young women as natural medicine. They wrote a report in a medical journal. In the report, they want to alert South African doctors

that geophagia is widespread in the region. They write that this anomaly - if it is an anomaly - cannot be understood from the explanatory perspectives offered-- extreme poverty, culturally sanctioned behaviour, or eating disorder

But the questions can never be answered. The researchers go out on the streets. They discover something astounding; humans are engaging in unusual activities. There are people out there eating soil. They alert colleagues but cannot explain it. The diagnosis vaporizes,. Geophagia slides back in to myth.(Margaret E Mills 2006)

PREVALENCE OF PICA

Globally, the available literature shows that the prevalence rate of pica varies from place to place and has been reported to range from 0 to 68% depending on the characteristics of the population studied. In a study involving 553 urban pregnant, otherwise healthy African - American women, Edwards et al (1994) reported that 8.1% of their respondents practiced pagophagia, no geophagia was reported.

A similar low prevalence rate (8.8%) involving geophagia and pagophagia was documented by al-Kanhal and Bani (1995) in a study involving 321 pregnant Saudi Arabian women. Other investigators who reported low pica prevalence rates included Simulian et al (1995) who documented 14.4% prevalence in a sample of 125 women from rural obstetric population in Columbus, USA; and Walker et al (1995) who recorded 2.2% and 1.6% prevalence rates respectively among the Indian and Caucasian pregnant women.

Some studies carried out in Western societies reported high prevalence rates in their subjects Lacey EP (1990), for example, recorded 38% prevalence in a study involving 128 pregnant women.

PICA----- **The African scene**

The practice of pica is widespread in Africa and is variously associated with medical treatment and with spiritual ceremonial behaviours

Explorers and missionaries reported on clay eating, dating from the 18th to the early 20th century. The practice has been observed in Nigeria, Ghana and Sierra Leone (Hunter, 1993).

Giant termite mounds are widely used in Zimbabwe and Zambia. These termites favour plateaux and rift valleys extend from Uganda to Natal. A clay of 100 feet is not uncommon in Zimbabwe, it is 50 feet in diameter and contained human skeletal remains which has been radio-carbon-dated at 670 plus or minus 100 AD. The alkalinity of the mound reserves the skeletal remains, in contrast to acidic soils which completely dissolve buried remains. This organic excreta from the termites is rich in minerals (Hunter, 1993).

The hard crust over the nest reduces water infiltration and leaching, thus pH levels are raised and mineral salts accordingly are increased. Concentrations of calcium carbonate, magnesium, nitrogen, potassium and other

extractable salts are also raised so much so that agricultural scientists in central Africa have used the mound for fertilizer. A large mound will supply pregnant women in surrounding villages with clay for years.

The practice is common in southern Africa, among both rural and urban expectant mothers. In South Africa the practice is most frequently among African mothers, but it is also found in Indian and coloured mothers (Walker et al, 1985). The frequency of pica among urban and rural African women was reported to be 38.3% and 44.0% respectively. In comparison, the prevalences among the India, coloured and white women were low- 22%, 4.4% and 1.6% respectively (Walker et al, 1985).

In Malawi it is reported to be surprising for a pregnant woman not to practice pica 'since this is how a woman knows that she is pregnant'. The taste of a clay is claimed to diminish the nausea, discomfort and vomiting in 'morning sickness' clay is normally only consumed during pregnancy and not between pregnancies (Hunter, 1993).

In many parts of Africa, urban women travel to particular rural areas to collect clay and termite soil to sell in the city. As an example, in Lusaka, Zambia, women wholesalers travel to the copper belt of Chingola, a 500 mile round trip to buy clay. A woman may purchase up to four 50kg sacks. The clay is separated into smallest pieces which are then sold at retail stalls in the cities of Southern Africa. Many white physicians do not appreciate the extent of practice, although they treat many Africa patients in pregnancy (Hunter, 1993).

Clay-eating is widespread among pregnant women in five countries, Malawi, Zambia, Zimbabwe, Swaziland and South Africa. In rural areas an estimated prevalence level is 90%. Between child bearing periods, clay consumption seems to be reduced or stopped altogether. There are few women who never take clay. One woman in rural Zimbabwe, 23 years old, married, did not take clay- from the fact that she has never conceived she regarded herself as barren. Certain sites are more favoured than others. A child on its mother's back will put a piece of clay in its mouth as it would a piece of candy.

In a Shona village, north of Harare, Zimbabwe, it was reported that village women variously and interchangeably consume at least six different types of locally available clay in this connection, a premium is placed upon 'smoothness' and on the absence of 'gift'. Often smoked over a fire, clays are powdered and kept in the house in a container or a twist of plastic (Hunter, 1993).

In South Africa, the case recorded is of a woman eating 400ml of soil 'almost every day' in the early morning. She complained of menorrhagia, which may have accounted for her chronic iron deficiency (Krengel and Geyser, 1978). In Washington DC, among Afro-America women, it was reported that large quantities of ice and freezer frost were consumed by women, half to two cups a day for between one and seven days per week. This resulted in serum ferritin levels of pregnant women becoming significantly lower during second and third trimesters of pregnancy (Edward et al, 1994).

A further study concerning pica and iron deficiency is reported from Reunion, Madagascar, of 16 African girls and one boy with pica, 15 were found to have anaemia and/or iron deficiency iron . Blood loss was considered as a possible cause in all patients, of the patients thirteen ingested large amount of raw rice and eleven ingested ice cubes; ten ingested both. Mean serum ferritin was 7.1ng/ml and haemoglobin value was 8.7g/100ml. Menstrual bleeding was excessive in eight girls. All were treated with adequate amounts of iron, pica disappeared within one to two months of treatment in all but one of the patients, biochemical evidence of iron deficiency persisted in some patients (Giudicelli and Combes, 1992).

Prevalence among children

Pica is commonly found in metabolically unbalanced, malnourished and inadequately supervised children (Garcia et al, 1987), but it may occur in children of all levels of intelligence (kolandaivelu and balan, 1979). During childhood, 80% of all gastrointestinal foreign bodies occur in children below 10 years of age: the occurrence is highest in children under two years of age (Garcia et al, 1987). Carelessness or indifference on behalf of the parents may contribute to the continuation of this habit as the child matures. Alternatively, in certain circumstances, such behaviour may be condoned because, for example, of a belief that dentition is facilitated by the chewing of hard objects (Kolandaivelu and Balan, 1979).

Prevalence of the practice is slightly higher among boys than girls. As already mentioned, geophagia is a natural habit among infants who crawl and eat whatever they can

pick up. Usually the total amount of earth eaten is small and insignificant (Hawass et al, 1987).

In the US, in Pittsburg, Pennsylvania, the prevalence of Pica among 100 children, one to six years of age, was found to be 71%. A significant association was found between faeces, soil or grass pica and an elevated Toxocara antibody titer. Paint or plaster pica was significantly associated with elevated blood lead level. The author suggested that the high prevalence could be attributed to the lower socioeconomic status and the liberal definition of pica that was used (Glickman et al, 1981).

In West Africa pica, particularly the chewing of pieces of wood was reported as common. The urge was for something hard to chew upon. The habit began even before the age of one year. After the wood had been softened, it was used by older people to rub accessible dental surfaces. Dental decay was absent (Neumann,1970).

Prevalence among women

In 1825 the practice of geophagia was reported as a public health hazard in the southern states of the north America (Mokhubo, 1986) it is thought that geophagia occurred largely via the slave trade between Africa, and the Americas (Vermeer and Prace, 1979). In America, geophagia is more common among Afro-American women (Mokhubo 1986) and those living in rural areas.

In rural Holmes Country, Mississippi, it has been reported that geophagia is a common custom stemming from deeply imbedded cultural traditions and attitudes in this

community the practice prevailed in 57% of women and in 16% of children in both sexes. The average daily intake of clay consumed by the women was approximately 50g.

Geophagia was not correlated with hunger, anaemia, nor helminthic problems. It was thought that it could contribute to the development of hypertension. It was apparent that the mother and the other women in the household played a primary role in the transfer of geophagia from one generation to the next. Mothers pacified a whining child by giving it clay to eat and children quickly adopted the practice. Social norms permitted geophagia among young children of both sexes. As children matured the practice was discouraged by mothers. During puberty or pregnancy, women resumed the practice and in adulthood geophagia was exclusively associated with women (Vermeer and Frate, 1979).

In Jamaica, in 1992, in a study on the dietary habits of rural women during pregnancy, it was noted that 15 of the 38 pregnant women questioned reported cravings, common craving included stone (20%), cigarette ash (13.3%) and drinking soda (13.3%) craving for marl, raw oats, green mango, baby powder, sulphur and ash were also reported (Melville and Frances, 1992). The main reasons given for craving a food item were 'I feel like eating' and 'I get to like it'.

Because of the absorptive capacity of some clays, geophagia has been practised as a relief of diarrhoea and stomach discomfort (Barteson and Liebroy, 1978; Morgan, 1984). In

third world countries, where the diet may be sufficient, clay has been eaten for a society effect (Morgan, 1984).

