

PICA PRACTICE AMONG PREGNANT GHANAIS : RELATIONSHIP WITH INFANT BIRTH-WEIGHT AND MATERNAL HAEMOGLOBIN LEVEL

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SUMMARY

In this study the pica habit of 502 pregnant women were studied. It was found that 48.01% of the pregnant women had pica habit. Clay eating was the major form of pica practised by the pregnant women (28.49%). Some of them also chewed wooden-sponge or wooden-stick (9.76%) more frequently. However a few of the pregnant women chewed cola nut (4.98%), uncooked maize dough (2.79%), chalk (1.20%), and fresh starch (0.80%). Multiple pica was not observed among our study population.

Two main reasons were given by the pregnant women for eating clay. One was to prevent salivation or vomiting (16.14%) while the other was because they liked its flavour (12.35%). Clay eating significantly correlated with maternal haemoglobin concentration ($r = -0.32$). Pregnant women who ate clay had a significantly lower mean haemoglobin concentration ($11.05 \pm 0.59\text{g/dl}$) than women who did not eat clay ($11.86 \pm 0.49\text{g/dl}$; $p < 0.05$). Those who ate clay had persistently lower mean haemoglobin concentration throughout pregnancy than those who did not. The overall mean birth weight of the 502 singleton infants delivered by the pregnant women was $3.01 \pm 0.50\text{kg}$. There was no significant difference in the mean birth-weights of infants born to women who ate clay ($2.99 \pm 0.39\text{kg}$) and those who did not eat clay at all ($3.03 \pm 0.51\text{kg}$) during pregnancy. Thus the observed level of clay intake did not significantly affect infant birth-weight.

Clay pica is shown by this study to be associated with low haemoglobin level. Medical doctors and dieticians should ask pregnant women with anaemia about pica habit. Education of women in general about the effects of pica and other habits must be intensified to reduce the prevalence of anaemia during pregnancy.

Keywords: Pica, clay, birth-weight, haemoglobin, pregnancy.

INTRODUCTION

There is no universally accepted definition of pica due to the diversity of the habit. While some authors define pica as the compulsive eating of non-food substances over a sustained period of time, others define it as the abnormal craving for food substances^{1,14}. There is another kind of pica which is defined as the sucking or mouthing of objects by children above 18 months of age¹. The term 'pica' is derived from the Latin word for magpie, a bird famous for its habit of gathering a variety of objects to satiate its hunger¹. During pregnancy, a number of non-food items are ingested by some pregnant women probably due to the effects of antenatal nausea and vomiting or anaemia. Pica habit may be excessive eating of ice (pagophagia), clay (geophagia) or starch (amylophagia). Some of the materials ingested can have deleterious effects on the health of both the mother and infant. The non-nutritive items when eaten occupies space in the stomach where food will normally be. This reduces the stomach capacity and hence reduces food intake during pregnancy. When seen in the context of increased nutrients requirement during pregnancy, pica habit can aggravate malnutrition problems encountered during pregnancy such as anaemia. A major cause of anaemia is the normal physiological changes which occur during pregnancy. However other causes such as inadequate body iron store, inadequate nutrition and deficient dietary practices, systemic infections, as well as habits such as pica contribute to the observed haemoglobin levels.

The role of pica in the genesis of iron deficiency anaemia has been reported with conflicting views. It is speculated that some of the components of the soils ingested can form chelates with minerals like iron and calcium to prevent their absorption².

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Minnich reported that ingestion of Turkish clay markedly decreased absorption of iron². On the other hand, Talkington³ studied two clays from East Texas that were popular with pregnant women and found a minimal impairment of iron absorption when the clays were ingested just prior to iron intake. Talkington³ also reported that the ingestion of starch may contribute to the development of iron deficiency during pregnancy not because iron absorption is impaired, but because the starch provides energy without iron. In addition to clay and starch, some women may ingest items like coal and chalk¹³. McGanity⁴ observed that 28% (n = 861) pregnant adolescent girls ate fresh starch, clay and refrigerator frost.

The objective of this study was to investigate the independent effects of pica during pregnancy on infant birth-weight and maternal haemoglobin level among a group of 502 pregnant Ghanaian women. The study was conducted between 1993 and 1994.

SUBJECTS AND METHODS

Study locale

Data for the study were collected from four Maternal and Child Health (MCH) Centres in Accra, Ghana. The MCH Centres were: University of Ghana Hospital, Labadi Polyclinic, Kaneshie Polyclinic and Nerzit Clinic. These centres provide antenatal services for pregnant women.

