Boletín Médico del
Hospital Infantil de México

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RESEARCH ARTICLE

Effectiveness of printed infographics to promote breastfeeding in the Sonora population

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Abstract

Background: *In Mexico, the prevalence of exclusive breastfeeding for 6 months is low (28.6%); in the state of Sonora, it is only 15%. Effective strategies are needed to promote it. The aim of this study was to evaluate the effectiveness of printed infographics designed to promote breastfeeding in mothers from Sonora.* **Methods:** *We prospectively studied lactation regimes from birth. Intention to breastfeed, general characteristics of the mother-infant dyad, and telephone number were registered. Participants received educational training in the hospital; those assigned to the intervention group (IG) also received up to five infographic materials (designed and evaluated previously) in different perinatal periods, while those in the control group (CG) did not. At two months postpartum, the infant feeding practice and reasons for introducing formula were collected by phone. Data were analyzed with the χ^2 test.* **Results:** *Of 1705 women enrolled, 57% were missed during follow-up. Although 99% of participants planned to breastfeed, 92% of IG did so, compared to 78% of CG (95% Confidence interval [CI]: 7.04, 19.98; $p < 0.0001$). Mothers in the IG used more formula than those in the CG (6 vs. 21%; 95% CI: –20.54, –8.0; $p < 0.0001$), arguing insufficient milk production. The delivery of three infographics (one in prepartum and two in the hospital-training), or five infographics in different periods, promoted breastfeeding in 95% of participants.* **Conclusions:** *The distribution of printed infographics and initial training promoted breastfeeding, although not its exclusivity.*

Keywords: *Breastfeeding. Promotional infographics. Sonoran mothers.*

Efectividad de la infografía impresa para promover el amamantamiento en la población de Sonora

Resumen

Introducción: *En México es baja la prevalencia del amamantamiento exclusivo durante 6 meses (28.6%); en el estado de Sonora, solo es del 15%. Se requieren estrategias efectivas para su promoción. El objetivo de este estudio fue evaluar la efectividad de la infografía impresa diseñada para promover el amamantamiento en madres sonorenses.* **Método:** *Estudiamos prospectivamente la lactancia desde el nacimiento. Se registraron la intención de amamantar, las características generales de la díada madre-hijo y el número telefónico. Las participantes tuvieron capacitación educativa en el hospital; las asignadas al grupo intervenido (GI) recibieron además hasta cinco materiales infográficos (diseñados y evaluados en un estudio previo) en diferentes periodos perinatales, mientras que las del grupo control (GC) no los recibieron. A los dos meses posparto se consultó telefónicamente el tipo de alimentación infantil y los motivos para introducir la fórmula. Los datos se analizaron con la prueba de χ^2.* **Resultados:** *De las 1705 mujeres reclutadas, se perdieron el 57% en el seguimiento. Aunque el 99%*

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Date of reception: 12-10-2022
Date of acceptance: 22-12-2022
DOI: 10.24875/BMHIM.22000141

Available online: 27-02-2023
Bol Med Hosp Infant Mex. 2023;80(1):36-45
www.bmhim.com

del total de las participantes planeó amamantar, el 92% del GI lo hacía a los dos meses posparto, en comparación con el 78% del GC (intervalo de confianza del 95% [IC95%]: 7.04 a 19.98; p < 0.0001). Las madres del GI usaron menos lactancia con fórmula que las del GC (6% vs. 21%; IC95%: –20.54 a –8.0; p < 0.0001), argumentando insuficiencia láctea. La entrega de tres infografías (una en preparto y dos en capacitación), al igual que cinco infografías en diferentes periodos, promovió el amamantamiento en el 95% de las participantes. **Conclusiones:** *La distribución de infografía impresa, además de la capacitación inicial, promovió el amamantamiento, aunque no su exclusividad.*

Palabras clave: *Amamantamiento. Infografía promocional. Madres sonorenses.*

Introduction

The postnatal period is a critical window in human development that impacts immediate and future health. According to the popular DOHaD theory, exclusive breastfeeding can modulate infant development. Breast milk components influence epigenetics, inducing the expression of genes associated with healthy development when the maternal diet is adequate[1].

