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'*[The pediatrician] said that maybe my milk, instead of doing good, no longer helped*': the ecology of infant formula in rural communities in Central Mexico

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Abstract

Objective: As Mexico continues to develop, an epidemiological and nutritional transition has led to an increase in infant formula use in its rural and indigenous communities. Our objective was to determine the social and cultural factors that influence the use of formula in such populations in Central Mexico.

Design: Qualitative study using a data collection instrument based on the socio-ecological framework.

Setting: Two rural and indigenous communities in Central Mexico.

Participants: Mothers, fathers, grandparents and healthcare providers.

Results: Breast-feeding was favoured in both communities; however, several cultural traditions hindered exclusive breast-feeding. As these communities became more developed, emerging ideas of modernity led to negative connotations about breast-feeding and many mothers began to view formula as a complement for breast-feeding. Formula was seen as a convenient solution for breast pain, insufficient milk and body image. Healthcare providers promoted the use of formula through their own beliefs, information, communication and conflicts of interest with formula industry representatives. The recent social and economic changes in these communities combined with the increased advertising and availability of breast milk substitutes have facilitated the preference for formula.

Conclusions: Women in rural, indigenous communities in Central Mexico are increasingly using formula. Efforts at the policy and institutional levels are needed to protect mothers and their children from the detrimental consequences of unregulated formula promotion and the formula culture that it brings with it.

Keywords
Breast-feeding
Infant formula
Socioecological framework
Rural communities

Breast-feeding is one of the top interventions for reducing under-five mortality and improving human development[1]. The promotion, protection and support of breast-feeding are key components of the Nurturing Care Framework, which provides an actionable plan focusing on children's social, educational and health needs in order to advance early childhood development[2]. Furthermore, the benefits of breast-feeding on maternal and child health, food security, education, health equity and environmental sustainability make breast-feeding an essential aspect for meeting the 2030 Sustainable Development Goals[3,4].

Despite the benefits and cost savings of breast-feeding, Mexico has one of the lowest rates in Latin America, with an exclusive breast-feeding rate of only 28·6 %[5]. Indeed, exclusive breast-feeding in Mexico's low-income, rural and indigenous communities is quite suboptimal and needs to be understood in the context of the profound epidemiological and nutritional transition that Mexico is experiencing[6,7]. The percentage of the population in Mexico that self-identifies as indigenous is 21·5[8]. Almost 70 % of the indigenous population live in poverty, 43 % have not completed primary education and 55·2 % work in low-skilled manual jobs[9,10].

Previous studies have shown that economic development in indigenous communities generates changes in breast-feeding practices[7,11,12]. The speed at which these

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changes occur depends on the socio-cultural context. For example, in some indigenous communities, the duration of exclusive breast-feeding is associated with mothers' adherence to social norms, while the overall duration of breast-feeding is impacted by market integration and individual factors[11]. Such contextual differences can explain why certain social changes have led to the deterioration of exclusive breast-feeding practices in Mexico's indigenous communities[7].

Major social changes underlying the epidemiological and nutritional transitions in rural and indigenous communities have been linked with an increased use of ultra-processed foods, including infant formula[13], and can lead to the perceptions that formulas are 'modern' and equal to or better than breast milk[4,14,15]. The infant feeding industry has played a major role in promoting a formula culture as increased availability and large-scale promotion of formula negatively impact breast-feeding rates[16]. Infant formula companies are now heavily marketing their products in low- and middle-income countries due to their rapid economic growth and higher fertility rates and population densities.

There is limited research on how individual and social factors have interacted to influence infant feeding practices across low- and middle-income countries. Additionally, infant feeding decisions have generally been seen through a biomedical lens that places all the responsibility or even blame for not breast-feeding on mothers[12,17]. This is concerning as research has shown that improving breast-feeding rates requires support from society at large, including family, health professionals and employers, and major structural changes in health and social policies[3,4]. Thus, interventions to promote breast-feeding must be based on a socio-ecological framework (SEF)[18] which not only focuses on individual factors but also on the mothers' interpersonal relationships, the institutions with which they interact and the social and cultural norms in which these operate. When a SEF is used, factors that may have been missed when using more individualistic models can be identified, such as sexism, racism and discrimination[12,19].

Mexico has a historical debt with indigenous populations as they have been grossly neglected by government policies and the healthcare system. As a result, they often lack access to quality health care that is respectful of their cultures. In Mexico, there are sixty-eight indigenous groups, each with its own native language[8]. It is important to study the conditions that occur in different indigenous groups and not generalise the findings obtained from one community to another. Given the limited infant feeding research focusing on indigenous groups in Mexico, we were interested in better understanding the multi-level factors that affect infant feeding practices in communities with a strong presence of indigenous groups. Thus, our objective was to explore the factors that influence formula use in two rural, indigenous communities in Mexico where formula use has rapidly increased in recent years. The study was designed based on the SEF with the expectation that it could inform future interventions targeting highly vulnerable populations.

Methods

Study sites

For this study, we worked in the State of Mexico, which is located in the centre of the country and has almost 15 million people, 9·1 % of which identify themselves as indigenous[20]. The State of Mexico has a Human Development Index of 0·74 and a level of inequality evaluated through the Gini coefficient of 0·42, indicating the strong presence of social inequities[21]. Although the state has a relatively higher economic development than the rest of the country, extreme poverty ranges from 21 to 49 % across disadvantaged municipalities[21]. Twelve percentage of its localities lack basic dwelling services, and 18 % lack food access[21]. The two communities included in this study were Santa Ana Nichi and Ganzdá, which were selected by *Un Kilo de Ayuda* (UKA), a national non-profit organisation with whom we partnered for this study. UKA selected these sites due to their previous work in both communities. Santa Ana Nichi has a population of 1213 people, of which 26 % are indigenous, with the majority being Mazahua; Ganzdá has 2433 inhabitants of which 34 % are indigenous, mostly Otomí[20,21].

