

Effects of educational technologies on maternal self-efficacy in preventing childhood diarrhea: a clinical trial

Efeitos das tecnologias educacionais sobre a auto-eficácia materna na prevenção da diarreia infantil: um ensaio clínico
Efectos de las tecnologías educativas sobre la autoeficacia materna en la prevención de la diarrea infantil: un ensayo clínico

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ABSTRACT

Objective: To evaluate the effect of educational interventions on maternal self-efficacy in preventing childhood diarrhea in mothers of children younger than five years old. **Methods:** Basic randomized clinical trial involving 280 mothers of children under five years old. **Results:** There was a statistically significant increase in maternal self-efficacy scores after the application of the video ($p=0.026$), booklet ($p<0.001$) and video and booklet ($p<0.001$). **Conclusion:** The combined use of video and booklet proved to be more effective in promoting self-efficacy than the isolated use. Thus, the interventions used in this study have been shown to significantly increase maternal self-efficacy in preventing childhood diarrhea and, therefore, can be used by health professionals as effective tools.

Descriptors: Diarrhea; Self-Efficacy; Educational Technology; Child Health; Nursing.

RESUMO

Objetivo: Avaliar o efeito das intervenções educativas sobre a autoeficácia materna na prevenção da diarreia infantil em mães de crianças menores de 5 anos. **Métodos:** Ensaio clínico básico randomizado envolvendo 280 mães de crianças menores de 5 anos de idade. **Resultados:** Houve um aumento estatisticamente significante nas notas de autoeficácia materna após a aplicação do vídeo ($p=0,026$), livreto ($p<0,001$) e vídeo e livreto ($p<0,001$). **Conclusão:** O uso combinado de vídeo e livreto provou ser mais eficaz na promoção da autoeficácia do que o uso isolado. Assim, as intervenções utilizadas neste estudo demonstraram aumentar significativamente a autoeficácia materna na prevenção da diarreia infantil, portanto podem ser utilizadas pelos profissionais de saúde como ferramentas eficazes.

Descritores: Diarreia; Autoeficácia; Tecnologia Educacional; Saúde da Criança; Enfermagem.

RESUMEN

Objetivo: evaluar el efecto de las intervenciones educativas sobre la autoeficacia materna en la prevención de la diarrea infantil en madres de niños menores de cinco años. **Métodos:** Ensayo clínico aleatorizado básico con 280 madres de niños menores de cinco años. **Resultados:** hubo un aumento estadísticamente significativo en los puntajes de autoeficacia materna después de la aplicación de las intervenciones. Hubo un aumento estadísticamente significativo en los puntajes de autoeficacia materna después de la aplicación del vídeo ($p=0,026$), folleto ($p<0,001$) y vídeo y folleto ($p<0,001$). **Conclusión:** el uso combinado de vídeo y folleto demostró ser más eficaz en la promoción de la autoeficacia que el uso aislado. Por lo tanto, se ha demostrado que las intervenciones utilizadas en este estudio aumentan significativamente la autoeficacia materna en la prevención de la diarrea infantil y, por lo tanto, pueden ser utilizadas por los profesionales de la salud como herramientas eficaces.

Descritores: Diarrea; Autoeficacia; Tecnología Educacional; Salud del Niño; Enfermería.

INTRODUCTION

Acute diarrhea is an important public health problem and is closely related to the quality of the water and hygiene conditions. Despite the reduction in infant mortality rates in recent years, diarrhea was the leading cause of death in children, accounting for approximately 8% of deaths among children younger than five years of age, worldwide in 2017⁽¹⁾.

In a global epidemiological context, diarrhea is responsible for about 800,000 deaths of children and affects mainly developing countries and Sub-Saharan Africa countries⁽²⁾. In Brazil, infant mortality was reduced by 5.5% per year in the 1980s and 1990s, and 4.4% per year in 2000, reaching 20 deaths per 1,000 live births in 2008. This result can be associated with decreasing regional and socioeconomic inequalities that decreased and access to maternal and child health interventions that increased⁽³⁻⁴⁾.

