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Qualitative assessment of pica experienced by frequent blood donors

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Abstract

BACKGROUND—Pica, the compulsive consumption of ice or other nonnutritious substances, is associated with iron deficiency, a common negative consequence of frequent blood donation. Because of this, blood donors, such as those participating in the Strategies to Reduce Iron Deficiency (STRIDE) study, are an ideal population to explore pica and iron deficiency.

STUDY DESIGN AND METHODS—STRIDE was a 2-year intervention trial to assess the effectiveness of iron supplementation for mitigating iron deficiency in frequent blood donors. Subjects completed baseline and follow-up questionnaires that included questions about pica symptoms. In-depth telephone interviews were conducted with 14 of these subjects reporting pica symptoms and eight presumed controls (casual ice chewers) to gain a deeper understanding of pica symptoms and their impact on daily life and to make a final determination on the presence of pica.

RESULTS—Pica was confirmed in five of the 14 subjects reporting symptoms and in two of eight controls. Outcome misclassification based on the questionnaire was attributed to inadequate assessment of several pica symptoms identified during the interview. Comparison of subjects' repeated quantitative iron measurements taken throughout STRIDE with subjects' final adjudicated pica status revealed a positive relationship between development of pica and worsening iron status; the opposite was found in those whose pica symptoms resolved.

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CONFLICT OF INTEREST

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's website.

Appendix S1. Questions from STRIDE enrollment, final, and final supplemental questionnaires that made participants eligible for STRIDE pica substudy.

CONCLUSION—Continued refinement of pica symptom questions will allow for rapid and accurate detection of pica in frequent blood donors and confirmation of successful treatment with iron supplements.

Pica is a well-recognized symptom of iron deficiency characterized by craving for and regular consumption of nonnutritional substances such as ice, dirt, paper, or chalk.¹ The most common pica is the compulsive chewing of ice, known as pagophagia.^{2,3} Relatively little is known about the impact of pica on the daily lives of those experiencing it, because pica sufferers seem reluctant to discuss their symptoms with their personal physician.¹ The prevalence of pica in healthy populations is difficult to establish, given that its symptoms may be conflated with mental illness, consumption of certain substances can be culturally dependent, and there is no validated screening questionnaire for pica symptoms.

Whole blood donation removes between 200 and 250 mg of iron from the donor. Consequently, many frequent blood donors experience iron deficiency.^{4–6} The Strategies to Reduce Iron Deficiency (STRIDE) study was a randomized, placebo-controlled, multicenter study designed to assess the effectiveness of providing iron supplements or iron status information to mitigate iron deficiency in frequent blood donors.^{7,8} The overarching goal of STRIDE was to contribute to the improvement of regular blood donor health through development of effective iron deficiency mitigation programs in community blood centers. For this reason, understanding the impact of iron deficiency symptoms, such as pica, on individual repeat donors is important for preserving the valuable resource of frequent blood donors.

STRIDE enrolled healthy individuals, 60% of whom had iron deficiency, for a 2-year longitudinal study.^{7,8} Participants completed study questionnaires at enrollment and final visits asking about craving and consuming non-nutritional substances. Based on these responses, a subset of STRIDE subjects were selected to participate in a qualitative, interview-based study to explore habits and attitudes about nonnutritional substance consumption. Qualitative methods were used due to the open-ended and exploratory nature of the research questions.

MATERIALS AND METHODS

Details of STRIDE study design, enrollment, and findings have been previously reported.^{7,8} Participants were drawn from STRIDE subjects who affirmatively responded to specific questions related to pica on study questionnaires, as well as controls who reported chewing ice but without overt pica behaviors. Appendix S1 (available as supporting information in the online version of this paper) includes a list of the excerpted questions that were used to identify the subset of participants eligible for this study.

A series of 1-hour telephone interviews was conducted with study participants. Interviews explored the following research questions:

1. How does pica impact the daily lives of those affected by it?
2. Is pica related to blood donation or other events (e.g., menstrual cycles) in participants' lives?

