Pica during pregnancy in low-income women born in Mexico

Ellen Simpson
Division of Human Genetics
Department of Pediatrics
University of California, Irvine Medical Center
Orange, CA 92668
J Dennis Mull
Department of Family Medicine
University of Southern California
1420 San Pablo St
Los Angeles, CA 90033
Erin Longley
Family Practice Center
Sutter Medical Center of Santa Rosa
Santa Rosa, CA 95404
Joan East
Mountain Area Family Health Center
Asheville, NC 28804

Correspondence to:
Dr Mull
jcmull@apc.net

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ABSTRACT ● **Objective** To describe pica behavior (ingestion of nonfood items) in pregnant low-income Mexican-born women in Mexico and the United States. ● **Design** A convenience sample of informants was interviewed with a questionnaire containing open-ended and closed-ended questions. ● **Setting** A low-income community on the outskirts of Ensenada, Mexico, and clinics serving low-income people in southern California (Santa Ana, Bakersfield, and Los Angeles). ● **Participants** Of a total of 225 Mexican-born women, 75 (33%) were interviewed in Ensenada, and 150 (67%) were interviewed in southern California. ● **Results** The prevalence of pica during pregnancy was 44% (n = 33) in the Ensenada group and 31% (n = 46) in the southern California group. Those who reported pica behavior more commonly had a relative who also practiced pica. ● **Conclusion** The high reported rate of pica in this sample indicates that pregnant Mexican-born women should be screened for pica and educated about the potentially serious effects on the fetus and mother.

Summary points

- The ingestion of nonfood items (pica) during pregnancy is common in low-income Mexican-born women in both Mexico and the United States
- Items eaten include store-bought substances such as magnesium carbonate as well as dirt and clay
- Substances are chosen because women crave their taste, smell, or texture in the mouth and think that this craving needs to be satisfied
- Health care professionals should screen for this practice because some items ingested, such as tar and laundry bluing, may be harmful
- The fact that pica is so common suggests that women in other ethnic or cultural groups not previously studied may also practice it during pregnancy

BACKGROUND

Pica—the ingestion of nonfood items—has aroused the curiosity of medical personnel since at least the 16th century.[1] Pica in children has been studied extensively, but pica during pregnancy remains understudied and underreported. Recent articles exploring the practice[1-4] have been contradictory and present little conclusive evidence about its cause and prevalence. Pica during pregnancy is a worldwide phenomenon,[5-8] but in the United States it has been studied largely in the South, with an occasional report from the Midwest. Although this behavior is known to occur in pregnant Latina immigrants in the Los Angeles area,[9] there are no detailed descriptions of the practice in Mexican-born women either in the United States or in Mexico.

The prevalence of pica in pregnant women has been reported from as low as 0% to as high as 68% in the various groups studied.[10] In general, pica behavior is probably underreported because the ingestion of nonfood items may be seen as either shameful or merely unimportant and "normal."[4]

Suggested risk factors also vary between studies. A meta-analysis of dirt-, clay-, and starch-eating women found that race was the major risk factor for pica during pregnancy: it was 4 times higher in black women than in white women.[3] A study by Edwards et al,[11] however, found no significant racial difference in the prevalence of pica in a rural obstetric population; instead, a childhood, family, and nonpregnant history of pica behavior played a role. The meta-analysis also indicated that rural women were twice as likely as urban residents to exhibit pica and that lower socioeconomic status, greater maternal age, impaired nutritional status, and a childhood or family history of pica were additional risk factors.[3]

The etiology of pica appears to be complex. Many environmental, nutritional, socioeconomic, physiologic, cultural, and psychiatric causes have been postulated. Some women apparently practice pica for medicinal purposes. For example, clay eaten in parts of Nigeria has been shown to contain kaolinite and to act as a potent antidiarrheal; it binds toxins and bacteria and may form a protective coat on the intestinal epithelium.[8] Culture also can play a role in pica—for example, if it encourages specific dietary practices and indulgence of cravings.[11,12]