In Mexico, people with formal jobs have social security that offers health services. Until 2019, people who did not have social security could join the *Seguro Popular* social programme. In Santa Ana Nichi and Ganzdá, 73–75 % of people were affiliated with *Seguro Popular*[20], which provided prenatal, postpartum and neonatal care services. The women of these communities could also receive maternal care through private clinics (some affiliated with pharmacies), traditional healers or UKA facilities. The promotion and support for breast-feeding were provided by *Seguro Popular*, UKA, and the government's conditional cash programme, *Prospera*.

Design and participant selection

As individuals consider adopting a new behaviour, their lived experience must be considered within a SEF to interpret its determinants[22,23]. Qualitative methods are essential for identifying such determinants[24]. Therefore, we conducted interviews, focus groups and observations with parents, grandparents and healthcare providers. Participants were selected through purposive sampling and were approached in areas with high population density (i.e. plazas, waiting areas in clinics). Inclusion criteria consisted of mothers, fathers and grandparents of children 2 years of age or younger and healthcare providers who attended to mothers and infants (physicians, nurses, health workers and traditional healers). This study is reported as per the consolidated criteria for reporting qualitative research checklist[25].

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Data collection

Focus groups and interviews

Interviews and focus groups were conducted in Spanish by four of the female authors between June and July 2018. All interviewers were trained in qualitative research methods and were native Spanish speakers. Interviews lasted between 10 min and 1 h, while focus groups lasted between 40 and 50 min each. About 40 % of the recorded interviews lasted 20 min or more. A demographic questionnaire was administered at the end of the interviews and focus groups. The number of interviews and focus groups conducted were enough to reach data saturation.

Script guide

The interview and focus group guides were semi-structured, and their design was based on the SEF (Appendix 1). UKA reviewed these guides to ensure cultural appropriateness. The guide for mothers explored: (1) prenatal experiences; (2) infant feeding practices before/after 6 months; (3) infant feeding practices in the community; (4) benefits of breast-feeding and (5) work and school. Similar topics were included in the guides for fathers, grandparents and healthcare providers as well as additional topics that were applicable to these groups. For example, the guide for healthcare providers explored: (1) protocols surrounding pregnancy and deliveries; (2) breast-feeding recommendations and (3) formula industry practices.

Observations

Direct, non-intrusive observations during interviews were carried out to further understand the factors affecting breast-feeding practices. While no structured guides were used for this process, we wrote down any especially noteworthy exchanges that we wanted to make sure were reflected on the interview transcripts. We also visited pharmacies, clinics and hospitals in each community to note the brands, prices and visibility of infant formulas being sold.

Data analysis

Focus groups and interviews were recorded and transcribed verbatim by native Spanish speakers. Participants who chose not to be recorded allowed the researchers to record their notes from the interviews either as notes or audio. The latter were also transcribed verbatim. The first author reviewed all recordings and transcripts to ensure quality and accuracy. Data analyses were conducted in two stages. First, two female authors manually analysed the transcripts independently using thematic analysis[26]. They developed a codebook using emergent concepts drawn from the texts, which was used to assign codes to the transcripts. The codes were then grouped into larger themes. When differences between the first two coders were identified, they were discussed until a consensus was reached.

In the second stage of analysis, two male authors analysed sixteen transcriptions (20 % of interviews) on Dedoose, a web application for qualitative and mixed method analysis (Dedoose, LLC). These transcriptions were randomly selected and were representative of all participant groups. Analysis from the second set of coders was highly consistent with the initial analysis, and additional observations were integrated into the final results. Key quotes from the transcripts were identified to serve as evidence for each theme and were chosen to represent the various participant groups. All analysis was done in Spanish to maintain meaning.

Figure 1 summarises the data collection, analysis and validation process. To maximise the validity of our findings, we used a rich data (verbatim transcripts and descriptive notes) approach and data triangulation strategy[27,28]. The latter was done at different levels by having: (1) multiple sources of information provided by mothers, family members and healthcare providers; (2) different methods for data collection through interviews, focus groups and observations and (3) four data coders with different genders and backgrounds (medicine, psychology, community nutrition and child development).

Results

In total, we conducted fifty-nine interviews with sixty-three individuals and two focus groups with eleven individuals for a total of seventy-four participants (twenty-five mothers, twelve fathers, two grandfathers, eleven grandmothers and twenty-four healthcare providers). There were a few combined interviews: two of the interviews were with a mother and a grandmother, one interview was with two healthcare providers and one interview was with a mother and a father. We included grandfathers in the fathers' category rather than with grandmothers due to limited availability of grandfathers and the unique influence of grandmothers on breast-feeding. Forty-nine participants were from Santa Ana Nichi and twenty-five from Ganzdá. Thirty-four percentage of participants spoke or understood an indigenous language, and all participants were fluent in Spanish. The median age of the family participants' youngest child was 16 months. Both focus groups took place in Ganzdá; one with five mothers took place in a community centre, while one with six nurses was conducted in the hospital after the nurses' shift. A summary of participants' sociodemographic characteristics is found on Tables 1 and 2.

