Knowledge and Practice of Prechewing/Prewarming Food by HIV-Infected Women

WHAT'S KNOWN ON THIS SUBJECT: Although associations between prechewing and transmission of pathogens including HIV have been reported, purported health benefits of this feeding practice have also been debated. The extent of this practice and a related practice of oral prewarming of food is unclear.

WHAT THIS STUDY ADDS: The infant/child feeding practices of prechewing and oral prewarming of food are not uncommon in Latin America. Health care providers could be missing information about cultural feeding practices, which patients may not report unless specifically asked.

abstract

OBJECTIVE: HIV transmission has been associated with offering a child food prechewed by an HIV-infected caregiver. We assessed awareness of prechewing and oral prewarming of food by an adult before offering it to a child among HIV-infected pregnant women and clinical investigators in 3 Latin American countries.

METHODS: HIV-infected pregnant women at 12 sites (Eunice Kennedy Shriver National Institute of Child Health and Human Development International Site Development Initiative Perinatal Longitudinal Study in Latin American Countries, a prospective cohort trial) in Argentina, Brazil, and Peru were administered a screening survey about prechewing/prewarming of infant foods and cautioned against these feeding practices. Survey responses were analyzed, overall, and stratified according to country.

RESULTS: Of the 401 HIV-infected pregnant women interviewed, 34% had heard about prechewing (50% from Argentina, 32% from Brazil, and 36% from Peru), 23% knew someone who prechewed food for infants, and 4% had prechewed food in the past. Seventeen percent had heard about oral prewarming of food, 13% knew someone who prewarmed food for infants, and 3% had prewarmed food for an infant in the past. Women who reported knowing someone who prechewed were more likely to also know someone who prewarmed food ($P < .0001$). Few site investigators anticipated that their patients would be aware of these practices.

CONCLUSIONS: Prechewing food, a potential risk factor for HIV transmission, and orally prewarming food, which has not been associated with HIV transmission but might expose a child to blood from an HIV-infected adult, are not uncommon practices in Latin America. Both practices should be further investigated. Site investigator responses underscore that health care providers could be missing information about cultural practices that patients may not report unless specifically asked. *Pediatrics* 2011;127:e1206–e1211

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KEY WORDS

HIV, prechewing, prewarming, premastication, child

ABBREVIATIONS

NICHD—Eunice Kennedy Shriver National Institute of Child Health and Human Development
NISDI—NICHD International Site Development Initiative
LILAC—Longitudinal Study in Latin American Countries

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We recently reported 3 cases of pediatric HIV infection that resulted from an HIV-infected adult feeding prechewed (pre-masticated) food to an uninfected child.¹ Prechewing (pre-mastication) involves an adult chewing food or another item such as an herb or traditional medicine and then feeding it to the child. Although the practice of prechewing food for children, usually during the weaning period, has been described sporadically in various parts of the world,^{2–6} including the United States,^{1,7,8} this practice has not been systematically surveyed. Pre-warming (or precooling) involves an adult holding food inside his or her own mouth to adjust the temperature of the food item before offering it to a child. Similar to prechewing, pre-warming may expose the child to blood from the oral cavity of an HIV-infected adult, yet to our knowledge the prevalence of this practice has not been previously described.

We administered a survey to a cohort of HIV-infected pregnant women from 3 countries in Latin America, informed them about the potential risk of HIV transmission associated with these practices, and recommended against them. In addition, we queried principal investigators at each study site about their awareness of these feeding practices and whether their patient population would be aware of or practice them.

METHODS

The Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) International Site Development Initiative (NISDI) Longitudinal Study in Latin American Countries (LILAC) is an observational, prospective cohort study of HIV-infected pregnant women and HIV-exposed, uninfected children. All participating sites have access to antiretroviral agents and infant formula, and avoid-

ance of breastfeeding is routinely recommended. The main objectives of the NISDI LILAC are to describe the use and impact of interventions for preventing mother-to-child transmission of HIV.

In this analysis we assessed women's awareness of prechewing and pre-warming by using a standardized questionnaire that trained study staff administered at the enrollment visit by reading a scripted definition of each practice followed by 3 screening questions for each practice. These questions included inquiring whether the enrollees had heard about the practice from family or community, whether they knew anyone who engaged in these feeding practices, and whether they themselves had prechewed or prewarmed food when feeding a child. At the end of the survey, a scripted statement was read to each respondent informing them about the potential risk of HIV transmission associated with these feeding practices and a recommendation against the practices. The survey and the scripted statement at the end of the survey were translated into Spanish and Portuguese and administered by trained study staff proficient in the local languages of the study participants.