A great problem in Mexico is that the rate and duration of exclusive breastfeeding up to 6 months is 28.6% (ENSANUT, 2018-19)[2], while Sonora, in Northwest Mexico, has one of the lowest rates, with just 15% of infants breastfed up to 5 months of age[3]. Thus, it becomes necessary to promote breastfeeding. The *Hospital Integral de la Mujer del Estado de Sonora* (HIMES), a major public hospital in Sonora, has implemented the Baby-Friendly Hospital Initiative. However, this initiative, by itself, does not guarantee continuity of breastfeeding for up to 6 months if extra support is not provided, such as an educational strategy from pregnancy through postpartum. Initially, the strategies would help the mother to change negative perceptions and increase her confidence to feed her child. Then, in the early postpartum, the strategies would help to solve immediate problems to continue breastfeeding[4].

Previously, we conducted a follow-up study with Sonoran mothers to register the reasons for discontinuing breastfeeding. To tackle them, we designed infographics and evaluated their acceptability qualitatively[5]. Thus, this study aims to analyze the effect of these materials on promoting breastfeeding at two-month postpartum as reinforcement of the health system's strategies.

Methods

Participants

Women who attended their pregnancy and childbirth at HIMES were recruited during the prenatal and postpartum visits and at the "*fiesta de egreso*" ("discharge party"), a service provided by health personnel for puerperal women before discharge, with training on health promotion topics, such as breastfeeding (Fig. 1).

Study design

We conducted a prospective study with non-randomized sampling. We worked with two groups of women: (a) intervention, which received a routine verbal educational hospital-training before discharge by health personnel, plus at least one of five infographics promoting breastfeeding delivered in different moments from pregnancy through postpartum by a lactation consultant with a brief counseling talk, and (b) control, which only received the routine educational hospital-training by health personnel. We assigned women who agreed to participate to the intervention group (IG), and once completed, we conformed to the control group (CG). The study participants were blinded to the intervention.

Printed infographics and time of delivery

For breastfeeding promotion, we used five printed materials pre-validated for this population: two short comics and three infographic cards illustrated in color[5]. While women were waiting in the pre or postpartum visit at the hospital, a person trained in breastfeeding counseling promoted its practice, using the corresponding infographics for that moment as support. Thus, general information was provided at the stage of pregnancy, trying to raise awareness about the importance of breastfeeding. Afterward, infographics were given with particular topics, as detailed.

From 28 weeks of gestation onward, women contacted at the prenatal visit received the "Breastfeeding is essential" card, which highlighted the benefit of breastfeeding, the average amount of milk produced for Sonoran mothers, and the infant's growth (Fig. 2). At the end of the hospital-training session, women were

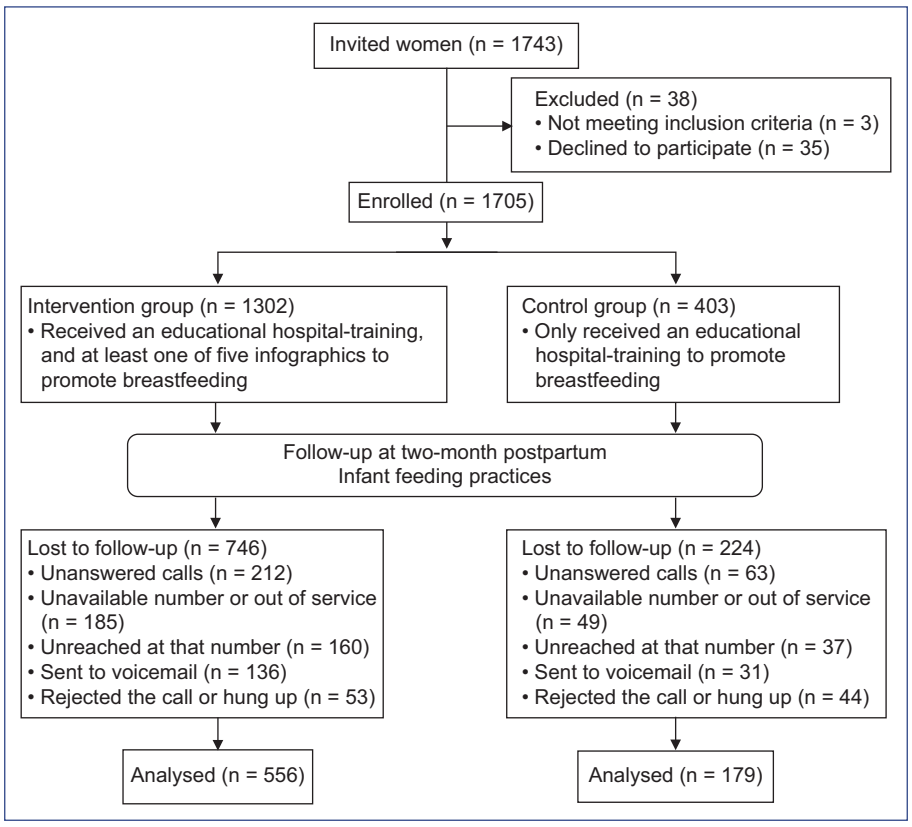

Figure 1. Participant flow chart.