Overall, data analysis revealed three main themes: cultural traditions, ideas of modernity and the influence of the healthcare system. Collectively, these themes provided a cohesive narrative of breast-feeding practices in these two communities. We found that breast-feeding was the norm in both communities and mothers and their family members believed that breast milk was the best source of nutrition for infants. Many respondents mentioned the

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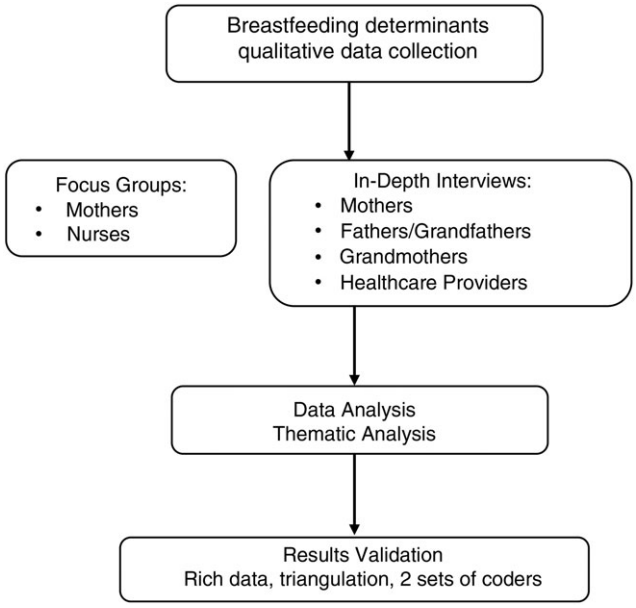

Fig. 1 Flow chart for data collection, analysis and validation

Table 1 Sociodemographic characteristics of participants from indigenous communities, Santa Ana Nichi and Ganzdá, Mexico

	Mothers				Fathers				Grandmothers	
	Santa Ana (*n* 14)		Ganzdá (*n* 11)		Santa Ana (*n* 10)		Ganzdá (*n* 4)		Santa Ana (*n* 11)	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Age (years)										
Median	23		27		26		43·5		48	
Range	17–29		16–31		19–37		26–64		38–54	
Education*										
Elementary school	4	28·6	1	16·7	3	33·3	2	50	7	63·6
Middle school	6	42·9	5	83·3	4	44·4	2	50	3	27·2
High school	2	14·3	–		1	11·1	–		–	
College	2	14·3	–		1	11·1	–		–	
Did not attend	–		–		–		–		1	9·1
No information	–		5		1		–		–	
Occupation*										
Homemaker	8	61·5	5	100	–		–		8	72·7
Business	4	30·8	–		4	44·4	–		3	27·3
Student	1	7·7	–		–		–		–	
Skilled worker	–		–		5	55·6	4	100	–	
No information	1		6		1		–		–	
Marital status*										
Married	3	21·4	2	40	2	25	3	75	6	54·5
Living with partner	11	78·5	3	60	5	62	1	25	3	27·3
Single	–		–		1	13	–		2	18·2
No information	–		6		2		–		–	
Speaks/understands indigenous language*										
Yes	6	42·9	1	20	1	14	2	50	4	36·4
No	8	57·1	4	80	6	86	2	50	7	63·6
No information			6		3					
Recipient of social programme*										
Yes	5	35·7	3	60	3	38	3	75	9	81·8
No	9	64·3	2	40	5	62	1	25	2	18·2
No information	–		6		2		–		–	

*Percentage is for individuals with known information.

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Table 2 Sociodemographic characteristics of healthcare providers from indigenous communities, Santa Ana Nichi and Ganzdá, Mexico

	Santa Ana (*n* 14)		Ganzdá (*n* 10)	
	n	%		%
Age (years)				
Median	31		23	
Range	25–52		22–46	
Sex				
Female	7	50	9	90
Male	7	50	1	10
Title				
Medical Doctor	8	57·1	1	10
Paediatrics	1	12·5*	0*	
Obstetrics/Gynaecology	3	37·5*	0*	
General Medicine	4	50*	1	100*
Nurse	4	28·6	9	90
Hierbera (Healer)	1	7·1	–	
Health promoter	1	7·1	–	
Time practicing (years)				
Median	0·5		12	
Years	8 d–20 years		0·5–19	
Time in current community (years)				
Median	3·25		4 (5 months–19 years)	
Range	0·5–31			

*Percentage amongst medical doctors.

immunological benefits of breast-feeding, as they had witnessed that breastfed children became sick less often and they indicated the emotional bond that breast-feeding creates between mother and child. In addition, many mothers and grandmothers stated that breast-feeding was a responsibility that one must assume and continue despite the pain and difficulties it can bring to the mother. Despite this, we observed that cultural traditions and certain healthcare practices often resulted in decreased exclusive and overall duration of breast-feeding. Recent social and economic changes in the communities have also led to negative connotations about breast-feeding related to ideas of modernity, especially for younger mothers. Together, such influences appeared to facilitate a preference for formula. A summary of participants' key quotes by themes can be found on Table 3.

Cultural traditions

While breast-feeding was considered the norm in both communities, we identified several cultural beliefs and traditional practices that undermined exclusive breast-feeding. One of the most common practices was the addition of liquid and solid foods to the infants' diets at 2–3 months of age, sometimes earlier. The reasons were varied, such as giving babies water for hydration or teas to alleviate discomforts like *empacho*, or indigestion. Such traditions were greatly propagated by the children's grandmothers, whether paternal or maternal, as they often lived close to the mother. Some grandmothers recommended adding water, teas or *atoles* (corn-based drinks) to the infant if they perceived that the mother did not produce enough milk or to cleanse the babies' bodies. Grandmothers also endorsed giving solid foods to provide nutrients and promote growth. Additionally, some believed that over time, a point was reached when breast milk was no longer enough and could even turn into feeding the baby with blood.

This need to introduce various foods to the infant early in life may be related to a frequently reported idea that breast milk needed to be supplemented. Infant formula was often mentioned as a good alternative to breast milk because it was thought to contain special nutrients that stimulate growth and development. Similarly, many participants mentioned the idea that chubbier babies were healthier. Mothers worried when they thought their babies were 'too skinny' or were not gaining sufficient weight, leading them to believe that they needed to supplement with formula. Respondents also mentioned that at times, the babies seemed to crave the other foods that the family ate, so mothers would feed their babies *probaditas*, or small tastes, to decrease their craving.