Theories concerning possible nutritional deficiencies as a cause of pica are abundant, with many researchers including vitamin and mineral deficiency in the list of suggested risk factors. There are data linking deficiencies with food preferences in animals, but this has never been documented in humans. Dietary differences between women who do and those who do not engage in pica have not been conclusively documented.[3,13] One of the most widely postulated causes of clay and dirt pica is iron-deficiency anemia. The contemporary opinion on mineral deficiency is polarized between Horner and colleagues' view that anemia may be a consequence of pica, rather than a cause,[3] and the more historical

evidence that mineral replacement therapy cures pica.[4,15]

Certain items possess a strong sensory attraction for women who practice pica. Edwards et al describe women who liked the odor, taste, or texture of clay and cornstarch.[11] There was a connection between liking the taste of cornstarch and enjoying its texture in the mouth. Cooksey describes a phenomenon of olfactory craving that escalates during pregnancy.[16] Researchers in several countries have reported heightened taste and odor sensitivities in some women during pregnancy.[7,17-19]

The medical consequences, if any, of pica for mother and fetus vary with the nature of the substance ingested.[20,21] Effects on the mother could include dental injury, constipation, intestinal obstruction, dysfunctional labor due to fecal impaction, parasitic infections, toxemia, interference with the absorption of minerals, lead poisoning, and hyperkalemia.[3,9,13] Possible effects on the fetus include prematurity, perinatal mortality, low birth weight, irritability, decreased fetal head circumference, and exposure to chemicals such as lead, pesticides, and herbicides.[3,5]

There have been no detailed studies describing pica in the Latina population. In our practice, we observed that pica was common in Mexican-born pregnant patients.[22] We therefore conducted a study to assess its prevalence.

PARTICIPANTS AND METHODS

We interviewed 225 Mexican-born women in Spanish over a 4-month period during the spring and summer. The study was carried out both in Mexico (n = 75) and in several areas of southern California (n = 150) to ensure that results would be as generalizable as possible and not simply represent a local phenomenon. Specific sites were chosen because outpatient clinics at those sites were affiliated with the authors' universities, and therefore, the patient populations were readily accessible.

In Mexico, women were recruited by systematically visiting all households surrounding a community clinic in a low-income neighborhood on the outskirts of the city of Ensenada, Mexico, which is 75 miles south of the border. In California, subjects were recruited by approaching women consecutively in medical facilities serving low-income populations in the cities of Santa Ana, Bakersfield, and East Los Angeles—all within 250 miles of the border. These were indigent-care facilities where women did not have to pay for care with their own funds. Of the 150 women interviewed in southern California, 102 were interviewed in Santa Ana, 36 in Bakersfield, and 12 in East Los Angeles.

The criteria for participation were that participants had to be Mexican-born, speak Spanish as their primary language, and be pregnant or have been pregnant within the past year. Within these variables, the sample was a convenience sample: all women were interviewed who agreed to be interviewed. Only 5 of those approached declined to participate. The refusal rate was low because the women understood that we were part of a team that had provided good medical treatment to the community for many years.

A questionnaire was composed in Spanish, and the University of California, Irvine, Department of Interpreter Services used standard methods of back-translation to validate its wording. After pilot testing, the final version of the questionnaire included 15 questions. We began by eliciting demographic data through closed-ended questions and then focused on pica behaviors, giving the informants a few examples of nonfood items that women might eat while pregnant and inviting them to supply their own examples in an open-ended manner.

The protocol for the research was reviewed and approved by the institutional review boards of the University of Southern California School of Medicine and the University of California, Irvine, College of Medicine. All participants gave informed consent before the questionnaire was administered. One of us (E S), who is fluent in Spanish, interviewed about half of the women; the others were interviewed by other authors accompanied by native speakers of Spanish so that unimpaired communication could be assured across the sample of women interviewed.

RESULTS

Demographic data

Participants in both Mexico and southern California had a mean age of 25 years (range: 18 through 42 years) and a mean of 7 years of schooling (range: 1 through 10 years). All reported that they were married. All were medically indigent and lacked private health insurance, but during their pregnancies, their medical expenses were covered by government programs in their respective countries. Women had been born in many different regions, but were principally from rural areas of central and southern Mexico.