In Australia some Aborigines eat white clay which is found only in the beds of rivers, fresh water springs and billabongs of the coastal areas of the Northern Territory. This practice is not associated with a perversion of appetite, neither with anaemia nor with pregnancy, but is used mainly for medical purpose (Bateson and Lebroy, 1978). The clay eaten consists mainly of aluminium silicate (92.6%) and is similar to the clay used in kaolin preparations. Clay is also eaten to 'line the stomach' before eating yams, or fish which may be poisonous, to allay hunger and to treat hookworm infestation (Bateson and Lebroy, 1978).

In the southern states of the US, pregnant women who traditionally ate substances such as clay, corn starch and baking soda, believed that such substances helped to prevent vomiting, helped babies to thrive, cured swollen legs and ensured beautiful children. Birthmarks are thought to be the result of an unsatisfied craving (McLoughlin, 1987). Clay eating has spread from rural areas into the cities where it is sometimes obtainable from supermarkets or, alternatively, is mailed from home. When clay is unavailable, laundry powder is sometimes used as a substitute (Roselle, 1970; Crosby, 1976).

In Kenya, some published works on pica prevalence in pregnancy have been those of Giessler et al (1999) which investigated geophagia in pregnant women attending

antenatal clinic at Kilifi District Hospital in Coast province, Kenya at different times. The other study by Ngozi P.O (2000) involved 1071 pregnant women, 74.0% reported eating soil regularly..

Lithophagia is another form of pica that is reportedly being practised by both pregnant and non pregnant women in Kenya. This involves eating 'odowa', a light yellow soft stone reportedly dug out from excavation sites at Kajulu hills in Kisumu district and cut out into chips (odowa chips) for consumption. Ajanja in a newspaper documentary reported that "odowa" eating has spread to major towns in Kenya and beyond and that the stones are sold at the roadside, in the markets and shopping malls. According to the local people there is a believe that the soft stones increase the women's strength during labour hence pregnant women take them as iron supplement and as a tonic. The practice of "odowa" eating in Kenya has however not been investigated empirically. (Ngozi P O 2000)

COMPLICATIONS OF PICA

The effects of pica have been classified into five groups:

- (1) inherent toxicity,
Including direct toxic effects of substances such as lead or other heavy metals;
- (2) Obstruction, such as may be seen in trichophagia (hair eating)
- (3) Excessive calorie intake, generally related to amylophagia (starch eating)
- (4) Nutritional deprivation, such as eating clay instead of nutritive foods; and

(5) Other, such as parasitic infections and dental injury.

Types of Complication include;

Inherent toxicity	metabolic abnormalities, such as heavy metal Poisoning, hypokalemia or hyperkalemia, iron and zinc deficiency, other vitamin deficiency
Obstruction	Gastric or intestinal obstruction from bezoar, Foreign body, faces, or parasites, with Subsequent perforation, peritonitis and death
Excessive caloric intake	Starch eating, excessive craving for food items
Nutritional deprivation	Failure to thrive, achlorhydria
Other	Dental injury, parasitic infections (Sayetta R. 1986)

Iron deficiency-----How does it come about?

Crosby (1976b), citing the study of Coltman (1969), proposed that pica is a symptom of iron deficiency, He estimated that more than 50% of patients with iron deficiency practice pica of one kind or another, usually ice or food pica (Crosby, 1976; Crosby, 1976b). However, clinical studies have been unable to ascertain whether geophagy is the cause, or the result, of particular deficiencies (Johns and Duquette, 1991). Ingested clay or soil may either chelate iron or displace nutrients thereby contributing to the development of deficiency (Mokhobo, 1986). The theory is supported by some studies which report a rapid resolution of the eating disorder following iron therapy (Korman, 1990). However, the exact relationship between iron deficiency and pica remains unclear (Mokhobo, 1986; Johns and Duquette, 1991).

In the US in a study on Afro-American children in Washington, it was found that children in had significantly lower haemoglobin concentration ($p=0.01$), lower plasma levels of ascorbic acid ($p<0.05$) more anaemia in infancy ($p<0.05$), and less adequate diet overall, compared with the situations among controls from the same socioeconomic background. Pica was also associated with unfavourable familial and environmental circumstances. However, it was unclear whether pica per se was the primary cause of poor nutrition in this population (Gutellus et al, 1962). In the same study, in which 148 children were investigated, pica was practised by 55%. There was no inferiority anthropomerically in the pica group (Gutelius et al, 1962).

In a study made on 53 anaemia women in Mafikeng, Northwest province, south Africa, 10 were found to have pica and were ingesting dry soil and paper. Within this group, eight patients had severe iron deficiency anaemia of unknown cause while two patients had pregnancy-related anaemia, of mixed origin, caused by iron and folic acid deficiencies, characteristics of the patients with pica included severe anaemia, young age, normal psychiatric assessment, good nutrition and lack of an overly disadvantaged social background (Mokhobo, 1986). After the treatment for anaemia, incidence of pica did not recur (Mokhobo, 1985).

A common explanation for the behaviour of geophagy is that it is a homeostatic physiological response to a nutritional deficiency. The homeostatic theory has been observed in other conditions; diabetics drink large amount of water, people with thyrotoxicosis have polyphagia; and patients with Addison's disease crave salt (Deursch, 1977).

Deficiencies of specific nutrients, such as iron and zinc (Korman, 1990; Johns and Duquette, 1991), copper, protein and calorie intake (McLoughlin, 1987) have been linked to geophagia, which lack of iron may account for a proportion of patients with Pica, it is interesting that often the craved substances have low iron content (Deursch, 1977).

Zinc deficiency

In china, low level of zinc in hair and blood were reported in pre-school children aged one to six years. Then with low level of zinc had a high frequency of pica, anorexia and retarded growth, as compared with levels in the well-nourished children supplementation with zinc sulphate significantly increased plasma and hair zinc levels, reduced pica improved appetite and increased growth rates in growth retarded children. Because the placebo efforts on pica have been reported previously, the authors recommend that the results should be interpreted with some caution. However they concluded that their findings indicate that zinc deficiency can be due to pica among young children (Xecun et al, 1985).

Other metabolic abnormalities associated with pica include zinc deficiency, as described above. Hyperkalemia was noted in a renal failure patient who ate sandstone. (Griffith J.1994). Ergun et al 18 explored the possibility of a relation between geophagia and liver damage, because early reports of pica syndrome included hepatosplenomegaly . Of the 38 patients with pica in the Ergun et al (1993) report, none had liver abnormalities. In children, a common problem associated with pica is lead poisoning related to unintentionally eating lead-based paint chips or the soil

surrounding a home painted with lead-based paint. (Waller BR1995) Helminthic infection, causing eosinophilia and gastrointestinal symptoms, has been described as well. In fact, in a study of Jamaican children with pica, worm infestation was found in more than 70%.

Intestinal obstruction can be caused by pica, either as a result of numerous parasites or more commonly trichobezoars. Patients with trichobezoars are typically women younger than 30 years, most of whom do not have a psychiatric disorder. (Castiglia P .T 1993)

Diagnosis of pica

Discovery of pica behaviour in a particular patient can be difficult. In the absence of complications that might signal such eating pattern, diagnosis depends on self-reporting. Patients are likely to underreport pica's behaviour because of embarrassment or because they are not aware that such behaviour might be worth reporting. More often, the diagnosis is made when the patient has complications, such as anaemia, lead poisoning, intestinal obstructions, or other metabolic conditions. Even in patients who have these complications, the diagnosis could easily be missed without a high degree of suspicion. In a study of 38 cases of pica, certain clinical cases were frequent, such as anaemia, splenomegaly, spoon nail, and growth retardation.

Physicians should give patients suspected of pica behaviour a thorough physical examination, looking for the above findings, and should obtain blood tests, such as

complete blood count, peripheral smear for eosinophilia, iron level, ferritin level, lead level, electrolytes, and liver function tests. Abdominal radiographs might be necessary to evaluate for intestinal obstructions from either bezoars or parasites. Stool samples can be used to rule out ova and parasites. Even when armed with all these tests, the diagnosis of pica requires that the patient (or parent of the patient in the case of children) admit to the behaviour, because all these clinical findings are non-specific. (Rose et al 2000).

When evaluating children, parents should be interviewed about dietary habits and pica behaviours. An open discussion with the child about favourite food, followed by specific questions about ingestion of non-food substances, might aid in the diagnosis. If pica is suspected, but parents are unaware of such behaviours, the physicians can ask them to keep an observational log of the child's solitary outdoor play. This log can reveal possible pica behaviours as well as give the physician some idea of the degree of the parental involvement with the child; it might also help to rule out a pattern of neglect that has been speculated by some investigators to be associated with pica in children. (Singh S1981)

If OCD (or impulse control) symptoms occur in an adult or child pattern, an assessment of pica symptoms is advised. Similarly, patients with pica should be assessed for DSM-IV OCD and impulse control symptomatology. Obsessive compulsive disorder is characterized as obsessive risk avoidance, with ritualistic behaviours aimed at avoiding injury or illness. Impulse control disorders are typified

as increased risk-seeking behaviours, with increasing tensions before the behaviour and relief of tension and gratification after the behaviour. (Stein DJ1996)

Treatment

Physicians must be prepared for cases of pica in their daily practice. Education about nutrition, along with iron therapy or transfusions, might be the first wave of intervention; psychological counselling or behaviour therapy can also be useful adjuncts.