Another reason why mothers did not breastfeed exclusively was the perception of insufficient milk, as many mothers reported that their milk did not always meet their babies' needs. Participants indicated that the lack of milk was often due to the lack of foods or nutrients in the mother's diet (teas, *atoles*, Brewer's yeast), the cold or the effect of 'bad vibes,' such as the *mal de ojo*, or evil eye. The prevention of and treatment for insufficient milk included protection with amulets, garlic braids, cleanses and *temazcales*, or ceremonial saunas. These treatments could also be used to heal babies' discomforts such as *empacho*. A general practitioner mentioned that 90 % of babies arrived at the doctor's office with a '*pulserita*' (a traditional amulet in the form of a red bracelet) and had already been taken to a cleanse or traditional massage to heal their *empacho*. When such traditional treatments did not work, families then resorted to medical care.

An interesting finding was the meaning assigned to some traditional foods such as those derived from corn (*atole*) and *maguey*, or agave plant (*pulque*, an alcoholic drink). Participants indicated that both *atole* and *pulque* could help mothers who did not produce sufficient milk and babies who experienced *empacho*. Knowledge about the preparation of *pulque* was used as an analogy for the changes that breast milk undergoes after time, in the same way as the syrup of the *maguey*. One participant also mentioned that previously they gave babies *pulque* and now they gave them juice or soda, 'as long as they are quiet.'

Ideas of modernity

We found that negative messages about breast-feeding were becoming more prevalent in these communities, most of them related to ideas of 'modernity'. Several participants referred to contemporary mothers as 'modern' who had different priorities than mothers in the past. These new priorities

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Table 3 Themes, Subthemes and exemplary quotes

Cultural traditions	
Traditional beverages	*'Well, here we are used to, well, there are mothers, let's say more ancestral, that did not give babies formula. Besides breast milk, they would give them [babies] pulque. Because here we still have this practice of pulque extraction and stuff. So, what they gave them [babies] was pulque, or at worst, instead of giving them atole from dough, they gave them sour atole . . . But that is sort of a dying practice.'* HCP SA10
	'Many times, children under the age of two are given juice or soda. Previously, my grandmother used to say, they would give them pulque to make them fall asleep [laughs].' HCP SA8
Traditional remedies	*'I've noticed, as I told you, that sometimes they do give them[babies] teas, or cleanses. Always, out of 10 babies who come here, 9 bring their bracelets, or they already took them to be cleaned. First, even before they are brought here [to the clinic], if they [mothers] don't know what they [babies] have, they take them to get rubbed, to get cleansed, and then if it they're not better, then they come for here.'* HCP SA5
	Interviewer: And did they do something to increase milk production? *Father SA4: She [the mother] only drank atoles. Atoles made of dough.* *Interviewer: And why the atoles made of dough?* *Father SA4: [laughs] Well, they normally tell you that's what makes them have milk. Others say they drink beer or pulque [laughs].'*
Grandmothers' negative influence	*'Ah, now exclusive breastfeeding is lacking. To say exclusive, no. The grandmothers always come with the chamomile and anise teas and water and everything. At a few weeks old, they give it [to babies]. It is very rare to see a patient who exclusively breastfeeds for 6 months.'* HCP SA4
	'But in this area, due to the taboos of grandmothers and others, they believe that it's good to give them that kind of food because they believe that they stimulate them to grow faster.' HCP SA8
	'Once I did tell her [the mother] to give her [the baby] a tea because with her own milk the girl gets very constipated. The pediatrician told us that it was normal because it was the colostrum, but I told her that nothing would happen if she gave her [the baby] water since I raised them that way. And yes, the girl is perfectly fine.' *Grandmother SA9*
	[This participant] says that after a certain time, the *maguey* stops producing honey water. And that's the same thing that happens with breastfeeding. For this participant this happens at approximately one year, when the milk is no longer nutritious for babies. (Taken from notes of interview with Grandfather G2)
	'Previous beliefs were that after a year the milk was no longer good, that it was like giving them [babies] pure blood.' Grandmother SA4
Supplementation with other liquids/solids	*'[We have to] try to make sure they [the mothers] don't include other foods in their [the baby] diet because many times here, since they were little, 2, 3 months, they want to start including atoles, tortillas, even soup, bean broths, everything, then [we must] orient them to the fact that all that can cause babies illness or digestion problems.'* HCP SA5
	'Sometimes we gave her [the baby] tea or water . . . we gave her in the afternoon, when she was thirsty, you could say. So as to not give her only milk, we gave her tea in the afternoon when it was hot.' Father SA4
Probaditas or Tastes	*'Since he would watch us sometimes, I say that he craved [what we were eating] and so we gave him little by little. But we didn't give him much. Only small tastes to let him try it and see how he likes it. Well, the results, if he liked it, then we would give him little by little.' Mother SA6*
Heavier babies	*'We can measure and weigh the kids, and they are fine in weight, but if the moms think they are skinny, they feel that maybe breastmilk is not enough and what they look for is precisely formula, to complement breastmilk with formula.'* HCP SA5
Ideas of modernity	
Status and classism	*'So obviously [mothers] adopt things from the city . . . And since they see that their bosses use formula, they prefer to not breastfeed anymore.'* HCP SA10
	'Many times due to the mother's laziness, the most feasible thing is the bottle. While at home the baby begins to cry and the mother is doing her activities, so it makes things easier for her to give her formula . . . The most respectable or influential thing here is formula.' HCP SA8
	'And since we come from a small town or ranch, one can say, it's always been normal to breastfeed the baby . . . And I say after a certain 6, 8 months, up to a year, you can give [the baby] formula.' Father SA3
	'People that have a little more means will buy milk and those that don't, don't. They'll choose to breastfeed and sometimes until [the baby is] a year and half, two years old.' HCP SA1
Breast-feeding in public	*'Also, the fear of revealing one's breast and for others see you, that can also influence [mothers].'* HCP SA8
	'The younger moms of today sometimes get embarrassed because they'll see people with morbosidad, and they get embarrassed. And at the end of the day, it's the baby that you are feeding, so if you are embarrassed, put on something, cover yourself. They are embarrassed because they are not well informed that the breast is the best food for the baby.' Father SA3
Body image	*'It's just the moms that . . . take care of themselves a lot and don't want to lose their figure and everything. But I would tell them, "You already lost the biggest thing, dear. Ever since you got pregnant, or ever since you had [sexual] relations. So, what else are you going to take care of? . . . Because if you are not ok, then neither is the baby going to be ok, dear. Besides, your husband is not going to be ok. He's going to say, 'This girl that I found just wants everything bought for her.'" No, no, really. And then they [the moms] themselves start to react.'* HCP SA3
	'Today's moms are more modern, they no longer want their breasts to be disfigured, or they don't want to lose their figure, because even for example, a modern mother right now no longer wants to have a belly or sometimes we already that they don't want to get pregnant, because [they say], 'I don't want to lose my figure and my husband will no longer accept me.' Grandmother SA10