Prevalence of pica

Of the 75 mothers interviewed in Mexico, 33 (44%) reported pica behavior, as did 46 (31%) of the 150 women interviewed in the United States ($P < 0.05$ [risk ratio 1.43; 95% CI 1.01-2.04]). The prevalence of pica in the US sites was highest in Bakersfield (42% [n = 15]), followed by Santa Ana (29% [n = 30]) and then East Los Angeles (8% [n = 1]).

Specific items ingested are listed in the table. Twenty-five women described strong cravings for traditional pica items such as dirt, which they said they either ignored or assuaged with "safer" replacements like magnesium carbonate. Reasons given for not eating a craved pica substance were similar in Mexico and the United States: that

Items ingested by low-income Mexican-born women who practiced pica during pregnancy in Mexico (33 of 75 women interviewed) and in the United States (46 of 150 women interviewed)

Item	Mexico (n = 33) No. (%)	United States (n = 46) No. (%)
Dirt	7 (21)	11 (24)
Bean stones*	5 (15)	17 (37)
Magnesium carbonate	1 (3)	8 (17)
Ashes	1 (3)	5 (11)
Clay	0	4 (9)
Ice	0	18 (39)
Other†	14 (42)	17 (37)

*See text.
†Including (in Mexico) battery acid, tar, fabric softener, shampoo, soap, starch, thread, paint thinner, laundry bluing, spearment leaves, and bricks; and (in the United States) eggshells, starch, salt, paper, lipstick, pieces of clay pot, and adobe.

it was "dirty" or unsanitary, that it would have an adverse effect on the fetus, and that someone had said not to do so. All women who refrained from eating dirt because it was unclean stated that they would eat "clean" dirt.

The validity of responses was verified in several ways. First, women showed us half-eaten blocks of clay or magnesium carbonate, "bean stones" (little clods of dirt found among unwashed beans), and/or the location of the clay or dirt they preferred. In addition, they described the types and amounts of materials they consumed with a high level of specificity, offering details that would have been difficult to invent. The reports of others, including neighbors and pharmacists who had observed the behavior or supplied the materials, provided further confirmation of the practice.

Sociocultural aspects of pica behavior

All women interviewed had heard of pica. Overall, those who said they engaged in pica during pregnancy were nearly twice as likely to report having a relative who practiced pica (49/79 people; 62% prevalence) as were those who denied engaging in the behavior (47/146 people; 32% prevalence) ($P < 0.001$ [risk ratio 1.93; 95% CI 1.44-2.58]).

Pica practices

As the table shows, the items reportedly ingested varied somewhat between the women in Mexico and those in southern California. Of these items, only ice was said to be routinely eaten outside of pregnancy, and even ice was eaten in much smaller amounts when the women were not pregnant than when they were.

Ice eating was reported only by US women, probably because no one interviewed in Mexico owned a refrigerator (2 had iceboxes); electricity was a recent arrival, and people were very poor. Quantities eaten daily ranged from about 10 ice cubes to a 32-oz cup of ice. Reasons given for eating ice were thirst, to cool down, and enjoyment of its texture. None of the ice-eating women believed that this could harm the fetus. Women who exhibited pica behavior were much more likely to report eating ice if they lived in Bakersfield, which is very hot in the summer (10 of 36 women, or 28%), than if they lived in Santa Ana (8 of 102 women, or 8%) or Los Angeles (0%). If the 12 women who ate only ice were removed from the count, then the percentage of US women who reported engaging in pica behavior would drop from 31% to 23% (34 of 150 women)—lower but still substantial.

In Mexico, women said they ate pica items because of their taste, smell, or texture in the mouth; for medicinal purposes; and (in the case of magnesium carbonate) because of advice from someone. In California, women said they practiced pica because of thirst (ice only); because of the items' taste, smell, or texture in the mouth; for medicinal purposes; because of advice from someone; and for religious reasons. None said they practiced pica to lose weight or increase caloric intake. Medicinal reasons included soothing of nausea, creating a laxative effect (magnesium carbonate), assuaging thirst (ice), and cooling the body (ice). Only 1 woman said she practiced pica for religious reasons. Her mother had told her that consuming a figure of the Virgin of Guadalupe made from holy clay gathered in San Juan de los Lagos, Mexico (figure), would "bring her blessings."