Behavioural interventions, such as reinforcement for eating from a plate or punishment for engaging in pica, have been effective in children with developmental disabilities. (Fisher WW 1994) . Parents can be instructed to provide close supervision of children during play and to child-proof their homes (e.g., remove lead-based paints) and play environments (e.g., remove sand boxes that contain animal faeces).

Although pica in adults and children tends to remit with time, physicians should treat the condition when it occurs and causes complications, then possibly using a combination of psychotherapy and selective serotonin-reuptake inhibitors. Not all forms of pica are dangerous, and some might not require intervention. A high index of suspicion is required to make the diagnosis. Severe or recalcitrant cases could require referral to a mental health specialist.

Medical benefits of pica

Although nutritionists and other observers have tended to view geophagy, and pica in general, as a compulsive craving and as a medicine to alleviate discomfort. In some respect, the partaking of clay is not different from that of other treatments pursued in attempting to modify their physiological or pathological state. Clay could absorb dietary toxins and bacterial toxins associated with gastrointestinal disturbance associated with pregnancy. Geophagy could play a useful role in its proper context and could be appreciated as a normal human behaviour (Hunter, 1993).

Some impression of the mineral benefit can be estimated by assuming a pregnant woman consumes 40-100g of clay per day, a not uncommon intake. White copper belt clay of this amount contributes 15mg calcium, 48mg iron, 42ug zinc as well as small amounts of copper, chromium, nickel and molybdenum. These amounts are nutritionally significant where dietary deficiencies exist for females, the white clay, at an upper consumption rate of 100g per day, would supply 3.22% of Recommended Dietary Allowances (RDA) for iron, 70% copper and 43% of manganese (Hunter, 1993).

Some regard geophagy as a positive environmental adaptation, when viewed in the context of marginal maternal diets, chronic maternal needs, burdens of parasitic disease, heavy manual work, repeated pregnancies and lactations, endless child care and maternal exhaustion (Hunter, 1993).

Clearly, as many authors have stressed, pica will remain a fascinating subject, in which our knowledge and understanding are far from complete.

PART III
METHODOLOGY

CHAPTER 3

METHODOLOGY

This chapter explained the methods and materials used for the study. It's divided into the following subheadings, study design, study population, setting, sampling methods, questionnaire development, sample size, pilot study, data collection, data analysis, reliability, validity, objectivity, bias and limitation, and Ethical Considerations.

Study Design

A cross-sectional descriptive quantitative survey was conducted in rural area of Limpopo province. This study was designed to measure certain phenomena e.g. events, behavior, attitudes in a population of interest (Ann Bowling 2002). This type of surveys is called descriptive surveys because the information is collected from a sample of the population of interest and descriptive measures are calculated (Mosor and Kalton 1971).

Study Population

All pregnant women who attend the antenatal care in Mecklenburg Hospital during the study period participated. These pregnant women mainly come from Moroke, Gamashishi, Mashabela, and Bogatladi villages in sekhukune district of Limpopo province

Setting

The study was carried out in Mecklenburg Hospital, a district Hospital located in Sekhukhune district of Limpopo province. The Hospital runs daily antenatal care with an average of three hundred antenatal cases monthly.

Sampling Method

The sample was collected using conservative sampling method, which involves taking every subject who presents herself over a specified time period. These are not strictly random techniques but they avoid selection bias (Practical Guideline for Health Research, Mahmoud F Fathalla, WHO, Cairo 2004).

Question Development

The questionnaire was designed based on the publications already cited and reasons obtained verbally from the pregnant women who attend antenatal care in Mecklenburg hospital.

Sample Size

Yamane's (1997:886) formula was used to calculate the sample size:

$$n = \frac{N}{1 + N(e)^2} = \frac{860}{1 + 860(0.05)} = 273$$

n= sample size

N= population of pregnant women attending the antenatal clinic within three months.

E= Sampling Error = 5%

Pilot Study

The study was piloted using ten patients who were randomly selected from the antenatal care population in Mecklenburg Hospital. Questionnaires were administered and information obtained was analyzed, this was used to strengthen the validity of the study design, problems encountered in this were corrected in the main study.

Data Collection

The interviews were conducted by two trained research assistants the language of communication was Sepedi which is the local language in this locality. A sepedi teacher translated the questionnaire into sepedi with a bachelor degree in Sepedi (Appendix). Two people were trained to administer the questioners to the pregnant women. Every file of any pregnant woman interviewed was marked. This makes it easier to identify persons already interviewed.

The total number of pregnant women to be interviewed was 273 and this includes both those who eat soil and those who do not eat soil. The interview process begins with a verbal question to determine whether the woman eats soil, if the answer is yes, the interviewer goes ahead to ask all the questions as they appear in the questioner, if the answer is no then it is noted and the interview process stops at that point, this helped in calculating the proportion that eat soil. All questions are to be filled by the interviewers as they obtain data from the pregnant women.

Data Analysis

The data was entered and analyzed using EpiInfo 2002 and STATA version 7, respectively. Frequency and percentages were used for data interpretation. Cross-tabulation using Chi-square test or Fisher's Exact Test was used for determining the relationships between variables. Statistical significance was determined by $p < 0.05$.

Reliability, Validity, and Objectivity

These were enhanced through verification of data and sample by the researcher. The questionnaire was translated into Sepedi and subsequently back to English by another Sepedi teacher. A statistician with the University of Limpopo was involved and calculates the correct sample size. Accurate description of every step in the research process enhances its reliability.

BIAS AND LIMITATIONS

Including all pregnant women presenting in the hospital during the study period minimized selection bias. Recall bias was minimized by providing the two types of soil popularly eaten in this locality and the various sizes of the soil being taken to patients. Language bias was minimized by the use of people quite proficient in English language and Sepedi and the use of validated translation of the questionnaire in Sepedi.

ETHICAL CONSIDERATIONS

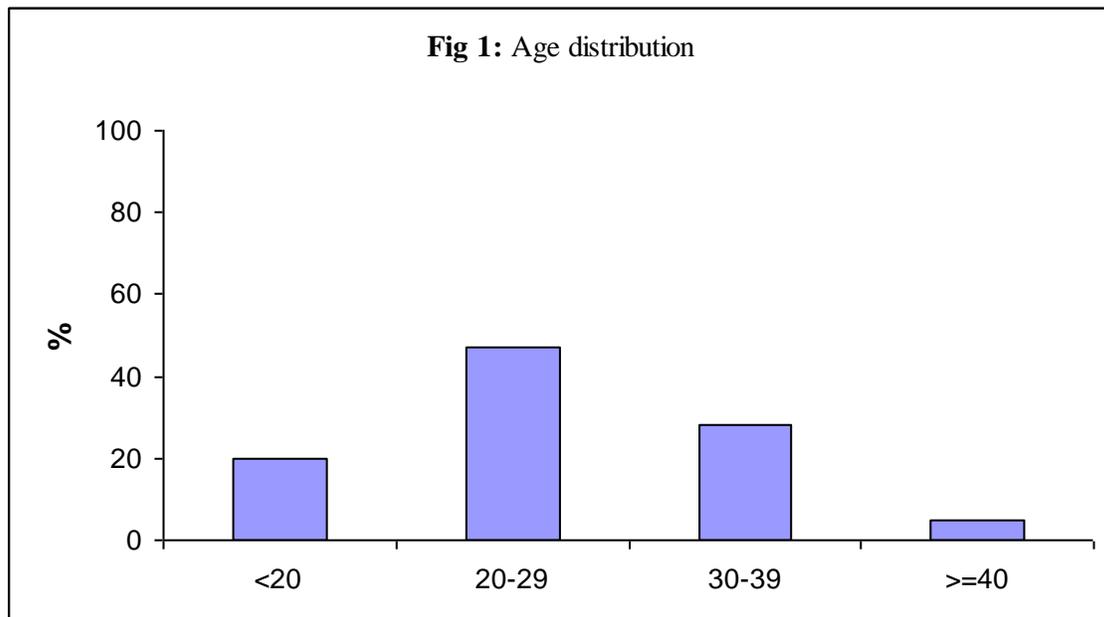
Permission to conduct the study was sought from the REPC, MEDUNSA. Written consent was obtained from all the participants using the standard University of Limpopo consent form.