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Table 3 *Continued*

Ideas of modernity	
Formula as a solution for breast-feeding obstacles	*'You have to give them until the child accepts it [the breast] and when the child accepts it, they will no longer hurt your chest. That's the situation for many [mothers], that since they [babies] don't want to accept it [the breast], the babies hurt them. And that's why they prefer to give them milk with the bottle.' Grandmother SA3* *'Well, we started giving her [formula] because she [the baby] was no longer feeling full with milk. Then we began to give her porridge and that's how she started eating. When she drank only milk, she cried a lot at night. She was hungry, I guess. And then she would eat her baby food and felt more, I think, fuller, so she rested more.' Father SA4* *Interviewer: Why did you stop breastfeeding at eight months?* *Mother SA8: Because I was tired . . . and if I gave her formula, she would not have to be glued to me and I could do my errands . . . for convenience.' Mother SA8* *'At first she [my partner] did not have milk. That is why we switched to bottle.' Father SA4*
Contemporary mothers	*Nowadays, young women don't want to breastfeed, they only want formula . . . Well, they don't want to stop being young, I guess, when breastmilk is better.' Grandmother SA10* *'The mentality of a girl or young adult who is mature is very different. Sometimes they don't want to feed them [babies] because the baby was not even wanted and they [mothers] don't develop the capacity to take care of it, they don't see a good reason as to why they have to breastfeed the baby, they are not interested.' HCP SA9*
Infant food industry influence	*'Above all, those [formulas] that have advertisements on TV, are the ones that moms most search for. In fact, with regard to formulas, including baby food, like Gerber, diapers, everything, everything, it's more so what they see on TV, and yea, the formulas that they most look for are exactly those.' HCP SA5* *'Since they advertise them on TV, they [moms] believe that they can count on them having the adequate nutrients so that [the baby] develops the most. They buy a lot, by the package, I would dare to say, even by the box' HCP SA8* *Interviewer: 'What influence does the infant feeding industry have on mothers or health professionals?'* *HCP SA6: 'A lot because sometimes they [mothers] come and ask, well at 6 months, which formula they can give [the baby]'* *Interviewer: 'And where do you think this influence is coming from the most?'* *HCP SA6: 'From television.'*
Formula availability	*'Perhaps those from the downtown area who have the economic solvency, buy vegetables, fruit and formula. It's the same as here [periphery of the city], maybe it is only tortillas, a chicken or bean broth and formula. But without saying brands, here one could buy a can of formula for $80–$100 pesos, while some of those in the downtown area could pay $500–$600 pesos for a formula of the same size.' HCP SA8* *Interviewer: 'Can mothers get formula here in the hospital?'* *HCP SA6: 'They have formula here in the pharmacy.'* *Interviewer: 'Is it cheaper here or the same as other places?'* *HCP SA6: 'It's the same as other places.'*
Work and school	*'There are many that, for example, go out to work after a year and say "well, now I can't continue breast-feeding my baby, I'd rather get formula" . . . They prefer to buy rather than prepare.' HCP SA10* *'I want to give [my baby] formula so that it's easier to leave her and I can continue with college.' Mother & Grandmother SA2* *'There are moms that leave to work and they don't just leave in the afternoons or in the mornings, they leave the whole week. It's common that they don't work close to the community . . . Many work in Mexico City like maids, so, they leave their kids, I don't know, a week, two weeks, so it's very complicated.' HCP SA6*
Infrastructure	*'Especially in this area, there are many families that sometimes don't even have a fridge at home, so there isn't much for them to be able to store milk for their babies, or to be able to tell them to save it in the fridge.' HCP SA6*
Milk expression	*'They view the process as very uncomfortable. They'll do it with a breast pump. At most, they will do it for a month and afterwards they will move on to formula.' HCP SA1*
Breast milk loses its nutrients	*'They [babies] are already big . . . they're about 2, 2 and a half years old and they still hang on their mother, truly. And I say that that no longer helps them, or I don't know.' Father SA6* *'After 2 years it is not so recommended [to breastfeed] . . . because there are no more immunoglobulins . . . There are children who just suck boob and no longer eat and are underweight.' HCP G3*
Influence of the healthcare system	
Inadequate training	*'[Breastfeeding counseling] is done by the nurses who are sort of trained.' Resident, HCP SA13_14* *'Well not much [training], in the specialty, not much. You get that more than anything while working . . . [You] do your online course on breastfeeding and all of that.' HCP SA4*
Time constraints	*'Sometimes because of time constraints, if there are a lot of people, or for any reason, [mothers] are not given [information] correctly, it is not explained to them, their doubts are not clarified.' HCP SA7*
Private *v.* public hospitals	*Interviewer: 'Why are there more c-sections here?'* *HCP SA4: 'Goodness! Because it's a private hospital, no? It's not justifiable, but public institutions have sort of an obligation to have more vaginal births, but in private ones they don't.'* *'There are patients who if they don't have good [milk] production, then sometimes they [HCP] won't be insistent very much, not here, but in other private hospitals, [they say] "No, just give him/her formula.'"* *HCP SA4* *'Yes, some [mothers] say, "Oh, I don't want to suffer, I want a c-section." Or others will say, "No, I want a normal [birth]. '" Grandmother SA10*