This infant feeding practice survey was administered to women enrolling into the LILAC protocol beginning in 2008. The study was approved by the ethical review board at each participating site as well as by the institutional review boards at the sponsoring institution (NICHD) and the data coordinating center (Westat, Rockville, MD). All subjects provided signed informed consent before enrollment into the study.

Categorical analysis (Fisher-Freeman-Halton exact test) was used to explore associations between the characteristics of the women (age, country of residence, number of household members, education, employment, Centers for Disease Control and Prevention HIV

clinical disease stage⁹) and knowing someone who prechewed or prewarmed food for a child. The Mantel-Haenszel χ^2 test for trend was used to appraise sequence of proportions.

RESULTS

The 6-question survey was administered to a total of 401 HIV-infected pregnant women: 38 in Argentina, 319 in Brazil, and 44 in Peru. None of the study cohort participants declined participation in the survey. Characteristics of the study population are listed in Table 1.

Responses to the 6 survey questions are listed in Table 2. Overall, although 33.9% of respondents had heard about prechewing and 22.9% reported knowing someone who prechewed, only 3.7% (15 subjects) reported ever prechewing for a child. Similarly, although 17.5% and 13.2% of respondents reported hearing about or knowing someone who prewarms food before giving it to a child, only 3.0% (12 subjects) reported prewarming for a child themselves. Maternal viral load was not significantly associated with respondents reporting prechewing or prewarming food for a child in the past.

Overall, respondents who reported knowing someone who prechewed were more likely to also report knowing someone who prewarmed ($P < .0001$), suggesting that these feeding practices might be coprevalent. In addition, respondents who reported knowing someone who prechewed food were more likely to report prechewing food in the past ($P < .0001$) and respondents who reported knowing someone who prewarmed food were more likely to report prewarming food in the past ($P < .0001$). There was no statistical association between any sociodemographic factor studied, maternal viral load, or CD4 count and knowing someone who

TABLE 1 Characteristics of HIV-Infected Pregnant Women Participating in the NISDI LILAC in Latin America (*N* = 401)