Several morbidities can be avoided when mothers or caregivers of children under five years old know and adopt hygienic care in their routine. In this sense, it is important to point out that health education is one of the pillars of Primary Care by contributing to the creation of knowledge and helping to transform reality through human action-reflection⁽⁵⁾. Regarding maternal behavior, the importance of this care and its role in reducing childhood diarrhea is highlighted, since they are the main responsible for the child's health and for the behaviors to be adopted in this condition⁽⁶⁻⁷⁾. However, just taking the information to caregivers is not enough, as this action does not guarantee that they will implement the previous guidelines⁽⁵⁾. In this case, it is essential to carry out activities that promote increased security that the individual has when performing a certain action⁽⁸⁻⁹⁾.

In this context, maternal self-efficacy stands out as a determining factor in health promotion by revealing the confidence that women have in caring for their children. In other words, self-efficacy is related to the mother's ability to overcome situations or assume healthy behaviors when taking care of her child⁽¹⁰⁾.

The concept of self-efficacy must be experienced in nursing actions, especially regarding the construction of educational technologies, as it includes aspects capable of modulating behavioral changes and strengthening maternal confidence⁽¹¹⁾.

Some educational technologies based on self-efficacy have been created and validated in the context of promoting children's health, making it urgent to evaluate them comparatively so that nurses have subsidies in choosing which tool will have the most positive effects.

OBJECTIVE

Evaluate the effect of educational interventions on maternal self-efficacy to prevent childhood diarrhea in mothers of children under five years of age.

METHODS

Ethical considerations

The study was approved by the Research Ethics Committee of the University in which the study was undertaken. The clinical

trial was registered and approved by the Brazilian Registry of Brazilian Clinical Trials (REBEC).

Study design, location and period

It is a randomized clinical trial, of an experimental type, which took place from the use of educational interventions (reading and handing out the booklet and application of the educational video) with four groups; three intervention groups and one comparison group.

The educational video "Child diarrhea: you are able to prevent it" and the booklet "You are able to prevent diarrhea in your child" have as theoretical reference Bandura's Theory of Self-Efficacy⁽¹²⁾ in which sources such as vicarious experiences, of personal success in addition to the characters' expressions and feelings of confidence in carrying out the proposed care in a way that can prevent diarrhea in their child.

Self-efficacy is related to a personal assessment of self-affirmation in which the individual seeks to adopt a certain behavior in order to achieve a goal. Thus, mothers with high confidence in carrying out preventive measures against childhood diarrhea, in addition to showing an improvement in their children's quality of life, had an increase in self-efficacy⁽¹³⁾. Data collection took place from March to July 2017.

The study was developed in the Primary Health Care Units (PHCU) of the city of Redenção-CE, located in the Northeast of Brazil, a city that in 2017 presented a high number of notifications of childhood diarrhea⁽¹⁴⁾.

For the construction of this study, the recommendations of the Consolidated Standards of Reporting Trials (CONSORT) were used. This instrument presents a list of checklist and a flow chart, which are essential for the relevance and reliability of the results.

Population or sample; inclusion and exclusion criteria

The research sample was calculated using the formula for studies with comparative groups, as follows: $n = (Z\alpha + Z\beta)^2 \times 2 \times p \times (1 - p) / d^2$, considering $Z\alpha = 95\%$, $Z\beta = 80\%$, $p = 35.1\%$, and $d = 15\%$, totaling a sample of 62 subjects per group. A safety percentage of 10% ($n = 8$) was added to this value in order to minimize the impact of possible sample losses on the results. Thus, the total sample was composed by 280 mothers of children under the age of five years, who were divided into four groups consisting of 70 participants each: video group (G1), who watched an educational video; booklet group (G2), who read a booklet; video and booklet group (G3), who watched the educational video and read the booklet, and comparison group (G4), who received only the routine care according to the service guidelines, as shown in Figure 1.

Randomization by cluster was used for selecting the health centers that participated in the research. Thus, mothers were randomized into groups from the PHCU in which they were recruited, with a view to minimizing the exchange of information between participants. This strategy reduces the risk of information exchange between participants from different groups and, consequently, the bias in the results.