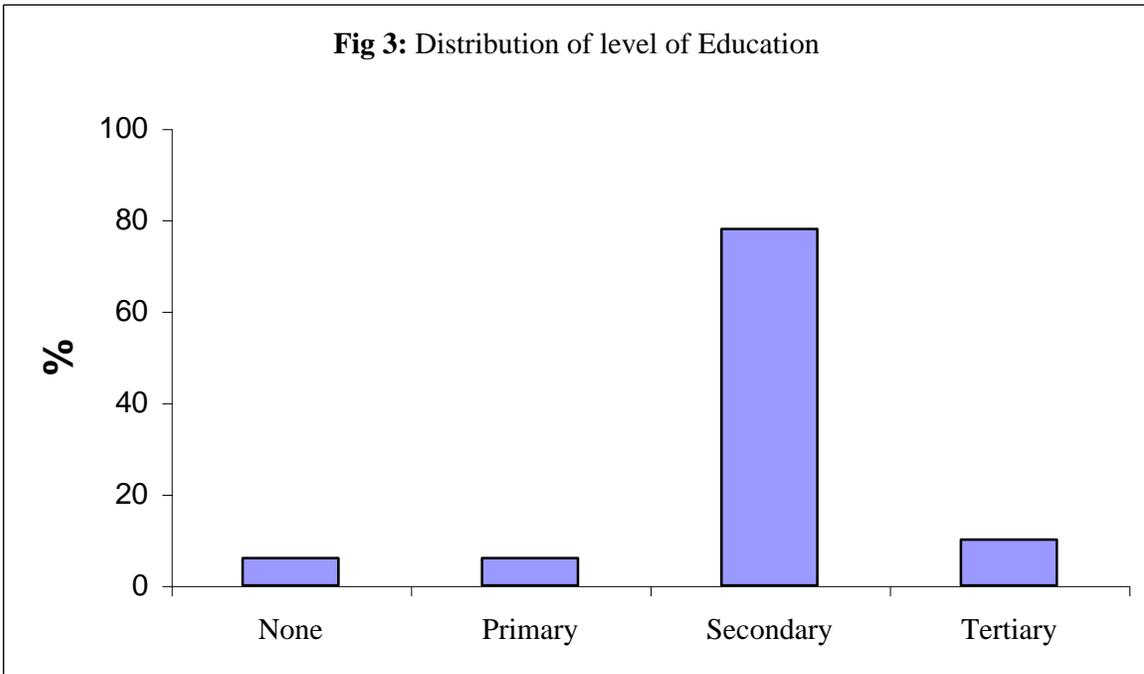
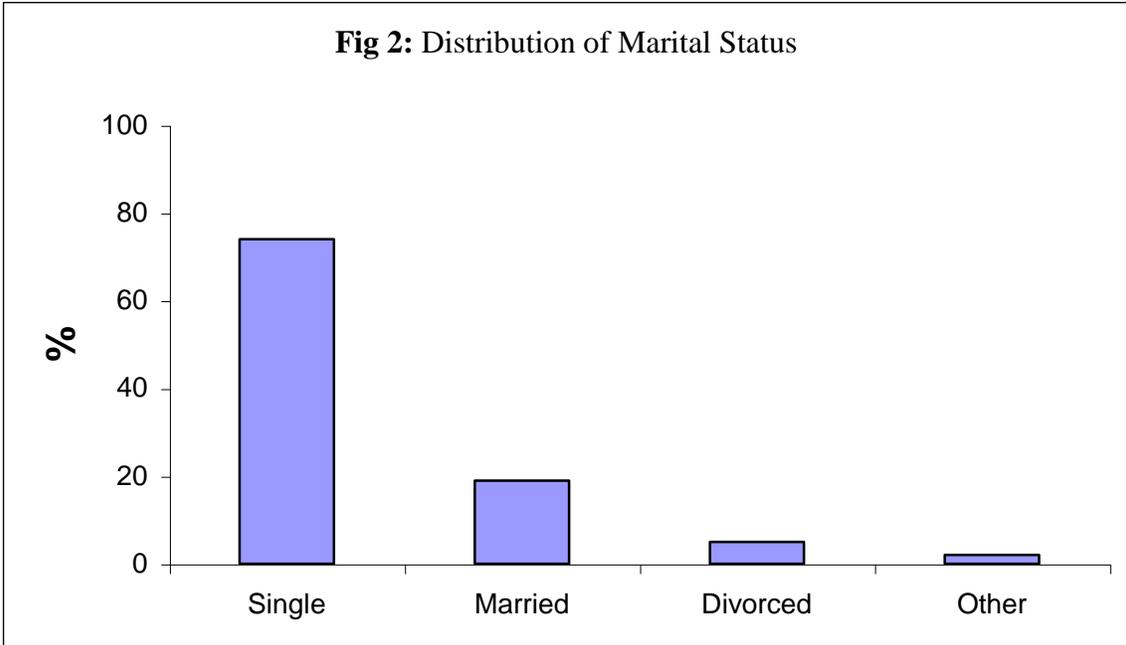
PART IV
RESULTS OF THE STUDY

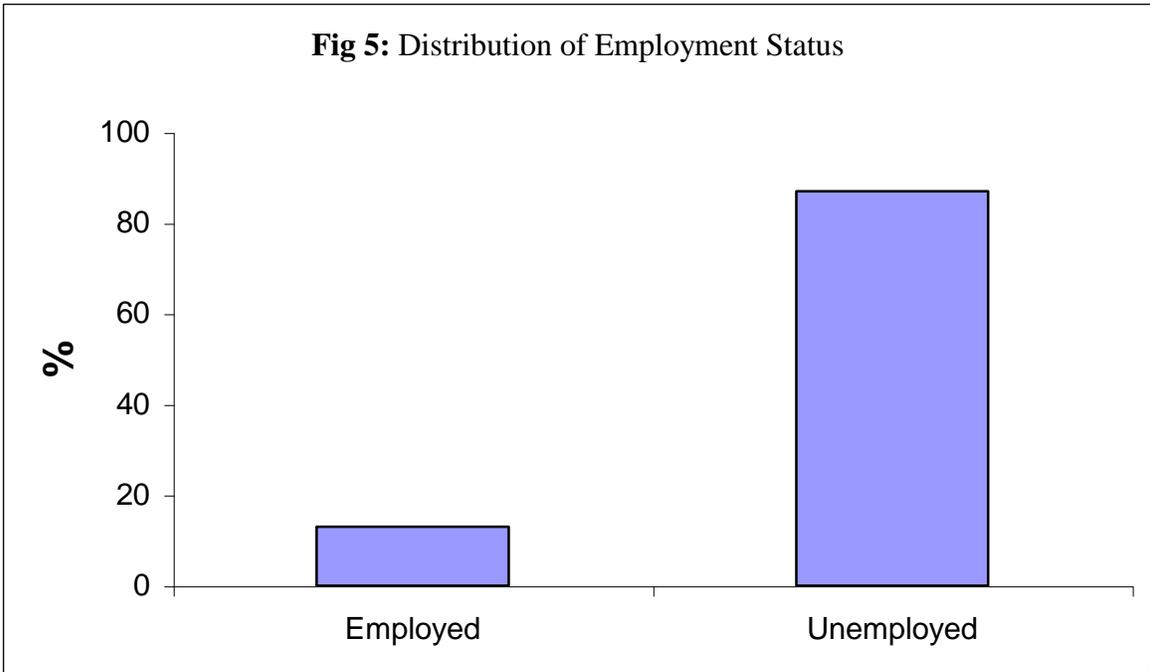
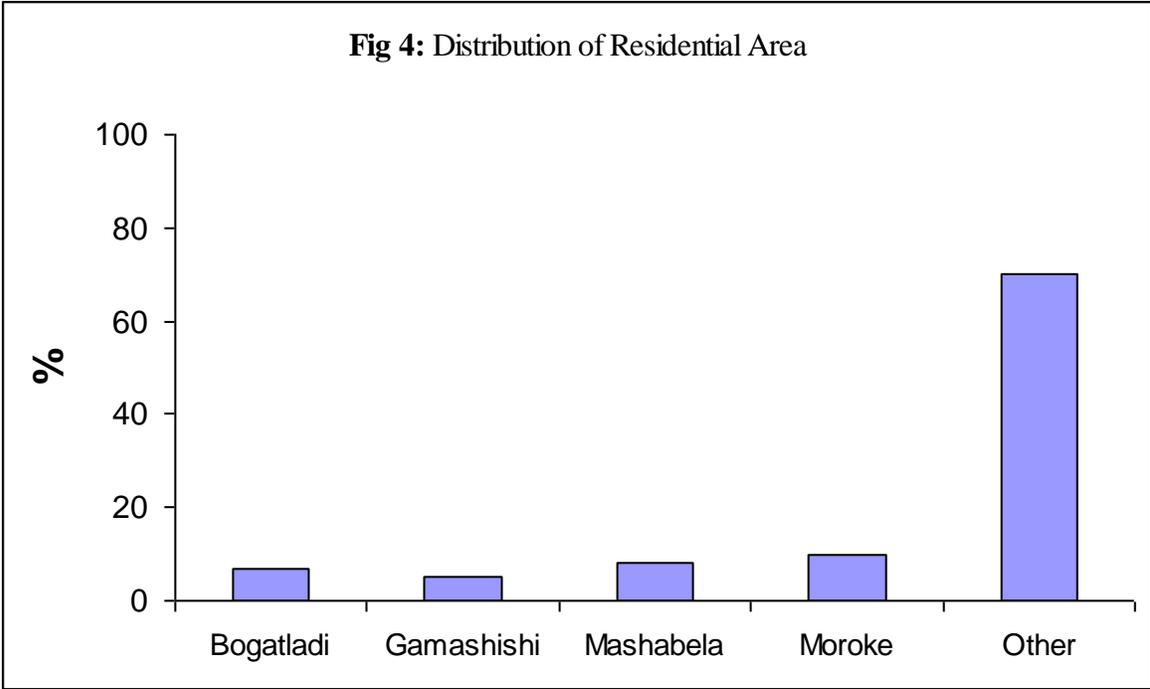
CHAPTER 4

RESULTS

In the previous chapter, the methodology used for the study was outlined. This chapter presents the results of the study. Information regarding participant's demographic information, reasons given for eating soil, and the association between reasons given for eating soil and educational status were also presented in the current chapter.