Subjects

The subjects for this study were pregnant Ghanaian women resident in Accra. Subjects were of the age range 20 - 35 years. A total of 502 pregnant women were selected for the study through a systematic random sampling technique¹¹. These were pregnant women receiving antenatal care at the time of the study. All the subjects showed consent before participating in the study. Subjects who had complicated pregnancy, sickle cell disease and severe malaria were excluded from the study. The pregnant women for this study were all on mineral and vitamin capsules (which provided 3x 60mg ferrous sulphate per day) as part of protocol for MCH clinics controlled by the Ministry of Health (MOH) in Ghana.

Data Collection

Interview data from the 502 pregnant women were collected by means of a study-specific semi-structured questionnaire. An epidemiological data which also included a dietary data were collected. Specifically data were collected on antenatal nausea, oedema, physical activity level, occupation of

subject and husband, smoking status, alcohol consumption, nutrient supplementation, parity, overlap (breast-feeding while pregnant), antenatal clinic attendance and women's perception of good nutrition during pregnancy.

Dietary data were collected on energy, protein and iron intakes of the pregnant women by means of a three-day 24-h dietary recall method in the first, second and third trimesters. Data on pica habit were collected at the time of the 24-h dietary recall data collection. Food intake and pica habit data were collected for two week-days and one week-end day to offset daily variations. Data collected in addition to infant birth-weights and maternal haemoglobin concentrations will enable us to have a clear perception of the characteristics of the subjects involved in the study.

Infant birth-weights were measured by means of a sensitive infant weighing scale (model 850B, WEYLUX Electronic Baby Weighers, British Standard Quality).

The infant birth-weights were taken immediately after parturition. Infant birth-weight and maternal weight measurements were done in accordance with standard procedures⁵.

The haemoglobin concentrations were determined monthly from the 3rd to 9th month of pregnancy. Haemoglobin determination was done by the use of the cyanmethemoglobin spectrophotometric method¹².

Data Analyses

Data analyses and storage were computer based using EPI-INFO version 6.0 [Centre for Disease Control and Prevention (CDC), WHO, Geneva] and STATA version 4.0 (Population and Development Program, Warren Hall, Cornell University). Students' *t*-test was used where comparison between the means was required. Correlation analysis was used to ascertain relationships between variables. All findings were considered statistically significant at $P < 0.05$. Dietary nutrient intakes were analysed by the use of FAO food composition tables for Africa⁶ together with local food composition tables formulated by Eyson and Ankrah⁷.

RESULTS

Characteristics of the Subjects

The mean age of the subjects involved in the study was 27 years with a range of 20-35 years. Most of

the subjects had received at least 10 years of education (97.7%), and 3.9% had had university education. Almost all were married (99.3%) and 28.1% of them were in their first pregnancy. Trading was the major occupation of the subjects (47.7%) followed by vocational work (28.9), defined here as hairdressing, dressmaking, catering, and farming. Office workers and professionals (teacher, lawyer, nurse, actress, police personnel) comprised 10.9% while housewives were 12.5% of the total number. The pregnant women had initial mean weight of 60.77 ± 10.11 kg. The mean BMI of the subjects was 23.14 ± 3.60 kg/cm² while the mean height was 162.09 ± 5.20 cm in the first trimester. The mean dietary energy intake of the subjects was 2176.03 ± 278.79 kcal per day, while the dietary protein intake was 70.04 ± 14.30 g/day. Mean dietary iron intake was observed to be 25.54 ± 6.82 mg/day.

Prevalence of Pica and Reasons

Out of the 502 pregnant women studied, about 48% practised pica during pregnancy (Table 1).

Table 1 Pica habit during pregnancy and reasons (n=502).

Types of Material Eaten	Number of Pregnant Women (%)	Reasons
Clay	81 (16.14)	To prevent salivation or vomiting.
"	62 (12.35)	Flavour was appealing.
Clay total	143 (28.49)	--
Stick/Sponge	49 (9.76)	To prevent salivation.
Cola Nut	25 (4.98)	To clear the mouth or to prevent salivation.
Maize dough	14 (2.79)	The flavour was nice / it was attractive.
Chalk	6 (1.19)	Appealing flavour.
Starch	4 (0.80)	Appealing flavour
No pica	261 (51.99)	Do not like it or it is not good

A substantial number of the pregnant women ingested clay (28.49%) during pregnancy (Table 1). Some of them also chewed wooden-sponge or wooden-stick (9.76%) and cola nut (4.98%) more frequently, while a few ingested fresh maize dough (2.79%), chalk (1.20%) and uncooked starch (0.80%). Although some of the pregnant women ate one form of non-food item or another, multiple pica habit was not found among our subjects.