asked to stay for a moment so we could reinforce the information on breastfeeding with the card "How to take care of your breasts" and the short comic "Won't Carlitos fill up with my milk?", which showed the correct latching on to the breast and encouraged confidence in the mother to satisfy her child (Figs. 3 and 4). During the postpartum visit, which took place from 7 to 15 days after delivery, the card "Your milk is enough!" provided the signs of good breastfeeding and recommendations for increasing milk production, and the short comic "Breast care for breastfeeding" told a story about how to tend sore and cracked nipples[5].

Data registration and consent

After signing the informed consent, the mothers' names, ages, dates of delivery, and intention to breastfeed were registered. Participants were informed that they could withdraw from the study at any time. We requested a telephone number for follow-up two months after delivery. When calling, women were asked what foods they were feeding their child, and then the type of feeding was classified. Those participants not contacted after three attempts to call were excluded from the study. The call attempts were made on different days of the week, at two-month postpartum.

Infant feeding practices

Exclusive breastfeeding was considered when the infant consumed only breast milk. Predominant breastfeeding when in addition to breast milk, small amounts of water, tea, and fruit juices was given. Mixed breastfeeding when breast milk was fed along with infant formula. Infant formula feeding when formula was the only food. Complementary feeding when the infant consumed milk and any solid or semi-solid food[6].

Data analysis

Continuous and categorical variables were described as mean ± standard deviation (SD) and percentages. The Chi-square test was used to compare infant feeding practices at two-month postpartum between the study groups. The significance level was set at $p < 0.05$. The NCSS v.2007 statistical package was used.