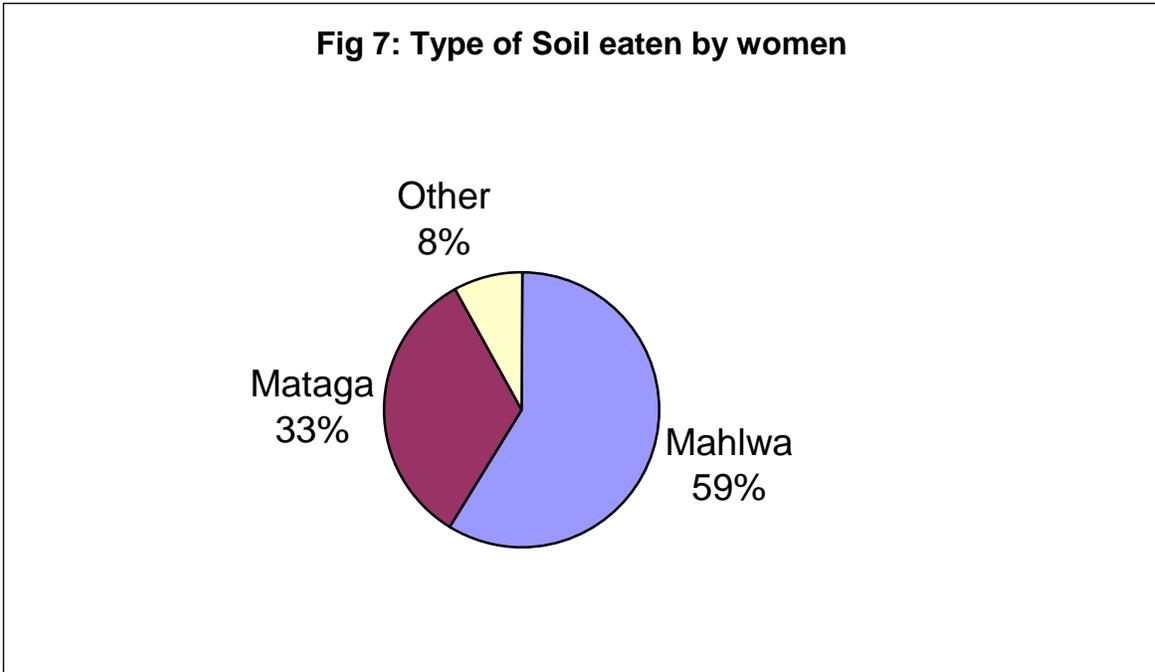
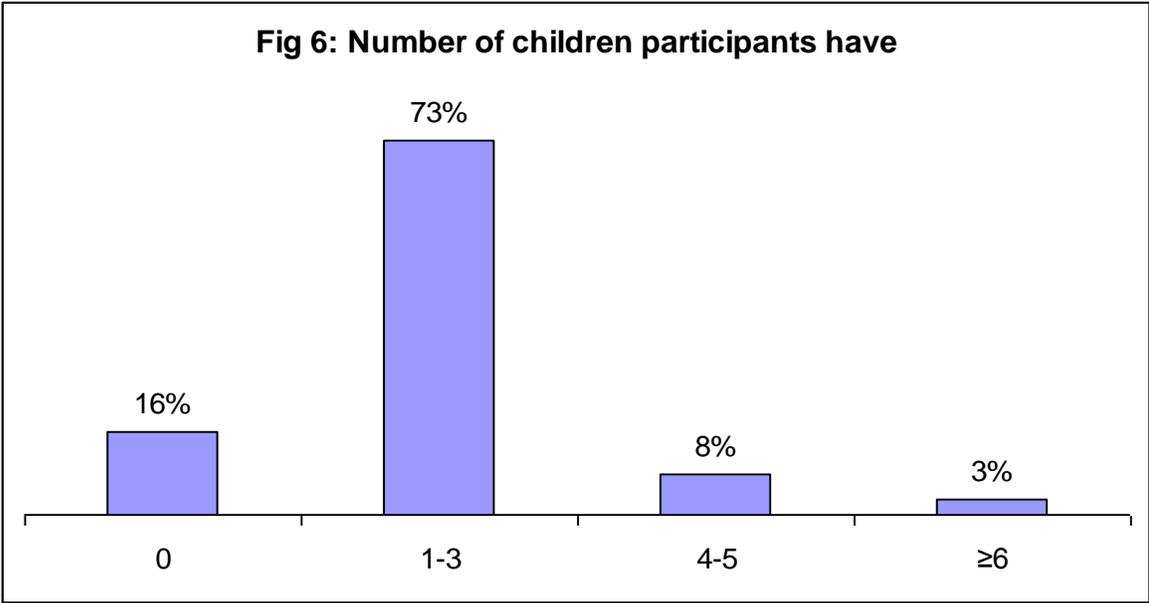


Table 1: Reasons for eating soil, (%)

	Disagree		Neutral		Agree	
	No	%	No	%	No	%
Nutritional:						
Soil eating gives energy	18	8	38	16	176	76
Soil tastes nice	14	6	37	16	181	78
Soil makes the pregnant women feel strong	19	8	30	13	183	79
Soil makes stomach feel full	24	11	26	11	182	79
Fetal reasons:						
Soil protects unborn baby from poison	14	6	42	18	176	76
Soil gives nutrients to unborn baby	22	10	35	15	175	75
Soil can harm unborn baby	113	49	65	28	54	23
Mother's issue:						
Soil prevents prolonged labor	21	9	32	14	233	77
Soil stops morning sickness	24	10	38	16	170	74
Soil enhances fertility	26	11	38	16	168	73
Soil enhances femininity	28	12	44	19	160	69
Soil can harm pregnant women	116	50	64	28	52	22

Scales were combined as follows: strongly disagree + disagree = Disagree; strongly agree + agree = Agree

Table 2a: Nutritional reasons for eating soil by educational status, (%)

		None/ Primary, n=28	Secondary, n=181	Tertiary, n=23	P-value
Soil eating gives energy	Agree	82	77	61	0.278
	Neutral	11	17	22	
	Disagree	7	6	17	
Soil tastes nice	Agree	75	80	70	0.025
	Neutral	11	17	13	
	Disagree	14	3	17	
Soil makes the pregnant women feel strong	Agree	79	80	70	0.225
	Neutral	14	13	9	
	Disagree	7	7	21	
Soil makes stomach feel full	Agree	75	79	78	0.571
	Neutral	7	12	9	
	Disagree	18	9	13	

Table 2b: Fetal reasons for eating soil by educational status, (%)

		None/ Primary, n=28	Secondary, n=181	Tertiary, n=23	P-value
Soil protects unborn baby from poison	Agree	78	77	65	0.195
	Neutral	11	19	22	
	Disagree	11	4	13	
Soil gives nutrients to unborn baby	Agree	68	77	69	0.160
	Neutral	25	15	9	
	Disagree	7	8	22	
Soil can harm unborn baby	Agree	36	22	22	0.522
	Neutral	21	28	35	
	Disagree	43	50	44	

Table 2c: Mother's issue for eating soil by educational status, (%)

		None/ Primary, n=28	Secondary, n=181	Tertiary, n=23	P-value
Soil prevents prolonged labor	Agree	68	80	70	0.129
	Neutral	22	13	9	
	Disagree	11	7	22	
Soil stops morning sickness	Agree	61	77	56	0.022
	Neutral	21	16	17	
	Disagree	18	7	26	
Soil enhances fertility	Agree	61	76	61	0.149
	Neutral	21	16	17	
	Disagree	18	9	22	
Soil enhances femininity	Agree	57	71	61	0.080
	Neutral	18	19	17	
	Disagree	25	9	22	
Soil can harm pregnant women	Agree	25	22	22	0.879
	Neutral	22	28	35	
	Disagree	54	50	43	

PART V

INTERPRETATION OF THE RESULTS

CHAPTER 5

INTERPRETATION OF THE RESULTS

In the previous chapter the results of the study were presented. In this chapter an interpretation of the results of the study is given.

Demographic Information:

Fig 1-5 shows the demographic information of the study population. A total of 273 pregnant women participated in the study. Of these, 232 (85%) eat soil.

Age Distribution: Forty-seven percent of women who participated in the study were in the age group 20-29 years, 28% were in the age category 30-39 years, and only 20% of women were less than 20 years. The mean age was 26 years , ranged from 14 to 46 years.

Marital Status: The majority (74%) of the participants was single, 19% were married, and only 5% were divorced.

Education Level: Seventy-eight percent of the study participants had secondary education, 10% had tertiary education, and only 12% had primary and/or no education.

Employment: About 87% of the women were unemployed.

Place of Residence: Eighteen percent of women who participated in the study come from Mashabela and Moroke, 12% from Gamashishi and Bogatladi and seventy percent from other villages.

Type of Soil eaten by women: The types of soil eaten by women in this study were mohlwa (59%), mataga (33%), and other (8%).

Number of children women have: Seventy-three percent of women have 1 to 3 children

Reasons for eating soil:

Table 1 presents the reasons given by study participants for eating soil.

Nutritional reasons for eating soil: Seventy-six percent of women said eating soil gives energy, 78% said it tastes nice, 79% it makes pregnant women feel strong, and 79% said soil makes stomach feel full.