3. What is the relationship between pica and iron deficiency or anemia?
4. What, if any, negative social stigma is associated with pica?
5. Did participant responses to the STRIDE study questionnaires accurately detect pica?

This study was approved by institutional review boards at each blood center and the coordinating center. At the beginning of each interview, verbal consent was obtained to proceed with the interview and to permit audio recording of the session. Recordings of all interviews were transcribed; these transcripts served as the primary data source for the analysis using qualitative analytical software (NVivo10, QSR International Pty Ltd, 2012).

RESULTS

Pica study participant characteristics

A total of 26 STRIDE subjects responded affirmatively to at least one pica behavior-related questionnaire item. Of these, 14 agreed to participate in the study. Twelve subjects, who indicated in questionnaire responses that they occasionally chewed ice, but did not appear to have pica symptoms, were selected as controls. Of these, eight agreed to participate in the study. Participants were categorized into one of four groups based on their questionnaire responses (Table 1).

Trained interviewers qualitatively assessed the likelihood that the participant had experienced pica after each interview. The first six questions of the interview, pertaining to the impact of pica on the participant's daily life, were used to make the assessment. If a participant's responses to these questions indicated persistent chewing of inappropriate amounts of ice for greater than 1 month, they were classified as a pica subject. Seven participants, all women, fell into this category (Table 2). Although formal mental health assessments of the subjects were not available, it was assumed that these frequent blood donors did not have a serious mental disorder underlying their consumption of a culturally inappropriate amount of ice.

False positives

Although questionnaire responses suggested that 14 participants had pica symptoms upon study enrollment, nine of these were determined not to have actually experienced pica (Table 2). In each case, it became clear during the first questions of the interview that these participants chewed ice only when it was in a drink and did not experience any particular craving for ice itself.

Impact of pica on daily life

The effect of pica on daily life was examined by probing the impact of cravings and behavioral changes made to satisfy cravings. The use of the term "craving" itself was unique to pica subjects. Many agreed that their need for ice was intense enough that they were comfortable characterizing it as a craving, whereas nonpica subjects were not comfortable using this term. For nearly all pica subjects, a need or craving for ice had been present for such a long period of time that they could not recall when the cravings started. In this sense,

it was difficult for the participants to assess how pica impacted their lives, since cravings were normal for them. Participants described their cravings as frequent, but not constant, and noted that they often made getting ice a priority upon returning home, such as after work.

... I actually would crave it so much that I would just come home and from the freezer get it. We have an icemaker that I would have crushed ice in a cup, the crushed ice, you know?

Sometimes it was the first priority, you know, or like if we were out to eat at a fast food, I would fill the cup as high as I could with ice before I'd add the soda.

Pica subjects did not report that their cravings for ice required them to regularly change their behavior, largely due to the fact that the majority had ice readily available at most times. Occasional behavior changes, such as stopping at a fast food restaurant to get a drink with ice in it, were made to obtain ice in instances when it was not readily available.

We have an icemaker at my home, and so it was never really out of the way. I could just go and get it. I guess if we didn't have that icemaker at the house, I probably would have kind of gone out of the way. I think one time I was going somewhere after donating blood, and so I stopped at McDonald's and like, bought a soda with ice in it.

Several pica subjects (and none of the nonpica subjects) mentioned that they had made an attempt to cut back on eating ice at some point in their lives. In some cases, they chose to cut back because a dentist had called attention to the adverse impact of ice chewing for the respondent's teeth. Several respondents noted that cutting back was difficult.

Well, just basically it really had to do with the teeth in saying, you know, that I can't keep doing this. I've got to curb this, and so I try not to do it as much and limit how often I did it. At times ... it got to the point where I had stopped putting ice in my cup just so that I wouldn't do it.