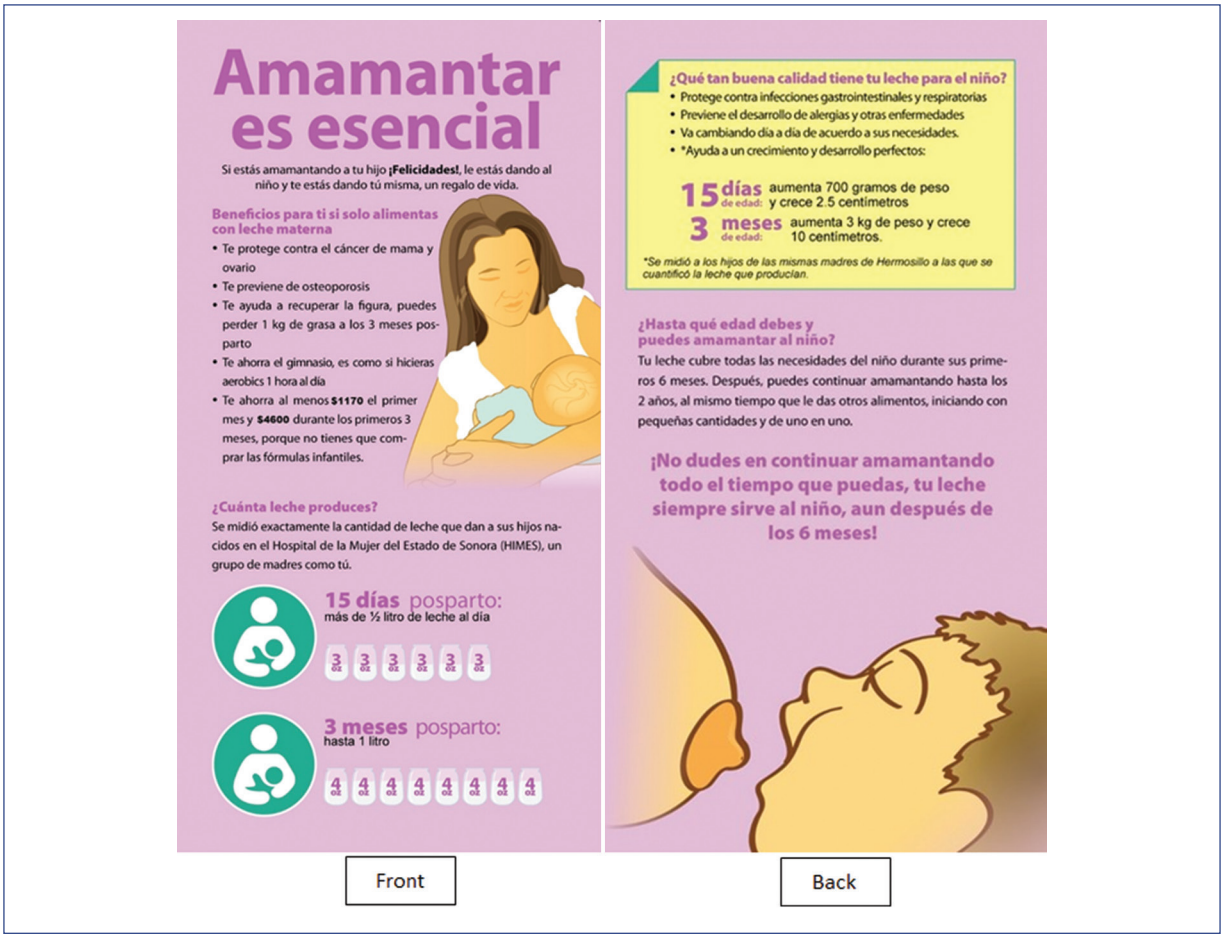

Figure 2. Infographics delivered at prenatal visit.

Results

Population studied

A total of 1705 women were enrolled, of which 99% intended to breastfeed. The IG included 1302 women recruited at the prenatal visit (n = 432), hospital-training (n = 743), and postpartum visit (n = 127). The CG included 403 women enrolled in the hospital-training.

At follow-up, more than half of the participants in both groups were lost: 746 (57%) of the IG and 224 (56%) of the CG. The main reasons were unanswered calls (28%), unavailable or out-of-service numbers (24%), and unreached women at the number provided (20%). We observed differences in the proportion of primiparous and multiparous and gender of newborns in the participant and non-participant women (Table 1). Participants were more primiparous women with female newborns, while those lost to follow-up were mainly multiparous with male newborns.

General characteristics of mother-infant dyads

We collected data on maternal and infant characteristics from 64% of the 735 mothers on follow-up (Table 2). The general characteristics showed homogeneity between groups ($p > 0.05$). The mean age was 22.83 ± 5.81 years, 55% were non-primiparous, and 38% were delivered by cesarean section. The groups were comparable concerning the sex of the newborns.

Delivery of printed infographics

A total of 1,051 mothers received the infographics at least once, 209 mothers received them twice, and 42 received the five infographics.

While delivering the infographics during the postpartum visit, positive feedback was received on the materials provided before. Among others: "*I am going to try this way, only to breastfeed*," "*Yes, it was beneficial to know this, because now I know I can produce good milk*."