A nearly unanimous theme among those who craved dirt was that its rich smell when freshly watered brought on a strong desire to ingest it. Similarly, women who ate bean stones reported being attracted by the smell of the little clods of dirt they found when washing the beans. In addition, about three quarters of the women said that they felt a yearning for particular substances, such as starch or clay, in the mouth so that they could savor their physical texture. Women who ate magnesium carbonate as a replacement for dirt stated that its texture in their mouth was similar to that of dirt.

Two women volunteered the term "addiction" in reference to their pica. One reported a "withdrawal" consisting of a "fall in blood pressure and sweating" if she did not eat dirt when she craved it. Another woman said that she felt nervous and got the taste of bean stones in her mouth if she did not satisfy her craving for them.

About a quarter of the women believed that practicing pica could harm the fetus—that it could get parasites, a cold, or suffer harmful effects from chemicals in the materials ingested. Many women who thought that pica was harmful continued the practice even after a physician's warning, saying they "couldn't help themselves." Most, however, thought that pica was beneficial for the fetus. Women interviewed in both Mexico and the United States believed that failure to satisfy a pica craving could lead to miscarriage, illness, or a baby "born with its mouth open," which they said meant that the baby would have

unsatisfied needs. Three named benefits of pica, such as "cleansing the baby" (through the laxative action of magnesium carbonate) and making the baby happy.

Women interviewed in Mexico reported various effects of pica on their own bodies, including relief of constipation or diarrhea, depending on amount ingested (magnesium carbonate); skin rash (battery acid); "burned tongue" (paint thinner); and a burning sensation in the stomach (ashes). In contrast, the US women reported only positive consequences of their pica practices: relief of "heartburn" (magnesium carbonate), laxative action (magnesium carbonate), relief of nausea (ice), and cooling of the body (ice).

Magnesium carbonate ingestion

Magnesium carbonate, a pica item not previously described in the literature, plays an important role in the communities studied. On both sides of the US-Mexico border, blocks of white, chalky magnesium carbonate about the size of a 35-mm film box (figure) are sold in pharmacies as a heartburn remedy and as a laxative. Four interviewees said that doctors or nurses in Mexico had recommended eating small amounts to assuage their craving for dirt. The quantity reportedly ingested daily ranged from a quarter of a block to as many as 5 blocks a day.

Women gave many reasons for eating magnesium carbonate: taste, texture in the mouth, medicinal effects, satisfying their craving for dirt, and following someone's advice. Overall, they were not concerned that it would have any adverse effects on the fetus; in fact, as noted earlier, one woman thought it would benefit her baby by clearing out its intestinal tract so it would be "born clean." Effects reported by the women on their own bodies included decreased heartburn, relief of constipation, and diarrhea, the last in a woman who was consuming 4 to 5 blocks a day.

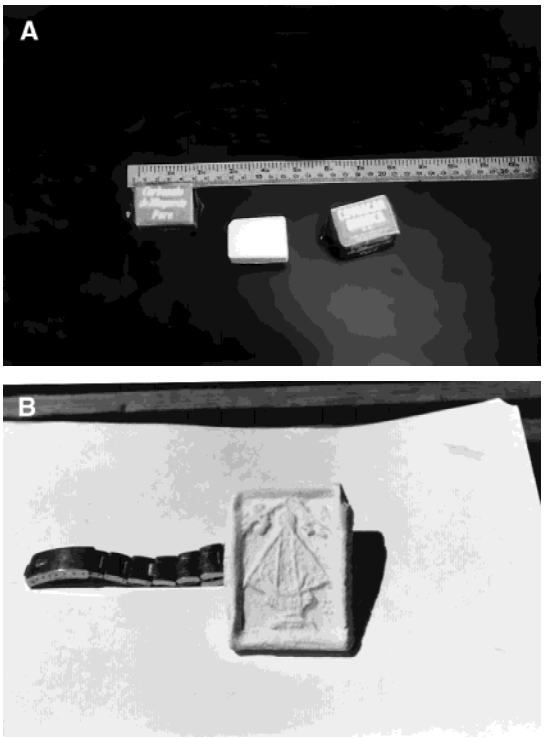

Figure 1 Two common pica items are magnesium carbonate and clay. A. Magnesium carbonate blocks can be obtained at California swap meets and at neighborhood pharmacies and botanicas (herbal medicine shops) in both Mexico and California. B. Small clay blocks from central Mexico stamped with the image of the Virgin of Guadalupe (example shown with watchband) are sometimes brought to the United States.