Activities or events that alter cravings

Interviews explored whether pica subjects experienced sustained periods where their ice cravings changed and whether identifiable triggering activities or events led to these changes. Most participants did not note sustained increases or decreases in their cravings or awareness of triggers. Of the few who noticed triggers, blood donation and menstrual cycles were noted as leading to increased cravings.

Pica and iron deficiency

As participants were current or former frequent blood donors, they had been regularly tested for anemia to ensure adequate hemoglobin (Hb) levels for donation. Many donors think of the Hb test as an iron test, and when asked about experiences with iron deficiency, low Hb deferral for fingerstick Hb level of less than 12.5 g/dL was commonly discussed. Nearly all pica subjects had been deferred at least once. A small number of pica subjects were told that their Hb was low nearly every time they attempted to donate blood, which was not reported by nonpica respondents. Participants made short-term dietary changes to address iron deficiency, and none used iron supplements to prevent deferral.

... almost every time I would donate they would tell me that I was low. I've been deferred pretty many times, and so finally I just started proactively eating a cereal that they recommended that has like 90% of your iron, you know, your daily allotment or whatever. I would eat that two days ... before I donated and so I would pass the donation.

Nevertheless, iron supplementation was common among the pica subjects. Although only two pica subjects had been in a STRIDE iron supplementation group, nearly all reported that they had taken iron supplements, either alone or in a multivitamin, at some point in their lives. By comparison, only about half of the nonpica subjects reported ever using iron supplements.

Pica symptoms and iron status assessed by plasma ferritin

Subjects were characterized by iron status, as assessed by plasma ferritin (Table 2). The two subjects in the “discontinued pica behaviors” group were in the iron status letter group and the 38 mg of iron group. Ferritin levels in these subjects increased from 12 and 15 ng/mL at the beginning of STRIDE to 27 and 39 ng/mL, respectively, at the end. In contrast, the two subjects in the “developed pica behaviors” group were both in the no information letter group. Their ferritin decreased from 17 and 20 ng/mL at the beginning of STRIDE to 14 and 8 ng/mL at the end. These two subjects also each had seven donations during STRIDE in which their plasma ferritin was less than 12 ng/mL. The initial pica category assignment and final pica determination based on interview for the subjects without pica are presented in Table 2.

Potential social stigma

Interviews addressed social stigma by asking about perceptions as to whether ice chewing was seen as a normal behavior, lying about or hiding the behavior, and discussions with health care providers. Pica and nonpica subjects had different views on whether the amount of ice they chewed was normal. Nonpica participants felt that the amount of ice they chewed was completely normal. However, pica participants had mixed reactions to the question; approximately half perceived the amount of ice they chewed as normal, whereas the other half perceived it as abnormal.

... I didn't understand why I was craving ice ... it just doesn't seem like a normal thing. You know what I'm saying? ... [E]ven though I was doing it, I wouldn't consider it normal behavior.

Despite the fact that several pica subjects felt that their ice chewing was unusual, they did not try to hide or lie about the behavior, nor did it bother them if others were aware of it. Every pica subject mentioned that others, generally close family members such as spouses, had noticed and commented on their ice eating habits.

Well, maybe every once in a while you get a look ... “Do you really have to make all that noise? I'm trying to watch this.”

This notice, however, did not prompt long-term behavior changes. If a family member commented that their ice chewing was loud (a commonly reported occurrence), they simply stopped chewing ice at that moment or attempted to do it more quietly. These comments

were perceived as related to the present moment only, not as a larger judgment on their behavior.

I'd stay more quiet about it and see if I could keep it below the radar. Yes, not be as noisy about it.

No pica subjects reported discussing ice chewing with their health care providers. Due to visible wear on their teeth, including grinding and cracking, several respondents noted that their dentists asked them if they chewed ice and had encouraged them to stop.

The dentist kind of brought it up to me. I think the one time I had told him that my teeth were sore, and he was looking at it. He goes, it looks like you've been grinding your teeth. And then I was just like, huh, I don't feel like I've been grinding my teeth. He mentioned, you know, do you chew ice? I was like sometimes. What does that matter? He was like well, you see it kind of gives more of the same effect. It's just like grinding your teeth. I'm like oh!