Fetal reasons for eating soil: The study participants also said that soil eating protects unborn baby from poison (76%), 75% said it gives nutrients to unborn baby, only 23% believed that soil can harm unborn baby.

Mother's issue: Some other reasons given by pregnant women for eating soil were, soil prevents prolonged labor (77%), it stops morning sickness (74%), it enhances fertility (73%) and femininity (69%), and only 22% said soil can harm pregnant women.

Reasons for eating soil by Educational Status:

Fetal reasons for eating soil: The study also determined the association between level of education and reasons given by women for eating soil. Although it appears that few (61%) of the women with tertiary education have said eating soil gives energy, this is not statistically significant. Soil makes pregnant women feel strong and soil makes stomach feel full were not significantly related to education level. Soil tastes nice emerges as a significant factor ($p=0.025$) with fewer (70%) women with tertiary education saying soil taste nice (**Table 2a**).

Fetal reasons for eating soil: Table 2b presents the fetal reasons for eating soil by educational level. Soil protects unborn baby from poison, gives nutrients to unborn baby, and can harm unborn baby were not statistically significant.

Mother's issue: Soil stops morning sickness was significant; with fewer (56%) women with tertiary education agree with the statement. Few women with none and/or primary education believe that soil enhances femininity ($p=0.080$). The following statements were not significant, soil prevents prolonged labor ($p=0.129$), soil enhances fertility ($p=0.149$), and soil can harm pregnant women ($p=0.879$) Table 2c.

PART VI
DISCUSSION/CONCLUSION

CHAPTER VI

DISCUSSION/CONCLUSION

Chapter five presents the interpretation of the study findings. This chapter covers the discussion and the conclusion of the study.

Demographic Information

In this cross-sectional descriptive study of pregnant women who eat soil seen at Mecklenburg Hospital, we found that of 273 pregnant women interviewed, 85% eat soil. Their mean age was 26 years, ranged from 14 to 46 years. Seventy-four percent were single, 78% had secondary education, 87% unemployed, and all were living in rural area. The majority of these women had 1 to 3 children.

Types of soil eaten

The study has indicated that the types of soil eaten by these pregnant women were mohlwa, and mataga.

Reasons for eating soil

More than seventy percent of women, who participated in the study, reported that soil eating gives energy, taste nice, makes pregnant women feel strong, and makes stomach feel full.

The findings of the study have also indicated that pregnant women believe that soil eating protects unborn baby from poison, gives nutrients to unborn baby, can't harm unborn baby.

The study also looked at the maternal reasons for eating soil. The majority of women indicated that eating soil prolonged labor, stop morning sickness, and it also enhances fertility, and femininity.

In this study, we did not find any relation between education level and soil eating gives energy, makes pregnant women feel strong, and it makes stomach feel full. An association was observed between soil tastes nice, and education.

In conclusion, our data indicate that the majority of pregnant women seen at Mecklenburg Hospital eat soil. There was not direct relationship between education level and nutritional reasons for eating soil. Furthermore, fetal and maternal reasons for eating soil were not associated with education level.

Reference

Al-Kanhal, M. A., Bani, I. A. Food habits during pregnancy among Saudi Women. *Int. J. Vitam Nutr Res* 1995; 65: 206-10.

Anderson, M. (2001). Pica: is it being overlooked? *Physician assistant*, 25(9), 19-25.

Aneli, B., Lagercrantz, S., 1958. *Geophagical Customs*. Almquist and Wiksells Boktryckeri, Uppsola.

Bateson, E., & Lebroy, T. (1978). Clay eating by Aborigines of the Northern Territory. *The Medical Journal of Australia*, 1(1), 1-3.

Castiglia, P. T., Pica. *J. Pediatr Health Care* 1993; 7:174-5.

Coltman C. A. (1969). Pica and iron lack. *Jama*, 207, 513-516.

Corbett R. W., Ryan C., & Weinrich, S. P. (2003). Pica in pregnancy: Does it affect pregnancy outcomes? *MCN: The American Journal of Maternal Child Nursing*, 28(3), 183-188.

Crosby W. H. (1976a) When friends and patients ask about Pica, *JAMA*; 235, 2765.

Deutsch R. M. (1977). *The New Nuts Among the Berries*, p21. Pulo Alto, CA Bull Publishing Cn.

Edwards, C. H., Johnson, A. A., Knight E. M., Oyemade, U. J., Cole, O. J., Westney, O. E., et al. (1994). Pica in an urban environment. *Journal of nutrition*, 124 (6), 954-962.

Edwards, C., McDonald, S., Mitchelle, JR., et al. Effect of clay and cornstarch intake on women and their infants. *J Am Dietetic Assoc* 1964; 44: 109-15.

Ergun, Y., Paydas, S., Seyrek, N., Seyrek, E. Is there any relationship between pica and liver failure? *Br J Clin Pract* 1993; 47: 147-9.

Fisher W. W., Piazza C. C., Bowman L. G., Kurtz P. F., Sherer M. R., Lachman S. R., A Preliminary evaluation of empirically derived consequences for the treatment of pica. *J. Appl Behav Anal* 1994; 27:447-57.

Garcia C., Schulbe K., Markowitz R. & Young L. W., (1987) Radiological case of the month, perforated gastric ulcer in a rock eater *Amj Dis Child*, 141, 213-214.

Geissler, P. W., Prince, R. J., Levene, M., Poda, C., Beckerleg, S. E., Mutemi, W., et al. (1999). Perceptions of soil eating and anaemia among pregnant women on the Kenya coast. *Social science & Medicine*, 48(8), 1069-1079.

Giuisicbell J. and Combes J. C., (1992). Pica and iron deficiency in adolescence. *Arab Francaises de pediatrie*, 49, 779-783.

Griffith, J. P., Bhanot, V.K. Geophagia in a chronic hemodialysis patient. *W V Med J* 1994; 90: 106-7.

Grotegut, C. A., Dandolu, V., Katari, S., Whiteman, V., Geifman-Holtzman, O., & Teitelman, M. (2006). Baking soda pica: A case of hypokalemic metabolic alkalosis and rhabdomyolysis in pregnancy. *Obstetrics & Gynecology*, 107(2), 484-486.

Hawass, S. E. D., Alnozha M. M. and Kolawole T. (1987) Adult geophagia report of three cases with review of the literature. *Trop Geogr Med*, 39, 191-195.

Horner, R. D., Lackey C. J., Kolasa K, Warren K. Pica practises of pregnant women. *J Am Diet Assoc* 1991; 91: 34-38.

Hunter, J. M. (1993). Macroterme geophagy and pregnancy clays in Southern Africa *J Cultural Geography*; 14 69-92.

Kolandaivelu, G and Balan, v. (1979). Pica *J India Med Aobt*, 73, 193-196.

Krengel, B. and Geysler, P. (1978). Chronic pica in an adult. *South African Med J*; 53, 480.

Lacey, E. P., Broadening the perspective of pica: Literature review. *Public Health Rep* 1990: 105: 29-35.

Lobel, M. Dunkel-Schetter C., Scrimshaw SC. Prenatal maternal stress and prematurity: A prospective study of socioeconomically disadvantaged women. *Health Psychol* 1992; 11:32-40.

Margaret, E. M. The implications of pica in Pregnancy; Nursing for Women's Health Vol 11 No 3, July 2007.

Melville, B. and Francis, V. (1992). Dietary habits and superstitions of Jamaican women during pregnancy. Eur. Journal clinical nutrition, 463, 373-374.

Mokhobo K. P. (1986). Iron deficiency anaemia and pica. South Africa Medical Journal, 70, 473-475.

Morgan R. B. (1984). Pica J R Soc Med, 77, 1052-1054.

Ngozi, P. O. Pica Practices of Pregnant Women in Nairobi, Kenya, East Africa Medical Journal Vol. 85 No 2, February 2008.

Paarlberg, K. M., Vingerhoets, A. J., Passchier, J., Dekker, G. A., Van Geijn, H. P. Psychosocial factors and pregnancy outcomes: A review with emphasis on methodological issues. J Psychosom Res 1995; 39: 563-595.

Rainville, A. J. Pica practices of pregnant women are associated with lower maternal haemoglobin level at birth. J Am Diet Assoc. 1998; (3): 293-6.

Rose, E. A., Porcerelli, J. H., Neale, A. V., Pica. Common but commonly missed. J Am Board Fam Pract 2000; 13: 353-358.

Roselle, H. A. (1970) Association of laundry starch and clay ingestion with anaemia in New York City Arab Intern Med, 125, 57-61.

Sayetta, R. B. Pica: an overview, Am Fam Physician 1986; 33:181-5.

Smulian, J. C., Motiwala, S., Sigman, R. K. Pica in a rural obstetric population. South Med J. 1995; 88: 1236-40.

Singhi, S., Singhi, P., Adawni, G. B. Role of psychosocial stress in the cause of pica. Clin. Pediatr (Phila) 1981; 20:783-5.

Stein, D. J., Bouwer, C., Van Heerden, B. Pica and the obsessive-compulsive disorder. S. Afr Med J 1996; 86 (12 Suppl): 1586-8, 1591-2.

Vermeer, D. E. and Frate, D. A. (1979). Geophagia in rural Mississippi environment and cultural contexts and nutritional implications Am J Clin Nutri, 32, 2129-2131.