Characteristic	Total	Know Someone Who Prechews				Know Someone Who Prewarms			
		Yes (<i>N</i> = 92), <i>n</i> (%)	No (<i>N</i> = 309), <i>n</i> (%)	<i>P</i> ^a	OR (95% CI)	Yes (<i>N</i> = 53), <i>n</i> (%)	No (<i>N</i> = 348), <i>n</i> (%)	<i>P</i> ^a	OR (95% CI)
Country of residence									
Argentina	38	0	38 (100.0)	<.0001	—	3 (7.9)	35 (92.1)	.40	0.6 (0.2–1.9)
Brazil	319	68 (21.3)	251 (78.7)	—	1.0	42 (13.2)	277 (86.8)	—	1.0
Peru	44	24 (54.5)	20 (45.5)	—	4.4 (2.3–8.5)	8 (18.2)	36 (81.8)	—	1.5 (0.6–3.4)
Race ^b									
Black	86	17 (19.8)	69 (80.2)	.12	1.0 (0.5–1.9)	10 (11.6)	76 (88.4)	.89	0.8 (0.4–1.7)
White	184	36 (19.6)	148 (80.4)	—	1.0	26 (14.1)	158 (85.9)	—	1.0
Mestizo	130	39 (30.0)	91 (70.0)	—	1.8 (1.0–3.0)	17 (13.1)	113 (86.9)	—	0.9 (0.5–1.8)
Other	1	0	1 (100.0)	—	—	0 (0.0)	1 (100.0)	—	—
Ethnicity ^b									
Latino	374	87 (23.3)	287 (76.7)	.81	1.0	51 (13.6)	323 (86.4)	.56	1.0
Not Latino	27	5 (18.5)	22 (81.5)	—	0.7 (0.3–2.0)	2 (7.4)	25 (92.6)	—	0.5 (0.1–2.2)
Age at delivery, y									
<20	19	4 (21.1)	15 (78.9)	.15	0.7 (0.2–2.3)	2 (10.5)	17 (89.5)	.45	0.6 (0.1–3.0)
20–29	195	53 (27.2)	142 (72.8)	—	1.0	30 (15.4)	165 (84.6)	—	1.0
>29	187	35 (18.7)	152 (81.3)	—	0.6 (0.4–1.0)	21 (11.2)	166 (88.8)	—	0.7 (0.4–1.3)
No. of household members									
1–3	186	46 (24.7)	140 (75.3)	.48	1.0	24 (12.9)	162 (87.1)	.88	1.0
≥4	215	46 (21.4)	169 (78.6)	—	0.8 (0.5–1.3)	29 (13.5)	186 (86.5)	—	1.1 (0.6–1.9)
Education (years completed)									
0–6	116	34 (29.3)	82 (70.7)	.11	2.9 (0.8–10.4)	20 (17.2)	96 (82.8)	.30	2.3 (0.5–10.5)
7–12	261	55 (21.1)	206 (78.9)	—	1.9 (0.5–6.5)	31 (11.9)	230 (88.1)	—	1.5 (0.3–6.6)
≥13	24	3 (12.5)	21 (87.5)	—	1.0	2 (8.3)	22 (91.7)	—	1.0
Gainfully employed									
Yes	146	29 (19.9)	117 (80.1)	.32	1.0	18 (12.3)	128 (87.7)	.76	1.0
No	255	63 (24.7)	192 (75.3)	—	1.3 (0.8–2.2)	35 (13.7)	220 (86.3)	—	1.1 (0.6–2.1)
Know someone who prechews									
Yes	92	NA	NA	NA	NA	37 (40.2)	55 (59.8)	<.0001	1.0
No	309	NA	NA	NA	NA	16 (5.2)	293 (94.8)	NA	0.1 (<0.1–0.2)
Have prechewed food									
Yes	15	12 (80.0)	3 (20.0)	<.0001	1.0	NA	NA	NA	NA
No	386	80 (20.7)	306 (79.3)	—	0.1 (<0.1–0.2)	NA	NA	NA	NA
Have prewarmed food									
Yes	12	NA	NA	NA	NA	9 (75.0)	3 (25.0)	<0.0001	1.0
No	389	NA	NA	NA	NA	44 (11.3)	345 (88.7)	—	<0.1 (<0.1–0.2)
CD4 count at enrollment, cells per mm ³									
<200	54	8 (14.8)	46 (85.2)	.30	0.5 (0.2–1.2)	5 (9.3)	49 (90.7)	0.50	0.6 (0.2–1.5)
200–499	170	40 (23.5)	130 (76.5)	—	0.9 (0.6–1.5)	21 (12.4)	149 (87.6)	—	0.8 (0.4–1.4)
≥500	176	44 (25.0)	132 (75.0)	—	1.0	27 (15.3)	149 (84.7)	—	1.0
Missing	1	0	1	—	—	0	1	—	—
Plasma viral load at enrollment, copies per mL ^c									
<1000	311	70 (22.5)	241 (77.5)	.56	1.0	46 (14.8)	265 (85.2)	0.15	1.0
1000 to < 10 000	51	15 (29.4)	36 (70.6)	—	1.4 (0.7–2.8)	5 (9.8)	46 (90.2)	—	0.6 (0.2–1.7)
≥10 000	32	7 (21.9)	25 (78.1)	—	1.0 (0.4–2.3)	1 (3.1)	31 (96.9)	—	0.2 (<0.1–1.4)
Missing	7	0	7	—	—	1	6	—	—
CDC clinical disease stage at enrollment ^c									
A	332	74 (22.3)	258 (77.7)	.01	1.0	45 (13.6)	287 (86.4)	0.42	1.0
B	33	3 (9.1)	30 (90.9)	—	0.3 (0.1–1.2)	2 (6.1)	31 (93.9)	—	0.4 (0.1–1.8)
C	36	15 (41.7)	21 (58.3)	—	2.5 (1.2–5.1)	6 (16.7)	30 (83.3)	—	1.3 (0.5–3.2)

OR indicates odds ratio; CI, confidence interval; NA, not applicable.

^a *P* values are from the Fisher-Freeman-Halton test. Rows labeled “missing” are excluded from *P* value calculations.^b No participants identified as American Indian/Alaska native, Asian, or Native Hawaiian/Pacific Islander; race and ethnicity were according to subjects’ self-report.^c Enrollment was during pregnancy.

prechewed food for a child (Table 1). Among the clinical characteristics studied, only the Centers for Disease

Control and Prevention HIV clinical category had a statistically significant association with knowing someone who

prechewed food for a child: women with HIV clinical category C at enrollment were more likely to have known

TABLE 2 Awareness of the Practice of Prechewing and Prewarming Among HIV-Infected Pregnant Women in Latin America in the NISDI (LILAC) Study