Two main groups of pregnant women were found in terms of reasons for clay eating (Table 1). One group ate clay to prevent salivation or vomiting (16.14%) while the other group ate it because they craved for it (12.35%) (Table 1). The eating of clay was not regular among the pregnant women. While some ate clay everyday 2.8% (n = 14), others ate it less frequently 25.7% (n = 129). The type of clay eaten by the pregnant women was a white clay popular among Ghanaians. The quantities of white clay eaten ranged from 2.0 to 25.0g per day with a mean of 10.65 ± 0.825 g/day.

Birth-Weight and Maternal Haemoglobin Concentration in Relation to Pica

The mean birth weight of the 502 infants delivered by the subjects was 3.01 ± 0.50 kg (Table 2).

Table 2 Infant birth-weight and maternal haemoglobin concentration in relation to pica (n = 502)

Pica group	Number of mothers (%)	Mean Infant birth-weight (kg) ¹	Mean maternal haemoglobin (g/dl)
Clay	143 (28.5)	2.99 ± 0.39	$11.05^a \pm 0.60$
No pica	261 (51.99)	3.03 ± 0.51	$11.86^b \pm 0.49$
OTHER PICA			
Sponge/stick	49 (9.76)	2.90 ± 0.60	11.73 ± 0.42
Cola nut	25 (4.98)	3.16 ± 0.37	11.89 ± 0.49
Maize dough	14 (2.79)	3.30 ± 0.41	11.83 ± 0.62
Chalk	6 (1.19)	2.92 ± 0.40	11.32 ± 0.46
Starch	4 (0.80)	2.95 ± 0.50	12.30 ± 0.45
Total: other pica	98(19.53)	3.08 ± 0.49	11.79 ± 0.55
Total	502 (100)	3.01 ± 0.47	11.50 ± 0.60

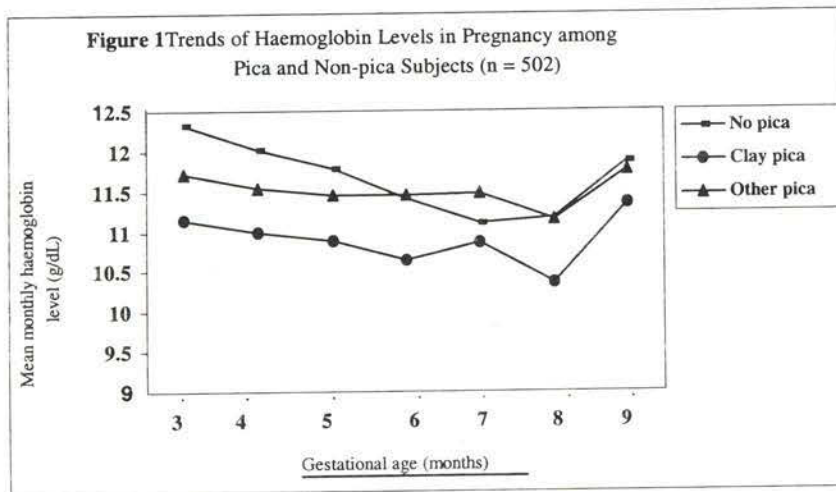
1: No significant differences were observed in terms of birth-weight, $p > 0.05$.

a: Mean values with different superscripts are significantly different $p < 0.05$.

There was no significant difference in the birth-weight of infants born to women who ate clay (2.99 ± 0.39 kg) and those who did not eat clay (3.00 ± 0.55 kg) during pregnancy.

Table 2 indicate that women who ate clay had significantly lower maternal haemoglobin concentration than those who did not (11.05 ± 0.596 vs 11.86 ± 0.574 g/dl). There was a significantly negative correlation ($r = -0.32$; $P < 0.05$) between maternal haemoglobin level and clay eating. However there were no significant differences between the other pica groups in infant birth-weight or maternal haemoglobin concentration during gestation (Table

2). Throughout pregnancy, those who ate clay had significantly lower haemoglobin concentration than their counterparts who did not eat clay. This trend is shown in Figure 1.



DISCUSSION

Pica During Pregnancy

Pregnancy is associated with some alterations of maternal food habits. Notable among these habits is pica or the eating of non-food items. This study showed that about half of the 502 pregnant women studied ingested some types of non-food materials. Clay eating was the most common form of pica practised among our subjects, involving about a third of them. Some of the pregnant women chewed wooden stick, sponge and cola more often than when not pregnant, while few ate fresh uncooked maize dough and uncooked starch as well as classroom chalk. Even though maize dough and starch are food items, the eating of the uncooked forms is probably abnormal and deviates from normal food habits.