The research personnel responsible for carrying out the randomization were blinded, as well as those responsible for the telephone interviews and the statistician responsible for performing the data analysis.

Inclusion criteria were being a mother with at least one child under the age of 5 years, attending at the selected PHCU, and having a cell phone or landline. Mothers who could not read were excluded since it compromises the reading of educational booklets. As criteria for discontinuity, the following were adopted: mother's withdrawal from participating in the research during the data collection; change of residence in the area assigned to the selected PHCU; change of phone number; and death of mother or child during the data collection period.

Study Protocol

The Maternal Self-Efficacy Scale for the Prevention of Diarrhea in Early Childhood (EAPDI in Portuguese), built and validated to measure maternal self-efficacy in preventing childhood diarrhea, was used for data collection. The scale consists of 24 items containing the following domains: family hygiene (with 15 items) and food / general practices (with 9 items). The total score of the scale (sum of the item scores) ranges from 24 to 120 points. The lower the final score, the lower the maternal self-efficacy to prevent childhood diarrhea. In addition to this instrument, a form was used to obtain the socioeconomic data of the participants⁽¹⁵⁾.

Data collection was carried out in two moments, the first contact with the mothers occurred in the health units participating in the research and the others occurred by telephone. The collection was made by a team composed of the researcher, nurses and nursing students. It should be noted that for uniformity in the application of the instruments, training was carried out over a month with the data collection team. In addition, the study was double-blind because neither the researchers nor the participants knew which method had been drawn, only an external researcher knew.

In the first moment of data collection (in person interview), the EAPDI and the socioeconomic form were applied. It is emphasized that in the intervention groups (G1, G2 and G3), in addition to the aforementioned instruments, educational interventions were applied. The second moment was established by monitoring maternal self-efficacy using EAPDI through telephone interviews, two months after the face-to-face data collection. Considering that self-efficacy is modifiable over time, it was necessary to analyze the evolution of maternal self-efficacy scores.

The flowchart of selection, randomization, follow-up, and analysis, as recommended by the CONSORT guidelines, is shown in Figure 1. There were no losses during the data collection.

After the first contact, the participant mothers were allocated into the groups. Mothers in G1 had the opportunity to watch the educational video "Infantile Diarrhea: you are able to prevent it"⁽¹⁶⁾, while mothers in G2 read the booklet "You are able to prevent diarrhea in your child!"⁽¹⁷⁾ and took them home, and mothers in G3 watched the video and took the booklets to their homes. Mothers in G4 group did not receive any type of educational intervention but only routine childcare consultations.

Results analysis and statistics

Data was analyzed in SPSS version 20 (SPSS Inc., Chicago, United States). The groups were compared at the baseline and after two months of the intervention, using the Pearson's Chi-square test and Likelihood Ratios (categorical variables), and the non-parametric Mann-Whitney, Wilcoxon, and Kruskal-Wallis tests (continuous variables) with an alpha of .05. These tests were chosen due to the non-parametric nature of the dataset based on Kolmogorov-Smirnov test.

RESULTS

Regarding the sample's characteristics, the participants aged from 20 to 29 years (n = 155; 55.4%), most had 9 to 12 years of education (n = 185; 66.1%), were living with a partner (n = 215; 76.8%), and had a per capita income ranging from zero to \$44.78 (n = 211; 75.6%).

No statistically significant difference was detected at the baseline between the intervention and the comparison groups regarding socio-demographic characteristics (Table 1). This shows that there was equalization between the subjects in each arm of the experiment, reducing the risk of bias.