Survey Question	Argentina (N = 38), n (%) Who Answered Yes	Brazil (N = 319), n (%) Who Answered Yes	Peru (N = 44), n (%) Who Answered Yes ^a	Overall (N = 401), n (%) Who Answered Yes
Have you heard about prechewing from family or community (not including any recent stories in the news about people who prechew food for infants)?	19 (50.0)	101 (31.7)	16 (36.4)	136 (33.9)
Do you know anyone who prechews food for a child/baby?	0 (0.0)	68 (21.3)	24 (54.5)	92 (22.9)
Have you ever prechewed food?	0 (0.0)	10 (3.1)	5 (11.4)	15 (3.7)
Have you heard about warming the food in the mouth from anyone in your family or community?	14 (36.8)	51 (16.0)	5 (11.4)	70 (17.5)
Do you know anyone who warms food in their mouth for a child/baby?	3 (7.9)	42 (13.2)	8 (18.2)	53 (13.2)
Have you ever warmed food in your mouth for a child?	1 (2.6)	9 (2.8)	2 (4.6)	12 (3.0)

^a The number of study participants from Peru who reported knowing someone who prechews or prewarms food is more than those who reported having heard about this practice. This is not an error and may have been related to study participants' understanding of these questions.

someone who prechewed compared with women with HIV clinical category A ($P = .006$). Awareness about prechewing increased with lower education level: 13% among women with ≥ 13 years of education, 21% among women with 7 to 12 years of education, and 29% among women with < 7 years of education (P value for trend, .03). No differences were observed between women who reported knowing someone who prewarmed food and women who did not in terms of other sociodemographic or clinical characteristics (Table 1).

Eight of the study's 12 principal investigators who were queried at a site investigator meeting reported having heard about the practice of prechewing and prewarming. However, before learning of the study results, only 1 principal investigator reported suspecting that prechewing was a feeding practice that would be prevalent among their patients or that their patients would be aware of, and only 2 reported finding such for prewarming.

DISCUSSION

Although associations between prechewing and transmission of group A streptococci,¹⁰ hepatitis B virus,¹¹ *Helicobacter pylori*,¹² Epstein-Barr virus,¹³ human herpesvirus 8,¹⁴ and, most recently, HIV¹ have been documented or hypothesized, purported health benefits of this practice (such as its sup-

porting infant nutrition and providing immunologic benefits) also have been proposed^{3,5,15} and debated.^{16,17} The present study documents that, in addition to prechewing, prewarming (a practice that could also expose an infant to the blood of an HIV-infected caregiver) exists in Latin America and that HIV-infected women are aware of both practices. There may be several reasons why relatively few cohort respondents reported engaging in these practices themselves. Some respondents did not have a previous child and may not yet have an opportunity to feed an infant. In addition, respondents might have been biased against reporting a practice some would view as socially unacceptable. We tried to minimize the latter by using a scripted neutral introduction to the survey questions that read "Some people around the world chew up food and then offer chewed food to a child. We would like to know more about this practice."

Primary investigators' surprise at the results suggests that health care providers may not become aware of important cultural practices in their patient population unless they routinely query patients about these practices as part of their medical history. In a cross-cultural study assessing prevalence of prechewing in nonmodern societies⁵ using the Human Relations

Area Files,¹⁸ researchers found prechewing mentioned in descriptions of 38 of 119 cultures that contained any information on infant feeding practices. Notably, none of the ethnographies from China mentioned this practice. The researchers then asked 104 Chinese college students to find out how they had been fed as infants by asking their parents or grandparents: 63% (65 of 104) were fed prechewed food, supporting the hypothesis that prechewing tends to be underreported in ethnographic studies, and specifically inquiring about such practices is needed. Even within a country, differences in the prevalence of infant feeding practices based on racial/ethnic backgrounds are to be expected. As the 3 Latin American countries involved in this study are each a mixture of peoples with diverse ethnic and cultural backgrounds, they differ considerably from one another as to the composition of their population "blend." A socio-anthropological approach through local or transcultural qualitative studies might highlight the influence of such traditions on feeding practices.

Although a case for the benefits of prechewing and the important role it may play in modern-day society has been proposed,⁵ based on the previous report of HIV transmission in children associated with prechewing by an HIV-infected adult,¹ pending further infor-

mation and risk/benefit assessment, we recommend against this feeding practice by HIV-infected care providers. Health care providers should review other safer feeding options with their HIV-infected patients.

Our finding that there was an association between knowing someone who prechews food and knowing someone who prewarms food suggests the co-existence of traditional feeding practices used to adjust the temperature or consistency of food before feeding it to a child. We are not aware of any previous reports that have described the prevalence of prewarming (precooling). We added the question about prewarming based on the suggestion of 2 site investigators who were aware of this practice in their patient population.