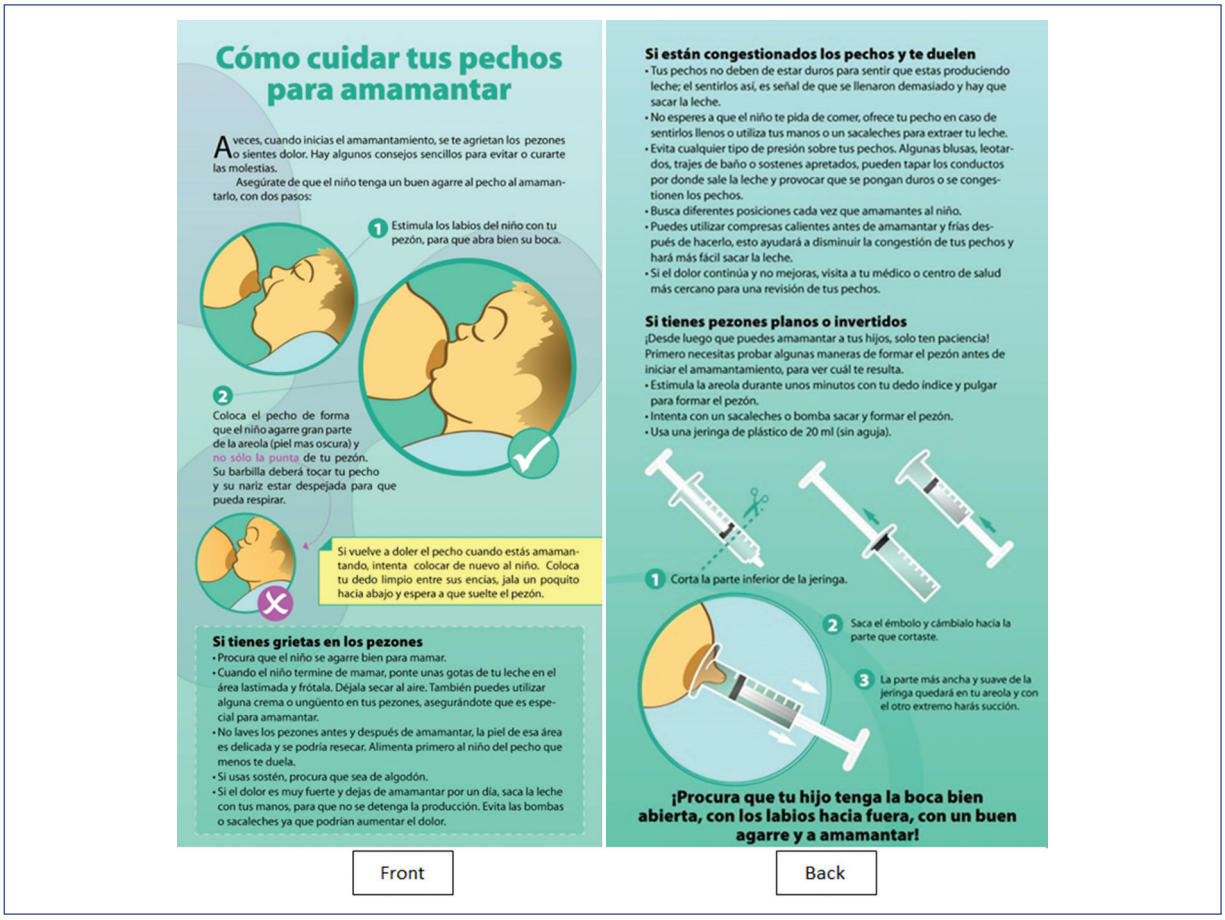

Figure 3. Infographics delivered at the end of the training at the hospital (discharge party).

Infant feeding practices at follow-up

Mothers with infographics breastfed more ($p < 0.0001$) than those of the CG (Table 3); with at least one of the printed infographics, 91.7% of the intervened mothers breastfed, compared to 78.2% of the CG. Unfortunately, the infographics did not influence the regimen being exclusive or predominant. In either group, it was equally mixed ($p > 0.05$), with more than 60% of infants supplemented with formula. However, the IG fed less formula ($p < 0.0001$).

Over 1% of the children received complementary foods as "little bites," regardless of the study group (Table 3). The rationale for early food introduction ranged from giving fruit porridge "*to keep the child happy*," or "*to get the child used to it*," to "*to see how the child responded*."

Infographics delivery effect on breastfeeding

Table 4 shows both the number of infographics and the time of delivery, according to the rate of breastfeeding (exclusive or predominant and mixed). The highest rate (95.6%) belonged to the mothers that received the five materials during the prenatal visit, the training session, and the postpartum visit; this was similar to the 95.3% of those who received three materials during the prenatal visit and the hospital-training session.

Reasons to introduce infant formula

In nearly 50% of the sample studied, the reasons for supplementing formula were insufficient milk production and a feeling that the infant was not satisfied (Table 5). The number of mothers arguing "*my milk was not coming in*" or "*the baby could not latch on*" was lower in the IG than in the CG. Sickness of the child or mother, "*my milk dried up*," returning to work or school, and medical advice were reasons given at a higher rate in the IG.