DISCUSSION

Gaining a better understanding of how pica impacts the lives of those affected by it can improve the ability of health care providers to recognize and treat it. In general,^{2,3} and certainly for frequent blood donors,^{9,10} pica is associated with iron deficiency and is expressed primarily through cravings for ice. These cravings often disappear within 1 to 2 weeks following treatment with oral iron supplements.^{2,3,10}

The qualitative interview findings described here show that pica impacts blood donors in different ways. Yet, likely because all study subjects craved ice rather than more unusual substances, it was not perceived as strange or concerning by those experiencing it. Some participants felt that their behavior was unusual, but the craving was justified because they were consuming an edible substance that others also regularly consume. These aspects of pagophagia—that ice is edible and commonly consumed—complicate the ability to reliably detect it using questionnaires. Even when the behavior is perceived as unusual, it does not lead people to discuss the behavior with their physician.¹ Based on the interviews performed here, the health care providers most likely to notice ice chewing are dentists, who recognize resultant tooth problems but may not be aware of the patient's other risk factors for pica.

The availability of ice is another complicating factor in uncovering pica. Automatic ice dispensers are common, and fast food restaurants are ubiquitous. This means that for most people, finding ice to consume does not require changes to one's daily routine. Thus, many who experience pica do not need to make behavior changes to satisfy their cravings.

It would be helpful to use surveys to accurately identify the population experiencing pica for further research. Thus, a secondary aim of this study was to examine whether survey questions used in STRIDE reliably detected pica. Overall, we found that the pica-related questions in the STRIDE study questionnaires did not accurately detect pagophagia. Within our sample of 22 subjects, 14 were thought to have experienced pica based solely on questionnaire responses. The remaining eight were classified as controls and were believed unlikely to have experienced pica. Of the 14 whose questionnaire responses seemed to

indicate pica, only five were determined to have experienced it based on interview responses (positive predictive value 36%). For this group, the STRIDE questions did not accurately differentiate common ice chewing from a craving, allowing for a number of false-positive responses. The remaining two pica subjects came from the eight subjects in the control group (negative predictive value 75%).

Interview findings uncovered characteristics that occurred in pica subjects, but most of these were not universal. This indicates that the experience of pica differs from person to person. Thus, detecting pica symptoms by questionnaire cannot rely on responses to a single question, but requires a pattern of responses to several questions. The responses to the STRIDE questionnaires were useful to identify potential pica subjects, but additional questions are needed for more definitive identification. The qualitative interviews identified several characteristics of pica subjects that could serve as the basis for improved questions to be used in future studies. Sample questions are provided in Table 3. This would allow for larger studies in blood donors, as well as other populations, that could be designed to define the genetics and biochemistry in relation to the iron deficiency associated with pica, which are essentially unknown at this time.¹¹

This study has several limitations. First, because all 26 STRIDE subjects who indicated pica symptoms in their questionnaire responses were approached for interviews, nonresponse bias is a concern. Although it is unlikely that potential participants opted out specifically due to pica, because pica or pagophagia was not mentioned during recruitment, it is still possible that those who did not participate differ from those who did. In addition, the study included only a small number of pica subjects, all frequent blood donors with pagophagia. Thus, the experience of pica within the general population may differ from the experience described by study participants, particularly for those who crave unusual substances. Those consuming other substances may have different feelings about their pica and associated social stigma.