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Table 3 *Continued*

Influence of the healthcare system	
Formula representatives	*'In government hospitals it is prohibited [that formula representatives promote their product], in fact, they aren't even allowed to go in. But in private hospitals, they will.' HCP SA6*
	'From what I've noticed, not specifically at this hospital, but on other occasions and with other doctors, even [formula representatives] will pay for them to have courses or like – come on, I don't know – they will promote it that way. They bring samples and leave them.' HCP SA4
Recommendations for formula use	*'If they [the babies] are older, like eight months, formula is recommended and if they don't want a bottle, then with cups… They [the pediatricians] recommend NAN 1 over others and if they are low in weight, Enfamil.' HCP SA3*
Lack of knowledge	*'Weaning should start after 4 months, in pediatrics they say at 4 months, I tell them at 5 months, for greater security that they [the babies] are not going to abuse foods they should not eat.' HCP SA12*
	'They [the babies] should have a range [for eating] of 2 to every 3 h, the first months. There are people who say, "No, every time they cry, right?" "Goodness, well, it can't be every time they cry, ma'am, because then we would give them … all day right?" … As for teas, definitely nothing, sometimes I tell them [the mothers] that water [can be given] every so often, just to let them [the babies] be disciplined at meal times which are every 3 h.' HCP SA1
	'If the mom is not well nourished then it's not going to matter that she is breastfeeding, so I tell them to breastfeed until they turn one… You start seeing that the baby is stagnating in weight…and they [mothers] say, "Well, I am only breastfeeding them" "Well you know what, you should start to give them formula. Because truly, the nutrients that you're giving them are not working anymore."' HCP SA1
	'I was going to give them PediaSure milk because they [the pediatrician] said that maybe my milk, instead of doing them [the baby] good, no longer served them … that later, [breastfeeding] was nothing more than entertainment.' Mother SA9
Negative attitudes	*'I feel like sometimes it depends a lot on the help that the nurses give you at the hospital. Some of them simply will leave them [mothers] there and say, "Here is your baby, breastfeed him/her." And others will tell you to take care while breastfeeding, to watch them, caress them, make eye contact, and more.' HCP SA8*
	'If you really don't want to give your baby [breastmilk] it's because you don't love him/her. Truthfully. Because what does it cost you?' HCP SA3
	'And then the nurse told me … as they say, "Give them a little of this, give them a lot of this." And then I get confused because it's this there, this that.' Mother G4
Racism, classism, sexism	*'People don't understand because of ignorance.' HCP SA13_14*
	'If only I gave you the list of what they give [to the baby] … But people prefer to watch their novelas or soccer.' Resident, HCP SA13_14
	'Oh yes. Mothers-in-law and grandmothers. Because where we live, it's kind of like lower level. So, the women are clinging to what the grandmother said, what the other grandmother said, the one that already died, and the great-grandmother.' HCP SA3
	'In the downtown, for example, they think that I don't know anything, but I'm here and I know that I have a degree and I know why I'm here. But many times, they believe that because you are from this town you don't really know anything.' HCP SA8

may have been introduced by television and social media and as more women began working in nearby big cities. As part of this transition into 'modern' life, infant formula became more popular. Many participants associated with the use of formula were related to a higher socio-economic status, embodied by the women seen feeding formula on television (generally white) and in cities like Mexico City. On the other hand, several participants reported that breast-feeding was for 'small-town people' who did not have the money or status to afford formula.

As these communities became more modern, changes in the workplace began to take place. Most mothers worked at home (housework and childcare) and some worked outside in nearby places where they could be in close proximity to their babies and continue breast-feeding. However, due to social and economic changes, more women began working in nearby cities, mainly as domestic workers. For them, it was difficult to take their babies to work, as most of them left for the weekdays and only returned home on weekends. This led to a discontinuation of breast-feeding, either because it was difficult to continue with the baby's sucking stimulus or because mothers were influenced by observing formula use by their employers and other women in the city. To further complicate the continuation of breast-feeding in the workplace, several participants indicated that milk expression was very difficult and a good proportion of women did not have the infrastructure to keep milk refrigerated.

The relationship of women with their bodies appeared to change as their environments became more 'modern.' Participants perceived that Western beauty ideals could not be achieved with breast-feeding as this could deform women's bodies, making formula the better option. In addition, breasts were often hypersexualised, and several participants indicated that some women believed that if their breasts were deformed, their husbands would no longer accept them. These ideas were more prevalent in younger women who were more likely to feel uncomfortable when breast-feeding in public.

Additionally, formula was seen as a convenient way to navigate modern changes in a mother's life. For example, many family members indicated that 'modern' mothers were not willing to endure any painful discomfort associated with breast-feeding and instead preferred to feed their

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babies with formula. Replacing breast-feeding with formula use was also seen as advantageous for younger mothers as it allowed them to continue schooling and complete their daily activities.

Regarding the duration of breast-feeding, most women in these communities breastfed for around 18 months. However, breast-feeding up to 2 years or more was deemed improper as some believed that babies become 'too old or big,' which could lead to dependency. Others believed that breast milk lost its nutrients after a certain period of time and that other foods were better for the growth of babies.

Many healthcare providers believed that the infant food industry had a significant influence on mothers, especially as access to television and social media increased over time. Particularly, television commercials had a great impact on infant feeding practices, and mothers always asked providers about the formulas that were most heavily advertised. The availability of formula was also increasing, and we found formula in most pharmacies, clinics and hospitals. Even the director and paediatrician of a hospital shared that their pharmacy sold formula for the same price as other places in town. The availability of formula also depended on the neighbourhood location, which was a proxy for the socio-economic status of the households. A healthcare provider indicated that families near the centre of town could afford and find more expensive formulas, while families in the peripheries continued to breastfeed.