Discussion

Overall, the response from the women to participate in this study was positive. Recruitment was higher at

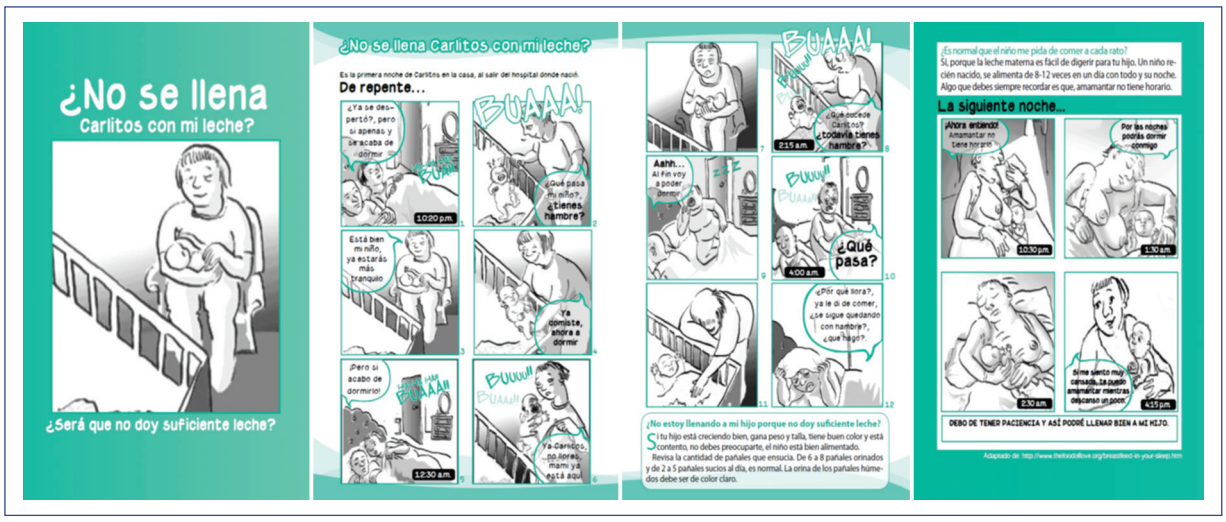

Figure 4. Comic delivered at the end of the training at the hospital (discharge party).

Table 1. Maternal and infant's characteristics by women who participated in the study and those lost during follow-up

	Participants (n = 472)	Lost during follow-up (n = 970)	Confidence interval 95%	*p*-value
Maternal age, years (mean ± SD)	22.77 ± 5.11	22.79 ± 5.84		
Infant sex, n (%)*				
Female	232 (49.15)	285 (29.38)	0.1443, 0.2511	0.0001
Male	245 (51.9)	699 (72.06)	–0.2548, –0.1484	0.0001
Parity, n (%)				
Primiparous	210 (44.49)	374 (38.55)	0.0051, 0.1137	0.0312
Multiparous	262 (55.50)	596 (61.44)	–0.1137, –0.0051	0.03112
Mode of delivery, n (%)				
Vaginal	291 (61.65)	587 (58.45)	–0.0217, 0.0857	0.2455
C-section	181 (38.34)	403 (41.54)	–0.0857, 0.0217	0.2455

*19 pairs of twins. SD, standard deviation.

the hospital-training when they were discharged than at the postpartum visit because women attended a health center instead.

Sample loss at follow-up was high (57%), probably because it is not so easily acceptable in our culture to answer phone calls from an unfamiliar numbers. Since this is a sample of young women, contact through social media could be a strategy[7]. Video calls could be another, such as those utilized by Kapinos et al.[8], who achieved 92% of participation of invited women.

With the lack of information on women lost during follow-up, there could be a differential participation bias since those who dropped out were mostly multiparous. Women who had practice breastfeeding before have significantly different breastfeeding experiences and knowledge than those in their 1st time. Therefore, primiparous women might be more anxious and insecure affecting breastfeeding success[9].

The hospital where we conducted this study is a public assistance institution. On average, the number of c-sections performed is lower than the national average (48.8%)[2] for women between 20 and 49 years of age but more than double the rate suggested by the WHO (5-15%). This is an adverse factor in initiating breastfeeding due to extended hospitalization, medication, pain, and problems accommodating the infant because of the surgical incision. All this stress affects lactogenesis[10], which induces formula feeding.

Prenatal education is an important factor in promoting breastfeeding. It prepares the expectant mother for a

Table 2. Maternal and infant's characteristics by group of study

	Intervention group (n = 298)	Control group (n = 174)	Confidence interval 95%	*p*-value
Maternal age, years (mean±SD)	22.88±4.24	22.66±5.98		
Infant sex, n (%)*				
Female	148 (49.66)	84 (48.28)	−0.0797, 0.1073	0.7710
Male	155 (52.01)	90 (51.72)	−0.0905, 0.0963	0.9516
Parity, n (%)				
Primiparous	127 (42.62)	83 (47.70)	−0.1439, 0.0423	0.2836
Multiparous	171 (57.38)	91 (52.30)	−0.0423, 0.1439	0.2836
Mode of delivery, n (%)				
Vaginal	177 (59.40)	114 (65.52)	−0.1512, 0.0288	0.1870
C-section	121 (40.60)	60 (34.48)	−0.0288, 0.1512	0.1870

*5 pairs of twins. SD, standard deviation.