These findings imply that apart from aversion to some nutritious foods some pregnant women develop taste for some non-food items. The combined effects of these on nutrient intake during pregnancy can be profound. The Non-food materials may replace a substantial part of the diet possibly preventing adequate nutrition during pregnancy. Some of these non-food items like chalk and clay can form chelates with essential mineral elements like iron and calcium and reduce their availability in the gut, and can also cause obstruction of the colon⁹. The reduced availability of iron and other essential mineral elements can aggravate the already high anaemia prevalence among preg-

nant women in developing countries. Pica practice in terms of starch eating has earlier been reported among pregnant women in Texas³. In that report³ it was observed that the ingestion of starch promoted iron deficiency anaemia, not because raw starch prevented iron absorption but because the it supplied energy without iron. The high microbial contents of items like fresh maize dough and starch can promote infection or induce diarrhoea in women who eat them. The ingestion of coal and chalk is also reported to be a common form of pica among some pregnant women^{1,13}.

In the present study the type of clay eaten by the pregnant women was a white clay popular among Ghanaians. Traditionally this white clay is used on the body during rituals like initiation into womanhood in some parts of Ghana and in some areas it is used on the body of the mother who has just delivered an infant successfully.

Among our study subjects, there were two main reasons for the consumption of clay. The first was to prevent salivation or vomiting during pregnancy, while the second reason was because they had developed taste for it (Table 2). It can be deduced from the first reason that to some extent, among our study subjects, nausea can induce consumption of clay during pregnancy.

Effect of Pica on Birth-Weight and Maternal Haemoglobin Concentration

This study took cognisance of the fact that haemoglobin concentration during pregnancy is affected by numerous factors. However it will be beneficial to study the haemoglobin concentration of pregnant Ghanaians who eat clay.

No significant differences in the birth-weights of infants born to women who ate clay regularly and those who did not eat clay during pregnancy. This could mean that the amount of clay eating by the pregnant women did not significantly alter infant birth-weight.

Clay eating was associated with low maternal haemoglobin level. Subjects who ingested clay during pregnancy had significantly lower maternal haemoglobin level than those who did not eat clay even though these subjects were from similar environment. The significantly negative correlation shown between clay eating and haemoglobin level suggests an association between clay eating and anaemia. This observation is consistent with what has been reported recently from a similar study¹⁴. Even though clay eating is statistically significantly associated with low maternal haemoglobin concentration, the observed difference may not be clinically significant for those with high haemoglobin concentration. It will however be harmful for those on marginal haemoglobin status.

There are several mechanisms by which clay eating may reduce haemoglobin concentration. Clay can form chelates with essential mineral elements needed for haemoglobin synthesis such as iron and copper, and prevent their absorption². It could also line the absorptive surface of the intestines to prevent efficient absorption of nutrients. The clay could provide excess amounts of minerals that competitively inhibit the absorption of iron and other nutrients required for haematopoiesis. The reduced availability of mineral elements such as iron needed for haematopoiesis can lead to iron-deficiency anaemia, worsening the already high anaemia prevalence among pregnant women. Some of the components of clay and other earth materials can promote toxemia and systemic infections, including worm infestation which may predispose one to anaemia. In a study a high rate of death was observed among pregnant women who ate clay during pregnancy⁹. Women who ingested clay frequently suffered from severe anaemia, complete obstruction of the colon with perforations and sepsis⁹.

The role of clay eating in the genesis of iron-deficiency anaemia is however not clear. For instance, while Minnich² reported that Turkish clay markedly decreased absorption of iron, Talkington³ found only a minimal impairment of iron absorption caused by the type of clay that is popularly eaten by pregnant women in East Texas. It is therefore probable that different clay types and quantities may have different effects on maternal haemoglobin concentration. It was also not clear by our study whether it is the anaemia that induces the pica habit or it is the pica that causes the anaemia.

There were no significant differences in the birth-weights of infants born to women who ate clay regularly and those who did not eat clay during pregnancy. This indicates that clay eating or the quantities of clay eaten by our subjects did not significantly alter infant birth-weight. A recent similar study has also shown a similar result¹⁴.

In conclusion pica habit is of high prevalence among pregnant women in Ghana. Although clay eating did not influence infant birth-weight it was inversely associated with maternal haemoglobin concentration.

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