Influence of the healthcare system

The healthcare system impacted breast-feeding practices in various ways. We noted certain practices that hinder breast-feeding, such as caesarean sections and the use of formula. Respondents stated that in many hospitals, especially private ones, mothers have the choice of vaginal birth or caesarean section. Indeed, we noted that women were having fewer vaginal deliveries and more caesarean sections – especially in private clinics. One gynaecologist indicated that mothers who have caesarean sections have delays starting breast-feeding, leading to formula use. Furthermore, healthcare providers mentioned that public hospitals are more insistent with mothers about breast-feeding, while private hospitals are more lenient about providing formula. Moreover, formula representatives increased availability by providing samples to physicians. While this was a bigger issue in private hospitals, many physicians who worked in those private hospitals also held positions in public ones, which could influence their practice anywhere they worked.

In addition, healthcare providers reported a lack of training and education about breast-feeding, leading to insufficient knowledge to support mothers. One gynaecologist stated that breast-feeding support for mothers was mostly given by nurses, who were 'sort of trained.' Furthermore, many healthcare providers indicated not having sufficient time to clarify mothers' doubts or give adequate lactation counselling. This limited training and time constraints led many providers to give erroneous information to mothers. For example, some providers indicated that breast milk was not a sufficient source of nutrition, some recommended establishing feeding schedules instead of free demand, and others reported that after time, usually 6 months, breast milk lost its nutritional properties and formula needed to be given. Some providers even recommended certain brands of formula for different needs.

We also noted that a significant proportion of healthcare providers shared their negative attitudes towards breast-feeding with mothers. Many providers often made recommendations to use formula instead of breast milk, and at times described breast-feeding as ineffective. This unfavourable view of breast-feeding could be partially explained by the lack of practical experience on the subject. Some healthcare providers acknowledged their own difficulties in breast-feeding their children, mentioning that they understood why their patients could not do it either. Furthermore, the exposure to diverse healthcare providers led to mothers receiving confusing and/or contradictory messages.

Last, the lack of support from healthcare providers was further aggravated by racist, classist and sexist ideas. The majority of healthcare providers had 'higher status' profiles that differed greatly from those of people from these rural and indigenous communities, thus creating a cultural and social shock which made adequate and empathetic communication difficult.

Discussion

In these rural and indigenous communities of Central Mexico, we found infant feeding beliefs, attitudes and practices consistent with an advanced epidemiological and nutritional transition in the context of 'modern life' in a high middle-income country. While social norms still favoured breast-feeding, we found several cultural traditions that hindered exclusive breast-feeding. We also documented beliefs that formula was associated with modernity and higher social status, facilitating women to work outside the home and maintain a body image consistent with Western standards of beauty. Several healthcare practices further fostered the preference for formula.

We identified the prevalent use of formula associated with messages of its compatibility with modernity from the infant feeding industry and from society in general. The idea that formula can be used to 'complement' breast milk may have a strong penetration in these communities due to an already established belief in early supplementation of breast milk with foods such as teas, *atoles* and *pulque*. Formula was also promoted as the best solution for a modern lifestyle that could solve the various obstacles mothers faced with breast-feeding. For example, many mothers mentioned beliefs that their milk was not adequate

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or sufficient, which is highly consistent with previous studies conducted in Mexico[29,30] and globally[31,32]. Some mothers believed that they did not produce enough milk, that their babies did not like their milk or that after the babies drank their milk, they remained hungry, experienced colic or did not sleep well. Formula was then viewed as a solution for these issues. Consistent with previous studies[33–35], younger and first-time mothers had the most difficulty with breast-feeding possibly because they had lifestyles that were incompatible with breast-feeding (i.e. work), had less experience breast-feeding and were under more pressure to not breast-feed due to stigmatisation and body image[33,36,37]. In our study, younger mothers were more subject to feeling embarrassed to breastfeed in public due to *morbosidad* (morbid curiosity), consistent with previous studies[38]. All of these obstacles can lead women to feel uncomfortable with breast-feeding and instead resort to formula[38,39].

Previous studies have observed similar infant feeding transitions, where the consumption of formula begins in high-income groups and then 'trickles down' to low-income groups[14,40,41]. A study in Laos found that mothers in rural areas were more likely to breastfeed exclusively and less likely to use breast milk substitutes, while breast-feeding rates decreased in areas near bigger cities[40]. The consumption of formula has been positively correlated with higher income within and between low- and middle-income countries, and as countries become more developed, measures to protect breast-feeding should be implemented, particularly among the poorest communities[36,42,43].

Studies on acculturation and migration have shown mothers' adaptations from breast-feeding in more traditional and rural environments to formula use in more modern and urban ones[39,44]. One meta-ethnographic study showed that migrant women were often exposed to messages from the media and healthcare providers promoting formula as convenient, providing mothers with the freedom to 'get on with [their] lives' and avoid the embarrassment of breast-feeding in public[39]. Furthermore, the increased visibility of infant formula in the new environments of migrant women affected their socio-cultural expectations and practices[39].

Western standards of beauty can further influence infant feeding practices, as having body image dissatisfaction increases the risk of abandoning lactation[45]. One study in Mexico found that for each one-unit increase in the body image dissatisfaction score, the odds of breast-feeding decreased by 6 %, a decrease that was even greater among obese and indigenous women[46]. These effects of body image dissatisfaction on lactation can be particularly dangerous in countries experiencing rapid epidemiological transitions, where the high prevalence of obesity further increases the risk for body image dissatisfaction and decreased lactation[46–48].