Table 3. Feeding practices at two-month postpartum

Mode of feeding	Intervention group (n = 556)	Control group (n = 179)	Confidence interval 95%*	*p*-value*
Any breastfeeding, n (%)	510 (91.72)	140 (78.21)	7.04, 19.98	0.0001
Exclusive or predominant breastfeeding, n (%)	190 (37.25)	51 (36.42)	−7.28, 8.94	0.8577
Mixed breastfeeding, n (%)	320 (62.74)	89 (63.57)	−8.94, 7.28	0.8577
Infant formula feeding, n (%)	36 (6.4)	37 (20.67)	−20.54, −8.0	0.0001
Complementary feeding, n (%)	10 (1.79)	2 (1.11)	−1.21, 2.57	0.5316

*X^2 test.

Table 4. Breastfeeding practice according to the quantity of printed infographics given at the prenatal visit, the hospital-training session, and/or during the postpartum visit

Number of infographics*	Time of delivery (n)	Breastfeeding n (%)
1	Prepartum (106)	94 (88.7)
2	Hospital-training (252)	229 (90.9)
2	Postpartum (67)	60 (89.5)
3	Prepartum + Hospital-training (43)	41 (95.3)
3	Prepartum + Postpartum (12)	11 (91.7)
4	Hospital-training + Postpartum (53)	46 (86.8)
5	Prepartum + Hospital-training + Postpartum (23)	22 (95.6)

*Infographics delivered at prepartum: "Breastfeeding is essential" card; at Hospital-training: "How to take care of your breasts" card + the short comic "Won't Carlitos fill up with my milk?"; at postpartum, "Your milk is enough!" card + the short comic "Breast care for breastfeeding".

positive experience. Gao et al.[4] demonstrated that prenatal breastfeeding education sessions improved breastfeeding latch skills in 88.5% of women, and 76.9% avoided nipple pain and damage, one of the primary difficulties lactating women face. Huang et al.[11] showed that individual prenatal breastfeeding education and postnatal breastfeeding support for 4 months resulted in 94.6% of women practicing breastfeeding on demand and produced a low incidence of cracked nipples (21%). Furthermore, postpartum counseling is crucial to motivate women who feel insecure but want to breastfeed or for whom breastfeeding is difficult or has negative experiences[12]. In our study, the delivery of infographics was institutionalized. Nevertheless, it was not possible to provide the complete materials to all the women as planned. However, women who received at least one of the infographics breastfed more at 2-month postpartum than those of the CG.

The printed infographics promoted breastfeeding, although not its exclusivity, possibly because its importance

Table 5. Reasons why mothers introduced infant formula

	Intervention group (n = 356)	Control group (n = 126)
Perception of insufficient milk production, n (%)	64 (17.97)	27 (21.42)
Infant's or mother's illness, n (%)	37 (10.39)	10 (7.93)
Prescription drugs, n (%)	12 (3.37)	4 (3.17)
Painful breasts and/or discomfort, n (%)	8 (2.24)	3 (2.38)
Flat or inverted nipples, n (%)	7 (1.96)	2 (1.58)
Perception of child not satisfied n (%)	108 (30.33)	35 (27.77)
"My milk dried up", n (%)	25 (7.02)	7 (5.55)
Breast or breast milk rejection, n (%)	21 (5.89)	9 (7.14)
Maternal decision, n (%)	20 (5.61)	8 (6.34)
"The milk did not let-down", n (%)	11 (3.08)	11 (8.73)
The infant could not latch on to the breast, n (%)	11 (3.08)	9 (7.14)
"To get the child used to the formula", n (%)	5 (1.40)	-
Return to work or school, n (%)	41 (11.51)	7 (5.55)
Medical advice, n (%)	24 (6.74)	6 (4.76)
When leaving home, n (%)	11 (3.08)	-
For convenience, n (%)	4 (1.12)	6 (4.76)
Other, n (%)	8 (2.24)	3 (2.38)

is not explicit in the materials since it was designed to overcome barriers to breastfeeding[5].