Wakham, M. D., Burtner, A. P., McNeal, D. R., Garvey, T. P., Bedinger, S. Pica.: A peculiar behaviour with oral involvement. Spec Care Dent 1992; 12: 207-210.

Walker, A. R. P., Walker, B. F., Sookaria, F. I., Cannan, R. J. Pica. J Ray Soc. Health Oct. 1997 Vol 117 Pos.

RESEARCH PROTOCOL

Reasons pregnant women who attend Antenatal care
in Mecklenburg hospital eat soil.

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INTRODUCTION

The researcher had observed with concern the result of hemoglobin estimation of woman who attend antenatal care in Mecklenburg Hospital. Most of the pregnant women in the antenatal clinic of our hospital have hemoglobin level of less than 8g / dl. The researcher was encouraging them to supplement their diet with fruits and vegetables when one of the nurses made a statement and said “Doctor they are anemic because they eat soil”; the researcher then asked in detail what she meant by eating of soil, then she explained that it was customary for pregnant women in this locality to eat certain form of soil, the belief being that it would enable them to have a healthy baby while remaining healthy themselves throughout pregnancy period. The encouragement she maintained always came from their mothers or their grandmothers. Being armed with this information, the researcher decided to ask every pregnant woman whose hemoglobin level was low whether she was taking soil. The response was surprising. All the women asked agreed that they took soil.

STUDY PROBLEM.

The native names of the two kinds of soil they usually took are Mohlwa – this soil is usually associated with termites, and Mataga which is white stones by literal translation. Soil eating is an established practice among pregnant women in this area just as it is in other parts of the world, it is true

that that there is an association between this practice and anemia, what is seemingly lacking is the reasons that sustain this practice especially in this locality. It is hoped that the results of this study would provide answers to this.

LITERATURE REVIEW:

Taking of soil is an attitude, whether this attitude is as a result of pregnancy is debatable, however it has been shown that some women take soil even before pregnancy.¹ Attitude is viewed as a learnt tendency to respond in a consistent manner. Attitudes are the precursor to our behavior. The group role or culture to which we belong teaches us its attitudinal frame-work through which we evaluate stimuli like a person, thing, event or idea from our environment. Attitudes provide us with a frame work of ways in which to react when we are confronted with people who come from a different cultural background.².

This is very true because for an African, mere mention of cockroach often stimulates a feeling of disgust, but to a Chinese it could be a delicacy, certain parts of Nigeria take pleasure in the consumption of millipids especially by pregnant woman who believe them to be potent detoxicants.³. In Abakaliki an area in the east central region of Nigeria, pregnant women especially those who are pregnant for the first time (primigravida) are given a traditional preparation usually tasteless called “Uria” to drink as it is believed to clean their blood. This preparation is often done by their grandmothers or mothers inlaw.⁴

Most pregnant women present with anemia in the African context, this may be due to the level of poverty, iron deficiency anemia appears to be very prevalent amongst this group. Taking of soil in pregnancy has been ascribed to the anemic state of the pregnant women⁵, this was the view of Corbett R W, Ryan C and Weinrich S.P in their publication of May-June 2003 entitled pica in pregnancy. To further buttress the prevalence of iron deficiency anemia in the developing countries amongst pregnant women, a publication by karini Etal of the hematology research centre Nemazee Hospital Iran concluded that the prevalence of iron deficiency anemia was as high as 28.5% which is same as the prevalence found in other developing countries (25-35%). He went ahead to add that southern Iran was from far the health status in the industrialized countries which is (5-8%).⁶

Vanin E. Etal in their study described pica as the compulsive ingestion of non nutritive substances, the causes they said were not yet known but the symptom may be associated with iron deficiency anemia or with pregnancy state.⁷ Ivascu NS etal in their study corroborated that pica prevalence was higher in pregnant women with sickle cell disease and a correlation with lower hemoglobin levels. They went ahead to state that it was unclear whether pica was a specific marker of disease severity, because their review did not show a relationship to increased number and duration of hospitalization , they went on to conclude that the association between pica and low body weight suggests a nutritional effect on its prevalence.⁸

The study by Rosa E.A, porcerelli JH and Neale Av concluded that pica is observed most commonly in areas of low economic status and is more common in women (especially pregnant woman). It also concluded that it is

probably a behavior pattern driven by multiple factors and suggested its inclusion in the obsessive- compulsive spectrum of disorders , finally they stressed that it was important to be aware of this common but commonly missed condition. Geissler P.W etal in their study wrote “ the cultural associations of soil eating with blood, fertility and femininity exist alongside knowledge of its links to illness. Our findings show that soil-eating is more than just a physiologically induced behavior, it is a rich cultural practice”.⁹

Cultural beliefs play a wonderful role as observed by Bremen P, in his study, he pointed out that it was a belief among young women in Kenya to take soil because it empowers their fertility.¹⁰. Two cases were reported by a study done by menge for which pregnant women had intestinal obstruction and iron deficiency anemia due to their indulgence in pica.¹¹. The belief that pica is initiated by pregnancy is gradually being disproved, a study by simulian JC showed that 56% of the patients started pica practice before pregnancy and even some were (32%) still not pregnant. The study finally concludes that pica is frequently initiated in childhood and continued till adulthood.¹².

However the number of subjects interviewed (125) is far too small to make this assumption. Writing on the cultural and medical perspectives of geophagia Reid RM concludes that the consumption of clays may interfere with the absorption of elemental iron, zinc and potassium. There was little evidence for the position that geophagia, especially its culturally prescribed form, is caused by anemia,(this may need extensive research to establish). Culturally it is believed that clay consumption is beneficial as an antidiarrheal, a detoxicant with mineral supplementation potentials.¹³.

The prevalence of pica among pregnant women in high risk groups declined between 1950's and the 1970's but now remains steady affecting one fifth of high risk women. Women at high risk of pica are more likely to be black, to live in rural areas and to have positive childhood and family history of pica.(Horner RD).¹⁴

A study by Patterson using three sets of female rats fed with kaolin when pregnant, pointed out that the set of rats which was given no iron supplement had significant birth weight reduction as compared to the set which had iron supplementation.¹⁵. writing in the star newspaper sbu mpungose itemized reasons which he found from his survey as to why South African women especially pregnant women embark on this soil eating habit. Some of them being that.

- in times of famine, it makes the stomach feel full and relieves hunger pangs.
- it is said to provide iron and other elements which pregnant women need. It is also said to prevent morning sickness.
- it cleans out the intestinal tract and rids the body of parasites and prevents infection.
- it helps cure skin conditions like acne and eczema because of its ability to absorb toxins.

He went ahead to publish the content of clay, which he sent to the council for geoscience in Pretoria as follows:

kaolinite- 43%
mica - 31%
quartz - 9%

smectite– 7%
plagioclase – 6%
potassium – feldspar 3%
Hematite/Geothite – 1% ¹⁶

Of these substances, the kaolinite which is very high in composition of clay,(being consumed by pregnant women in S.A) was extensively studied in the work of Nathaniel T Dominy; he submits “ our results support the hypothesis advocating an adsorptive function of ingested clay.

For pregnant women, the advantages of reduced toxicity and digestion inhibition are clear. By adhering to gastrointestinal epithelia, clays may not only improve digestive efficiency, but also reduce fetal exposure to toxins tolerated by the mother,¹⁷ from some of these points raised above it appears plausible why some women indulge in pica. In the light of this increasing cultural practice of soil eating among pregnant women and the seeming concomitant anemia, this study would want to establish various reasons pregnant women who attend the antenatal care in Mecklenburg Hospital eat soil.

RESEARCH QUESTION:

Why do the pregnant women who attend antenatal care in Mecklenburg Hospital eat soil?

AIM OF THE STUDY

To determine the reasons given by pregnant women who attend the antenatal care in Mecklenburg Hospital for eating soil.

OBJECTIVES

- To determine what proportion of pregnant women attending antenatal care in Mecklenburg Hospital eat soil.
- To describe this population with regard to soil eating using descriptive statistics.
- To identify the reasons for ingestion of soil during pregnancy

METHODOLOGY

Study Design:

Descriptive quantitative survey was used. This approach is designed to measure certain phenomena e.g. events, behavior, attitudes in a population of interest (Ann Bowling 2002). This type of surveys is called descriptive surveys because the information is collected from a sample of the population of interest and descriptive measures are buttress the characteristics of the population.(Mosor and Kalton 1971).

Study Population:

All pregnant women who attended the antenatal care in Mecklenburg Hospital. These pregnant women mainly came from Muroke, Gamashishi, Mashabela, and Bogatladi villages in sekhukune district of Limpopo province

Setting:

This research was carried in out in Mecklenburg Hospital a district Hospital located in Sekhukhune district of Limpopo province. The Hospital runs daily antenatal care with an average of three hundred antenatal cases monthly.

Sampling Method:

The sample was collected using consecuttive sampling method, which involved taking every subject who presented herself over a tree week period. These are not strictly random techniques but they avoid selection

bias (Practical Guideline for Health Research, Mahmoud F Fathalla, WHO, Cairo 2004).

Questionnaire Development:

The questionnaire was designed based on the publications already cited and reasons obtained verbally from the pregnant women who attend antenatal care in Mecklenburg hospital.