Quantitative measurements of iron status in the subjects studied here were available as part of the larger STRIDE study. Ferritin is a measure of storage iron in the body, with values less than 12 ng/mL a highly specific marker of absolute iron deficiency.¹² Among the small number of subjects with a final determination of pica in this study, those who appeared to develop new pica symptoms over the course of the study had corresponding decreased ferritin levels, while those who had pica symptoms resolve had increased ferritin levels. These findings are consistent with the pica studied here being related to iron deficiency and suggest that greater recognition and treatment of iron deficiency among frequent blood donors will decrease pica symptoms and improve overall health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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ABBREVIATION

STRIDE Strategies to Reduce Iron Deficiency

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TABLE 1

Pica study groups

Group	Description
Developed pica behaviors	Participants responding “no” to craving and consuming ice at baseline, but responding “yes” to craving and consuming ice on the final questionnaire.
Maintained pica behaviors	Participants responding “yes” to craving and consuming ice on the baseline and final questionnaires.
Discontinued pica behaviors	Participants responding “yes” to craving and consuming ice at baseline, but “no” to craving and consuming ice at the end of the study.
Control subjects	Participants responding “no” to craving and consuming ice on the baseline and final questionnaire, but responding “yes” to the question “do you ever chew ice?” on the final questionnaire. These subjects did not affirmatively answer any other questions suggesting pica behavior and were randomly selected to ensure that all STRIDE treatment arms were represented in the sample of potential interview participants.

TABLE 2

Pica study participant characteristics

Final pica status	Initial pica assignment	STRIDE randomization*	Sex	Baseline ferritin (ng/mL)	Final ferritin (ng/mL)
Present	Control	Placebo pill	Female	27	9
Present	Control	19 mg of iron	Female	5	25
Present	Developed pica behaviors	No information letter	Female	17	14
Present	Developed pica behaviors	No information letter	Female	20	8
Present	Discontinued pica behaviors	Iron status letter	Female	12	27
Present	Discontinued pica behaviors	38 mg of iron	Female	15	39
Present	Maintained pica behaviors	Iron status letter	Female	1	13
Absent	Control	38 mg of iron	Female	15	51
Absent	Control	38 mg of iron	Male	24	78
Absent	Control	19 mg of iron	Female	24	42
Absent	Control	19 mg of iron	Male	19	33
Absent	Control	Placebo pill	Male	154	63
Absent	Control	19 mg of iron	Male	25	136
Absent	Developed pica behaviors	Placebo pill	Female	4	4
Absent	Developed pica behaviors	No information letter	Female	4	9
Absent	Developed pica behaviors	No information letter	Male	44	51
Absent	Discontinued pica behaviors	38 mg Iron	Male	6	24
Absent	Maintained pica behaviors	No information letter	Female	12	8
Absent	Maintained pica behaviors	Iron status letter	Male	13	54
Absent	Maintained pica behaviors	38 mg Iron	Male	18	35
Absent	Maintained pica behaviors	19 mg Iron	Male	19	14
Absent	Maintained pica behaviors	38 mg Iron	Male	12	50

* STRIDE randomization groups are characterized as follows: 1) *No information letter*—thank you letter with no ferritin information sent after each donation; 2) *iron status letter*—letter with ferritin information sent after each donation; 3) *placebo pill*—participant received placebo pill with no ferrous gluconate; 4) *19 mg of iron*—participant received supplement with 19 mg of ferrous gluconate; 5) *38 mg of iron*—participant received supplement with 38 mg of ferrous gluconate.

TABLE 3

Example survey questions related to pica characteristics

Pica-related characteristics	Example survey questions
Comfortable describing need for ice as “craving”	Do you crave ice?
Chew ice by itself	Do you ever chew ice by itself?
Changed behavior to get ice	Have you ever changed your behavior in order to get ice, for instance, stopping at a fast food restaurant when you had not planned to do so, or going somewhere for the sole purpose of getting ice?
Felt need to cut back on chewing ice	Have you ever felt that you should try to eat less ice?
Felt ice chewing was unusual	Do you feel that the amount of ice you eat is unusual?
Noticed by others	Have family or friends ever noticed or commented on your ice eating?
Experienced tooth problems attributed to chewing ice	Has your dentist noticed grinding, cracking, or unusual wear patterns on your teeth?

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