About 37% of mothers provided with the infographics practiced exclusive or predominant breastfeeding, a higher rate than the 29% registered by Hurtado-Valenzuela et al.[3] at 3-month postpartum in the same population. However, it was lower than the national average of 40%[2]. This is likely attributable to the fact that in this population, the use of tap water or chamomile tea is common in the 1st days of the child's life. Although this practice is not considered important by mothers, it is negative for the duration of breastfeeding[13].

The mothers in the CG clearly relied on infant formula as the only type of feeding at 2-month postpartum, similar in proportion to a study with follow-up at 4-month postpartum[11]. This did not occur in the IG, which reflects that the infographics helped to reduce this feeding practice. Despite the cost and being a low-income population, mothers may consider infant formula safe and modern, a behavior influenced by excessive marketing promotion in the media[14].

Lack of information on complementary feeding was notorious, with a small rate of children under 2 months of age being fed solid or semi-solid foods despite international organizations recommending its introduction from the 6th month of life onward, while breastfeeding continues[6], in agreement with the *Norma Oficial Mexicana* 043 (Mexican Norm on Nutrition 043)[15]. The early introduction of solids has a negative effect on breastfeeding. Lessa et al.[16] estimated a higher risk for discontinuing breastfeeding before 6 months of age, when solids were introduced before 4 months of age, than from 5 months onward.

Regarding the effect of the infographics, providing one piece of material at the prenatal visit and two during the hospital-training session would be the extra support needed to initiate and maintain breastfeeding. In this case, the 95% rate of breastfed children was similar to that obtained when mothers received five materials. Nonetheless, we also recognized that the training of women by the health personnel before discharge from the hospital was important to promote breastfeeding. The positive effect of the infographics might be because the information that they contained was appropriate to the sociocultural context of the women in this population. Their design and evaluation were carried out on mothers who

attended the same hospital. In addition, when they were handed out, women received a brief counseling talk about the information they contained, according to their stage (pre or postpartum).

Breastfeeding is a practice that any woman can carry out, except in special circumstances, but beyond the physiological process, sociocultural factors are important[17]. In our study, although the infographics promoted breastfeeding, they did not influence the perception of insufficient milk production, which has been reported before in this population[3,5].

In this study, insufficient milk supply did not lead to the abandonment of breastfeeding, but rather its supplementation with formula, as happens in other populations[11].

In both groups of our study, the reasons for supplementing with formula included returning to work or medical advice. Those causes are unrelated to the mother-child bond, so they cannot be changed by supporting the mother. Therefore, actions aimed at promoting breastfeeding should consider all the factors involved in the woman's environment, including support from health personnel[13,17].

A strength of this study is the recruitment of women at different moments (prenatal visit, hospital-training session, and postpartum visit) to deliver printed infographics to promote breastfeeding and the feedback received when new infographics were provided. Nonetheless, although we recruited a relatively large sample of mother-infant dyads, the phone calls were not an effective strategy for follow-up. The lack of information on women lost during follow-up could have caused a differential participation bias. In addition, the printed infographics did not focus on exclusive breastfeeding. Even when in the follow-up, we did not ask women of the IG about the classification of infant feeding, but rather the food they gave their children, we cannot be sure that they answered correctly to please the researcher.

In conclusion, the delivery of the printed infographics designed for Sonoran mothers, in conjunction with the hospital-training, promoted breastfeeding. Over 95% of mothers breastfed at 2-month postpartum when provided three materials: one during the prepartum visit and two in the hospital-training session. In addition, exclusive or predominant breastfeeding was higher in the intervention than the rate reported in previous studies in this population and was close to the national average.

Thus, we infer that it was possible to promote breastfeeding in this population with printed infographics. However, we need to improve the intervention strategy to avoid losses. First, it is necessary to adapt the infographics focusing on exclusive breastfeeding. Then, to deliver the infographics combined with individualized counseling sessions. The first one can be face-to-face during the prenatal visit at the hospital in the third trimester of pregnancy. Then, a second face-to-face session at the end of the training session at the hospital before discharge. From this moment onward, we might offer ongoing support by video calls or social media within the first postpartum days (7-15 days). For women who returned to the postpartum visit at the hospital, the session could be face-to-face for counseling and delivery of infographics.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author has this document.

Conflicts of interest

The authors declare no conflicts of interest.

Funding

No funding.

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