DISCUSSION

We found a high prevalence of pica behavior in the 2 groups studied. The slightly lower prevalence in the United States—31% versus 44% in Mexico—could be due to lesser availability of clean dirt, clay, and adobe and/or to underreporting of a behavior that is less culturally acceptable in the United States. The observed association between pica activity and having a family member who practiced pica suggests that this may be a learned behavior.

Women who have heightened sensitivity to smell and texture may have a greater tendency towards pica. Knox et al report that Belfast women experiencing heightened olfactory sensitivity during pregnancy had substantially more cravings than did women who noted no change in sense of smell. In addition, pregnant women preferred certain smells.[7] This correlates with Cooksey's findings about the importance of olfaction in pica[16] and is consistent with our own results.

We are concerned that excessive magnesium ingestion could cause harm to the fetus or mother. Reports of a small number of cases have associated the infusion of magnesium sulfate to prevent uterine contractions during the second trimester with impaired formation of fetal bones and hypoplasia of the dental enamel.[23,24] Maternal hypermagnesemia may also occur as a result of magnesium infusion in individuals with already impaired renal function. This in turn may cause depressed maternal respiratory and cardiac rates or decreased fetal heart rate activity.[25-27] Despite the fact that women of Mexican ancestry (and especially those born in Mexico) have generally good birth outcomes,[28] fetal damage from the maternal ingestion of toxic substances may not be evident at birth. It is unclear whether magnesium ingested during pregnancy could produce maternal serum levels high enough to cause fetal or maternal harm, but caution would seem to be in order.

Cultural and family perceptions of the normalcy of pica may influence whether women feel comfortable indulging in cravings and discussing their practice with outsiders, but in the present study, the specific choice of pica item seemed to be driven by individual preference for a

particular texture or flavor, as has been described by Edwards et al elsewhere.[11] Women who ate tar lived next door to women who ate laundry bluing who lived next door to women who ate dirt. At times, however (as with ice), the choice of items was based on availability.

The most commonly reported pica items in Mexico were dirt, bean stones, and magnesium carbonate, whereas dirt ingestion was less common in the United States, with ice and bean stones being the most common pica items. Edwards et al report a similar shift in preferences from clay and dirt in rural environments to ice and freezer frost in urban locations.[13]

Some of the women believed that the failure to satisfy a pica craving could bring harm to them or to the fetus. This idea about bottled-up cravings may also play a role in the withdrawal symptoms—nervousness, sweating, and tasting the substance craved—reported by several women.

The present study shows that in-depth interviews of women can elicit a large amount of information about pica behavior. There is some evidence that self-completed questionnaires are less effective. For example, clinic counselors of the Women, Infants, and Children Supplemental Food Program (WIC) at one interview site reported that their clients rarely checked off "yes" in response to an intake questionnaire item that asked, "Do you eat or crave things like dirt, clay, laundry starch, or freezer frost?" (personal communication). However, many women interviewed at that site admitted to these behaviors when asked about them privately and nonjudgmentally.

Similarly, the fact that only 1 of 12 women questioned at the East Los Angeles interview site reported engaging in pica behavior may be connected with privacy issues. This was the only place where we could not interview women in private, and we noted that they seemed to be embarrassed about discussing pica in front of the onlookers, most of whom were also Latina but born in the United States.

Further research is needed to correlate parity and month of pregnancy with women's pica behavior. Also, additional work should be carried out in a larger number of sites spaced more widely across the United States and Mexico to determine whether the pica beliefs and behaviors documented in this article are widespread. The fact that subjects were born in many different areas of Mexico, however, suggests that pica is common in low-income Mexican-born women.

Pica behavior is probably precipitated by a complex array of factors that we do not fully understand. Until more compelling evidence of its cause makes treatment possible, each woman should be asked about her experience with pica. Health care professionals need to be aware of the high prevalence of this behavior in low-income Mexican-born women and its constantly evolving nature, as evidenced by the emergence of magnesium carbonate as a new pica item. The phenomenon clearly merits further study and increased clinical vigilance.

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