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Are You What You Eat? Pica in Pregnancy

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Although pica is viewed as acceptable behavior during pregnancy in many cultures, it presents inherent dangers. How should adverse consequences be managed in the emergency department?

Case

A 37-year-old woman from Kenya who gave birth to a child 2 months ago presents to the emergency department with epigastric pain that has been present for one day. The patient reports that her abdominal pain started after she ingested several baked clay pellets that she had brought from Kenya and that she had been ingesting in low doses daily throughout her recent pregnancy. She denies any nausea, vomiting, or diarrhea. Her vitals are as follows: blood pressure, 106/71 mm Hg; heart rate, 72 beats/min; respiratory rate, 20 breaths/min; temperature, 97.8°F. Her oxygen saturation is 100% on room air. Her physical exam is notable only for mild epigastric tenderness without guarding or rebound. No abdominal masses are palpated.

What is pica and what is its epidemiology?

Pica describes a behavior of craving and subsequent purposeful ingestion of nonfood substances.[1,2] Pica was documented as early as 400 BC by Hippocrates and continues to be practiced today. Pica is generally considered to be a chronic behavior (> 1 month).[1] There are three commonly described forms of pica, corresponding to the three most frequently consumed nonfood substances: geophagy—ingestion of earth (soil, clay, or baked clay), amylophagy—ingestion of raw starch, and pagophagy—ingestion of ice.

Overall, geophagy occurs most often, especially among pregnant women and children, although the prevalence of pica and the nonfood substances consumed vary geographically.[1-3] In Africa, for example, geophagy is most common.[1,4] This may be related to the ready availability of soil and clay compared to ice and starch, which require financial resources and accessibility to commodities such as electricity and refrigeration. Geophagy is practiced in approximately 50% of pregnant women in Africa, and in Uganda up to 84% of pregnant women reported daily consumption of soil/clay.[4] In Latin America, the prevalence of pica ranges from 23% to 44%, and in certain countries pagophagy is more common than geophagy (eg, Brazil, where the prevalence rates of pagophagy and geophagy are 70% and 18%, respectively).[1,5,6]

Pica in the United States traditionally has been described and studied in the southern states.[1,5] However, the practice of pica can be found in all regions of the country, reflecting the diverse demographic makeup and socioeconomic background of the population. It is more commonly reported among socioeconomically disadvantaged women living in rural and immigrant communities, and in women of African heritage.[3] The self-reported prevalence of pica was as low as 8% in a study of urban African-American women in Washington, DC, while up to 76% of pregnant African-American women in Houston, Texas, reported pica.[1,7] Although ice was the most common nonfood substance reportedly consumed among women in the United States, a

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significant proportion of women still reported ingesting soil and other substances.[1,2,5]

Pregnant women typically consume the deeper layer of the soil, obtained more than 60 cm below the topsoil, which is less likely to be contaminated by metals and other chemicals compared to the topsoil.[8] Children, however, tend to ingest the topsoil.[8] In Africa, soil or clay is often obtained from termite mounds, walls of houses made from clay, or purchased in local markets and shops. Often, clay and baked clay pellets are exported to Europe and North America and sold in immigrant community stores to be consumed by the local ethnic population.[9]

Overall, the true prevalence of pica is likely higher in developed countries such as the United States, where women may keep their practice secret because pica is often considered "abnormal" and discouraged. The prevalence of pica in children also varies widely around the world (eg, Zambia and Kenya, > 70% versus New York, 1.7%), similar to the trend observed in pregnant women.[1,4]

What is the underlying etiology of the practice of pica/geophagy?

There is no clear unifying explanation of why pica occurs. Cultural beliefs, micronutrient deficiency (especially iron and calcium), hunger, and medicinal purpose may each play a role.[4,8] For example, among pregnant women in a coastal district of Kenya, 73% of the women ate clay regularly; in this region, geophagy is a culturally accepted behavior during pregnancy and is practiced by women exclusively for its symbolic ties to fertility, reproduction, and ancestral blessing.[4] However, in the United States, where pica is not culturally or medically accepted, it is still widely practiced by African-American women and women in both rural and immigrant communities.[3]

The most frequently cited hypothesis for pica is the concept of physiologic response—craving—arising from the micronutrient deficiencies caused by pregnancy, especially iron. There is no evidence to suggest that micronutrient deficiencies can elicit a physiologic craving of pica substances. Several studies, in both developed and developing countries, have demonstrated that anemia and low hemoglobin concentration are commonly found in pregnant women who practiced pica.[1,3,4,6,7] However, a causal relationship remains unclear, as iron supplementation among children with anemia and pica failed to stop soil ingestion.[1] Other micronutrient deficiencies, such as zinc and calcium, have also been investigated, but the evidence is limited and the results inconclusive.[1] Moreover, a large majority of the women who reported a "craving" for the nonfood substance cited an affinity toward the substance's taste, odor, and texture as reasons for their ingestion.[2,3] Thus, the practice of pica is most likely driven by a complex interplay of multifactorial etiologies that warrant further investigation.