Sample Size:

Yamane's (1997:886) formula was used to calculate the sample size:

$$n = \frac{N}{1 + N(e)^2} = \frac{860}{1 + 860(0.05)^2} = 273$$

n= sample size

N= population of pregnant women attending the antenatal clinic within three months.

E= Sampling Error = 5%

Pilot Study:

The study was piloted using ten patients who were randomly selected from the antenatal care population in Mecklenburg Hospital. Questionnaires were administered to them and information obtained was analyzed, It became obvious that leaving subjects to fill the questionnaire was going to pose a lot of problems ,therefore the trained personnel were made to retrieve the information from the subjects and fill them into the questionnaire.

Data Collection:

The interview was conducted by two trained research assistants the language of communication was Sepedi which is the local language in this locality. The questionnaire was translated into sepedi by a sepedi teacher with a bachelor degree in Sepedi .Two people were trained to administer the questioners to the pregnant women. The file of any subject interviewed was marked and the pregnant woman told that she should be interviewed once. This made it easier to identify persons already interviewed.

The total number of pregnant women interviewed was 273 and this included both those who ate soil and those who did not eat soil. The interview process began with a verbal question to determine whether the woman indulged in soil eating if the answer was yes, the interview went ahead ahead to ask all the questions as they appear in the questioner, if the answer was no, then it was noted and the interview process stopped at that point, and only continued with those who indulged in this practice,

Data Analysis:

The data was entered entered and analyzed using EpiInfo 2002 and STATA version 7, respectively. Frequency and percentages were used for data interpretation.

Reliability, Validity, and Objectivity:

Verification of data and sample was done by the researcher. The questionnaire was translated into Sepedi and subsequently back to English by another Sepedi teacher. The use consecutive sampling method reduced selection bias.

BIAS AND LIMITATIONS

Selection bias was minimized by the use of consecutive sampling method which involves interviewing every pregnant woman who gave consent on any given day until the total number required was reached.. Recall bias was minimized by providing the two types of soil popularly eaten in this locality and the various sizes of the soil being taken to patients. Language bias was minimized by the use of people quite proficient in English language and Sepedi and the use of validated translation of the questionnaire in Sepedi.

ETHICAL CONSIDRATION.

Permission for this study was granted by the REPC, MEDUNSA. Written consent was obtained from all the participants using the standard University of Limpopo consent form ..

BUDGET:

This would be funded by the researcher.

Items	Rands
Stationeries	R500-00
Training	R3000-00
Transport	R500-00
Statistician	R1 500-00
Miscellaneous	R 500-00
Total	R6000-00

TIME FRAME

	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07
Proposal Write-up														
Dept Approval														
Ethics Approval														
Data Collection														
Data Analysis														
Write-up														

CONSENT FORM

Consent form format to be used for this study, is from the REPC MEDUNSA campus of university of Limpopo.

QUESTIONNAIRE; Annexure A

TOPIC:

REASONS PREGNANT WOMEN WHO ATTEND ANTENATAL CARE IN MECKLENBURG HOSPITAL EAT SOIL

SECTION A

Study ID			
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Demographic Information:

1. What is your age? _____ years
2. Employment Status
 - Employed
 - Unemployed
3. Marital Status
 - Single
 - Married
 - Divorced
 - Other (specify)_____
4. Educational Level
 - None
 - Primary
 - Secondary
 - Tertiary
 - Other (specify)_____
5. Residential Area
 - Moroke
 - Gamashishi
 - Mashabela
 - Bogatladi
 - Other (specify)_____
6. How many children you have? _____

SECTION B

1.0 Do you eat soil?	○ Yes	○ No
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	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1.1. Soil eating gives energy	○	○	○	○	○
1.2. Soil taste nice	○	○	○	○	○
1.3. Soil protect the unborn baby from poison	○	○	○	○	○
1.4. Soil make stomach feel full	○	○	○	○	○
1.5. Soil prevents prolonged Labor	○	○	○	○	○
1.6. Soil gives nutrients to unborn baby	○	○	○	○	○
1.7. Soil makes the pregnant women feel strong	○	○	○	○	○

1.8. Soil stops morning sickness	<input type="radio"/>				
1.9. Soil enhances fertility	<input type="radio"/>				
1.10. Soil enhances femininity	<input type="radio"/>				
1.11. Soil can harm the unborn baby					
1.12. Soil can harm pregnant woman					

2. Please specify other reasons for eating soil:

2.1 Type of soil eaten

2.1.1 Mohlwa-----

2.1.2 Mataga-----

2.1.3 Other-----

2.2 Quantity of soil taken-----**(size A, or B)**

2.2.1 How much soil do eat?

- one table spoon
- two table spoons
- three table spoons
- four table spoons

2.3 Frequency of soil eating per day-----**(once, twice, three times, four to five times, other -----**

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MASHABELA

BOGALATLADI

DINGWE _____ TŠE

6. NAA, O NALE BANA BANA BA KAE? _____ BANA.

SECTION B

1.0 Naa, o ja mobu?	<input type="radio"/> Ee	<input type="radio"/> Aowa
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Dipotšišo	Dumela e le ruri	Dumela	Magareng	Ganetša	Ganetša e le ruri
1.1 Go ja mobu go fa matla.	<input type="radio"/>				
1.2 Mobu o na le mohlodi.	<input type="radio"/>				
1.3 Mobu o šireletša ngwana yo sa go a belegwa go mpholo.	<input type="radio"/>				
1.4 Mobu oa khoriša.	<input type="radio"/>				
1.5 Mobu o thibele lešoko le le telele.	<input type="radio"/>				
1.6 Mobu o fa ngwana	<input type="radio"/>				

yo a se go a belegwa difepa mmele.					
1.7 Mobu o dira gore moimana a kwe a nale matla.	O	O	O	O	O
1.8 Mobu o fediša bolwetši bja mesong.	O	O	O	O	O
1.9 Mobu o matlafatša pelego.	O	O	O	O	O
1.10 Mobu o dira gore mosadi a lebelelege.	O	O	O	O	O
1.11 obu o ka gobatša ngwana yo a se go a belegwa.	O	O	O	O	O
1.12 obu o ka gobatša moimana.	O	O	O	O	O

2. Ka kgopelo, thlalošo ka go tsenelela mabaka a go ja mobu.

2.1 MEHUTA YA MOBU WA GO JEWA.

2.1.1 MOHLWA

2.1.2 MOTAGA

2.1.3 E MENGWE _____

2.2 Bontšhi bja mobu

saese A

saese B

2.2.1 Naa, o ja mobu o mo kae?

lelepola ka le tee

malepola a mabedi

malepola a mararo

malepola a mane

2.3 Naa, o ja mohu ga kae moletšatšing?

Ga tee

Ga bedi

Ga raro

Ga nne go ya go hlano

References.

- (1) Simulian J C , Pregnancy and iron deficiency anemia: unresolved issues, *Nutr.Rev.*55, 99-101
- (2) Adele Idowu; cultural issues in Health and Health care. Meckden publishers,1999.
- (4) Nicoletti A: Pica when you least expect it. *J. Pediatric & adolescence gynaecol* 2003 June; 16 (3): 173-4.
- (5) Corbett R W, Ryan C, Weinrich SP: Pica in pregnancy: *MCN AM J. maternal / child nurs.* 2003 May – June; 28 [3].
- (6). Karini M. Kadivan R, Yarmohammadi H: Assessement of the prevalence of iron deficiency anemia by serving ferritin in pregnant women of Southern Iran, *med. Science monitor*, 2003 July : 8(7) : CR 488 – 92.
- (7) Vanin E, URSOL, meneghelti S, mescolli G, Marcazzo L: pica and pregnancy state maternal / *paediatric medical journal* 2002 Jan – Feb; 24(1), 67-9.
- (8) Wascu NS Sanaika, Mrcal J, Volitten – shurney W, Thomas R, Bond S, characterization of pica among patients with sickle cell disease: *Arch pediatric adolescence med.* 2001 Nov; 155 (11); 1234-7.
- (9) Geisscar P.W etal; perceptions of soil eating among pregnant women on the Kenya coach *soc.sci.med.* 1999 April, 48 (8): 1069 – 79.

(11) Menge H, Lang A, Cuntze H; pica in Germany- amylophagia as the aetiology of iron deficiency anemia : *Z, gastroenterol* 1998 Aug ; 36 (8): 635 – 40.

(12) Simulian J.C, pregnancy and iron deficiency anemia; unresolved issues, *Nutr, Rev* 55; 91 -101.

(13) Reid R.M, cultural and medical perspectives on geophagia. *Med. Anthropol.* 1992 Jan; 13 (4): 337 – 51.

(14) Horver RD, Lackey CJ, Kolasa K, Warren K, pica practices of pregnant women : *J AM Diet' ASSOC.* 1991 Jan (1) : 34-38.

(15) Patterson EC, Staszak DJ: effects of geophagia (Kaolin ingestion) on the maternal blood and embryonic development in the pregnant rat *J.Nutr.* 1977 Nov; 107(11): 2020-5.

(16) Sbu Mpungose: SA women are eating dirt and loving it : *The star newspaper* Pg 11, August 26, 2004.

(17) Nathaniel J. Dominy, pica pagophagis and frequency' *JAMA*; 1999 Apr 21; 281 (3) 535.