An important factor affecting breast-feeding is marketing by the infant food industry[16,40,49]. We observed the strong influence of the infant food industry through the widespread availability of formula and advertising, which has been shown to increase mothers' interest in buying formula[50,51]. Interestingly, in our study, mothers developed a liking to formulas they saw on television, consistent with formula companies' marketing strategy to create brand preference[52]. A UNICEF report on the violations of the WHO International Code of Commercialization of Breast Milk Substitutes (The Code) in Mexico indicated that over 50 % of mothers received recommendations from health-care providers to feed their baby with dairy products and 80 % saw advertising about breast milk substitutes in the previous 6 months[53]. Furthermore, infant feeding companies visited 15·5 % of private practices, reaching up to six communications per healthcare provider during the previous 6 months in 22 % of those cases[53]. Such violations to The Code have been documented elsewhere in Latin America. In Peru, visits by formula representatives to healthcare providers are common and mothers often report receiving free formula and vouchers and even purchasing formula samples at discounted prices during their health visits[16]. Studies have shown that providing nursing mothers with formula samples in hospitals can lead mothers to question the benefits of breast-feeding and doubt their own ability to breastfeed[54–57]. About 60 % of paediatric associations receive some form of financial support from the infant food industry, and this increases up to 82 % in the Americans[49]. This is worrisome since research shows that doctors experience loyalty towards companies and feel obligated to prescribe their products[58,59].

Several participants expressed that physicians recommended particular brands of formula, justifying the indication that breast milk was no longer sufficient or that babies were not gaining enough weight. A previous study found that mothers who received formula recommendations from healthcare providers were almost 10 times more likely to feed a mixed diet and up to four times more likely to abandon breast-feeding [16]. In contrast, healthcare providers' support for breast-feeding has been associated with increased odds of initiating and continuing breast-feeding[60,61]. Lu and colleagues found that when healthcare providers recommended breast-feeding, women were over four times more likely to initiate breast-feeding[62]. Combining the influence of the infant food industry on healthcare providers, lack of breast-feeding training and education, time constraints impeding adequate breast-feeding counselling, lack of social programmes offering breast-feeding counselling and the increase in obstetric practices that hinder breast-feeding (i.e. C-sections), we can understand how formula has now also become a social norm in highly socio-economically vulnerable communities.

Communication between healthcare providers and patients is not always adequate, leading to additional obstacles to breast-feeding, as was seen in this study[63]. In Peru, mothers have reported that nurses often only tell them to breastfeed but without providing specific instructions, and they have described their clinical encounters as impatient and disrespectful[16]. When interviewed, the

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nursing staff acknowledged that time constraints and resource limitations deterred appropriate breast-feeding counselling[16]. Another important aspect little studied in Latin America is racism and classism within health services. Previous studies have documented forms of institutionalised racism and discrimination towards vulnerable mothers in the context of infant feeding, as healthcare providers showed apathy towards those mothers and considered them as 'too submissive' to family influences, especially those of grandmothers[12,39,64–66].

One interesting finding was the use of traditional beverages that carry symbolic meaning. For people unfamiliar with Mesoamerican culture, it may be surprising that infants can be given *pulque*. However, this derivative of the *maguey*, as well as foods derived from corn, is strong cultural and social traditions. The replacement of such traditional foods with infant formula identified in our study was similar to a study in Laos, which found that while mothers traditionally introduced rice to infants early on, they had begun to instead use breast milk substitutes as they believed these had similar nutritional value to rice[40]. It would be interesting to inquire whether traditional infant feeding practices, such as giving *pulque* or *atole* to infants in Mexico, are based on beliefs that these foods complement infants' nutrition and if now formula is replacing those traditional foods. Beliefs that breast milk alone is insufficient may be influenced by the social and economic changes that communities experience, perhaps in response to strong infant food industry marketing. Formula advertising can represent formula as an option equal or complementary to breast milk, influencing infant feeding normative behaviours and social norms[15]. Murray has argued that we must scrutinise the origin of ideas that breast milk is insufficient and analyse if these beliefs are related to the claim that reproductive bodies are insufficient and need better management[67].

The results of our study have implications for future interventions to support mothers who wish to breastfeed in these indigenous communities in Mexico. Counselling mothers, family members and healthcare providers may be beneficial in addressing the various misconceptions about breast-feeding. For example, providing mothers with anticipatory guidance based on key messages regarding the addition of teas, water and *probaditas* in the first 6 months of life may help improve the rates of exclusive breast-feeding. Key messages targeting the ideas that breast milk becomes unsuitable for the infant over time may help extend the overall duration of breast-feeding. Breast-feeding counselling must also be given for women to learn to overcome lactation problems that mothers commonly face, such as breast pain, perception of insufficient milk and beliefs that their baby is dissatisfied. To maximise their effectiveness, these interventions should include family members – particularly grandmothers – as these communities still have strong and deep cultural traditions. Future interventions will need to be respectful of such traditions and should be co-designed with the participation of community members for them to be successful and sustainable. Furthermore, training for healthcare providers must focus on standardising basic and applied breast-feeding pre-service and in-service training and education that includes improving communication skills that emphasise respect, dignity, humility and compassion.

Our study had several limitations. First, the external validity of our findings needs to be interpreted with caution as participants from our purposive sample were mostly low-income homemakers from indigenous communities in Central Mexico. In addition, most of our findings were based on self-reported behaviour and were dependent upon the participants' recollections, associated feelings, and their recall may have been influenced by socially acceptable behaviours. Last, we were not able to return to the communities for validation and feedback of our results.

Conclusion

Our study offers new insights into the social ecology of infant formula in rural and indigenous communities in Central Mexico. Our findings are consistent with previous studies that demonstrated an epidemiological and nutritional transition in rural populations, but that had not been able to connect the dots as we did in the context of a SEF. While breast-feeding was still widely accepted so is infant formula nowadays. It is urgent to design multi-level and multisectoral interventions to prevent the further dissemination and revert the already strong infant formula culture that has formed in these highly vulnerable communities. Marketing regulation policies that are consistent with The Code need to be well enforced in order to protect the right that women have to breastfeed their children for as long as recommended.

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participation: This study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving study participants were approved by the Yale Human Subjects Committee. Verbal informed consent was obtained from all subjects. Verbal consent was witnessed and formally recorded.

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980021002433

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