FAST TRACK

Geophagy can result in exposure to metals, including lead, arsenic, mercury, and cadmium, or other chemicals (such as pesticides).

Are there potential adverse consequences of pica to the mother and her fetus?

Depending on what is consumed, geophagy can result in exposure to metals, including lead, arsenic, mercury, and cadmium, or other chemicals (such as pesticides). Some of these toxic chemicals may be naturally present or they may be in the soil due to environmental contamination by humans. The toxins that most frequently cause concern are the metals, particularly lead, which is nearly all human derived. In one study, testing of clay/soil samples from Africa, Europe, and the United States showed high mean lead concentration (40 mg/kg) compared to cadmium (0.055 mg/kg) and mercury (0.053 mg/kg).[9] Similarly, a UK study showed elevated concentrations of arsenic and lead in the imported baked clay from Bangladesh.[10] It was estimated that daily clay ingestion could result in three- and sixfold greater exposure to arsenic and

FIGURE. Abdominal x-ray showing multiple round foreign bodies (white arrow) in several loops of colon.

lead, respectively, compared to the World Health Organization's recommended maximum daily intake.[10] Among pregnant women in New York City with elevated blood lead concentrations, geophagy (clay, brick, or ceramic) was associated with significantly higher lead concentration and higher incidence of premature birth.[2]

In general, the effect on the fetus from maternal exposure to metals results in a wide spectrum of complications, including premature birth, spontaneous abortion, and permanent neurocognitive or neurodevelopmental deficits. Although the bioavailability of lead is limited compared to other heavy metals, it crosses the placenta readily and accumulates in the fetal tissues throughout gestation, potentially affecting neurodevelopment even at low exposure.

In sub-Saharan African countries, geophagy has been associated with a high prevalence of infection with *Ascaris lumbricoides*, which can contribute to malnutrition and the development of iron deficiency anemia in pregnant women.[4] However, iron deficiency anemia associated with geophagy has not been shown to affect obstetric outcomes such as birth weight and length, gestational age, or head circumference.[3,6]

How should a patient with geophagy be managed in the emergency department?

There is no evidence-based approach to managing a patient with pica. However, patients who have ingested clay pellets should be managed as those with the ingestion of any foreign body. Although the risk of perforation and need for emergent endoscopic removal is low, baked clay pellets can potentially cause obstructive symptoms. Radiologic imaging such as abdominal x-ray and CT scan of the abdomen should be considered, as needed, and can be helpful in efforts to assess the size and location of the foreign body and evaluate for signs of intestinal obstruction.

FAST TRACK

Since the source of the soil is often unknown and the potential risk of harm to the fetus is high, a blood lead concentration should be obtained in any pregnant woman practicing geophagy.

Laboratory testing may be of limited utility. However, a low hemoglobin concentration may be suggestive of chronic lead poisoning, as may the presence of basophilic stippling in the peripheral blood. Anemia with a reduced mean corpuscular volume (MCV) and high red cell distribution width (RDW) can also be suggestive of iron deficiency anemia. Since the source of the soil is often unknown and the potential risk of harm to the fetus is high, a blood lead concentration should be obtained in any pregnant woman practicing geophagy, and perhaps in all patients with geophagy.

The primary intervention for a patient with an elevated blood lead concentration is to stop further exposure. The patient should be given a gastrointestinal agent such as polyethylene glycol (PEG) electrolyte so-

lution to assist in evacuation of the gastrointestinal contents to decrease further absorption. Chelation therapy poses a unique challenge in pregnant women due to the theoretical association with teratogenicity in early pregnancy. However, symptomatic pregnant women with elevated concentrations of lead or other metals should be considered for maternal chelation therapy, although there are only limited data to suggest a benefit to the fetus. When considering chelation therapy for a pregnant woman, consultation with a medical toxicologist or regional poison center may help to clarify the risks and benefits of maternal chelation therapy. Once the woman is postpartum, the blood lead concentration of the neonate should be checked and managed according to accepted guidelines.

CASE CONCLUSION

An abdominal x-ray showed multiple foreign bodies in several loops of colon without radiologic signs of intestinal obstruction (Figure). A large amount of stool was also noted. The patient's laboratory evaluation showed a hemoglobin concentration of 9.7 g/dL, decreased MCV of 62.6 fL, and elevated RDW of 24%, suggestive of underlying iron deficiency anemia. The remaining laboratory evaluation results were unremarkable. The lead concentration was undetectable. During her course in the emergency department, the patient remained in stable condition with improvement of abdominal pain. She was subsequently discharged with PEG solution to facilitate the passage of the baked clay pellets and given instructions to discontinue her pica habit and follow up with her primary care provider. **EM**

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