We were concerned to find that the knowledge about prechewing was greater among women with more advanced HIV disease and that women who knew about prechewing were more likely to have themselves prechewed food for an infant. Patients with AIDS experience more oral diseases that compromise mucosal integrity and which could therefore facilitate admixture of HIV-infected blood to prechewed and prewarmed food. Thus, clinicians should make special efforts to ensure that HIV-infected care providers, particularly those with a high viral load and oral disease (factors that likely increase the HIV exposure risk to a child), are aware of the risks of prechewing (and possibly prewarming) food and how to avoid them.

CONCLUSIONS

While we await further research examining the association of prechewing

and prewarming food with HIV transmission, our study suggests that clinicians should routinely query HIV-infected child care providers about these practices and recommend safer alternatives. We believe that these feeding practices might be more common than expected, warranting the incorporation of questions about prechewing and prewarming food in future studies assessing feeding practices. Although we recognize that further research to examine the risk factors—including race and ethnicity and potential risk/benefit of these feeding practices in current society—is urgently needed, we believe that at this time a thorough explanation of the associated potential risks should be presented to HIV-infected caregivers.

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REFERENCES

1. Gaur AH, Dominguez KL, Kalish ML, et al. Practice of feeding premasticated food to infants: a potential risk factor for HIV transmission. *Pediatrics*. 2009;124(2):658–666
2. Hennart P, Vis HL. Breast-feeding and post partum amenorrhoea in Central Africa. 1. Milk production in rural areas. *J Trop Pediatr*. 1980;26(5):177–183
3. Imong SM, Jackson DA, Rungruengthanakit K, et al. Maternal behaviour and socioeconomic influences on the bacterial content of infant weaning foods in rural northern Thailand. *J Trop Pediatr*. 1995;41(4):234–240
4. Neander WL, Morse JM. Tradition and change in the Northern Alberta Woodlands Cree: implications for infant feeding practices. *Can J Public Health*. 1989;80(3):190–194
5. Pelto GH, Zhang Y, Habicht JP. Premastication: the second arm of infant and young child feeding for health and survival? *Matern Child Nutr*. 2010;6(1):4–18
6. Radbill SX. Infant feeding through the ages. *Clin Pediatr (Phila)*. 1981;20(10):613–621
7. Lewis CW, Riedy CA, Grossman DC, Domoto PK, Roberts MC. Oral health of young Alaska Native children and their caregivers in Southwestern Alaska. *Alaska Med*. 2002;44(4):83–87
8. Walburn JN, Pergam JM, Perry SH, Jensen J. Black child care practices in the Midwest. *Pediatrics*. 1988;82(5):789–790
9. Centers for Disease Control. 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. *MMWR Recomm Rep*. 1992;41(RR-17):1–19
10. Steinkuller JS, Chan K, Rinehouse SE. Prechewing of food by adults and streptococcal pharyngitis in infants. *J Pediatr*. 1992;120(4 pt 1):563–564
11. Huang MJ. An epidemiological study on prevalence and risk factors of hepatitis B virus (HBV) infection in preschool children [in Chinese]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 1990;11(3):129–132
12. Taylor DN, Blaser MJ. The epidemiology of *Helicobacter pylori* infection. *Epidemiol Rev*. 1991;13:42–59
13. Mbulaiteye SM, Walters M, Engels EA, et al. High levels of Epstein-Barr virus DNA in saliva and peripheral blood from Ugandan mother-child pairs. *J Infect Dis*. 2006;193(3):422–426
14. Mbulaiteye SM, Pfeiffer RM, Whitby D, Brubaker GR, Shao J, Biggar RJ. Human herpesvirus 8 infection within families in rural Tanzania. *J Infect Dis*. 2003;187(11):1780–1785
15. Bulkow LR, Singleton RJ, Karron RA, Harrison LH; Alaska RSV Study Group. Risk factors for severe respiratory syncytial virus infection among Alaska native children. *Pediatrics*. 2002;109(2):210–216
16. Aggett P. Premastication [published correction appears in *Matern Child Nutr*. 2010;6(2):199]. *Matern Child Nutr*. 2010;6(1):2–3
17. Van Esterik P, Williams A, Fewtrell MS, Tolboom JJ, Lack G, Penagos M. Commentaries on Premastication: the second arm of infant and young child feeding for health and survival? By Gretel Pelto, Yuanyuan Zhang & Jean-Pierre Habicht. *Matern Child Nutr*. 2010;6(1):19–26
18. Human Relations Area Files. eHRAF world cultures. Available at: www.yale.edu/hraf/collections.htm. Accessed June 9, 2010