As shown in Table 2, which compares the scores achieved by each group, the self-efficacy level increased significantly in all intervention groups, between the first and second moments of data collection. However, this finding was not found in the comparison group. Based on these results, it can be inferred

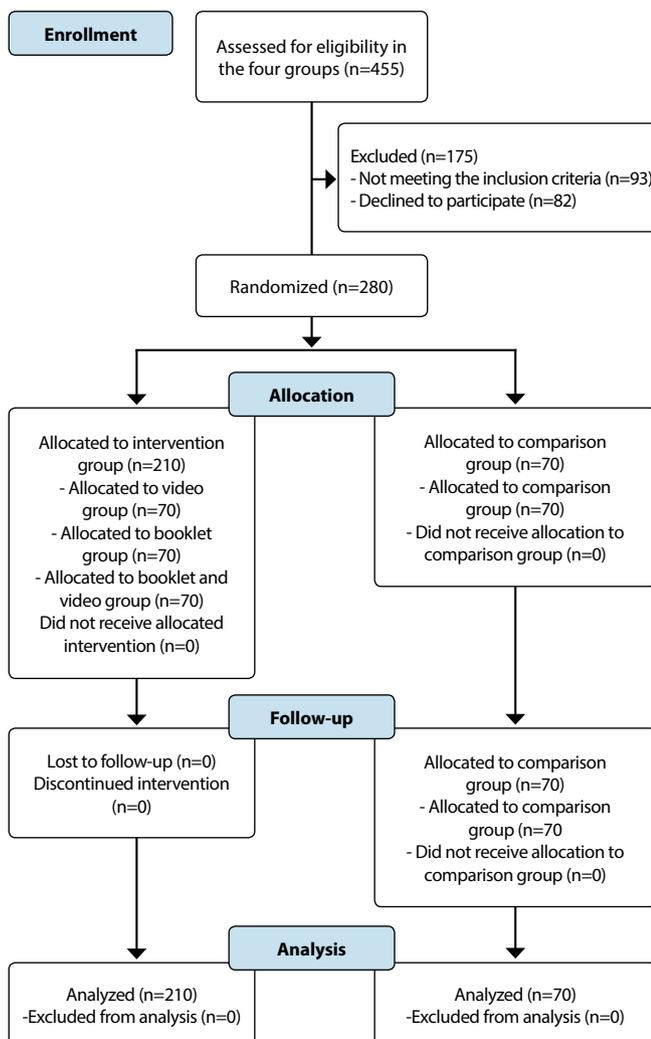


Figure 1- Consort flow diagram, Northeast, Brazil, 2017

that the interventions were effective in increasing the levels of maternal self-efficacy to prevent childhood diarrhea.

By comparing the increase that occurred in each intervention group in isolation, it was noticed that the “video group” was the one that had the greatest increase in the median of self-efficacy scores (Before - 111.5 and After - 117.0), followed by the “video and booklet group” (Before - 113.0 and After - 118.0), and by the “booklet group” (Before - 114.0 and After - 117.0) (Table 2).

The statistical analyses showed that, at baseline, there was no difference in the levels of self-efficacy between the groups. However, after two months of the interventions, a statistically significant difference ($p < 0.001$) was found between the groups (Table 2).

Table 3 shows that, at first, there was no statistically significant difference in the level of maternal self-efficacy between the four groups. However, after two months of the interventions, significant

differences in the scores were found between the groups. The scores obtained by the participants in the intervention groups regardless of the type of educational technology used were higher than those achieved by the comparison group. Thus, there was a positive effect of the tested interventions in increasing maternal self-efficacy to prevent childhood diarrhea.

Table 4 shows a comparison between the groups that received educational intervention. The only groups that differed in self-efficacy before the completion of each intervention were the “booklet group” and the “video group” ($p = 0.032$). In the initial moment, mothers in the booklet group had higher self-efficacy scores than those in the video group. However, after the completion of the interventions, this inequality disappeared, thus indicating that regardless of the type of intervention used by the participants, the increase of self-efficacy to prevent childhood diarrhea happened.

Table 1 - Distribution of socio-demographic variables of mothers of children under the age of 5 years, Northeast, Brazil, 2017

Variables	Comparison		Video		Booklet		Video and Booklet		p value
	n	%	n	%	n	%	n	%	
Age (years)									0.240**
17-19	5	7.1	5	7.1	3	4.3	7	9.9	
20-29	38	54.3	44	62.9	32	45.7	41	57.7	
30-46	27	38.6	21	30.0	35	50.0	23	32.4	
Maternal schooling (years)									0.572***
Up to 8 years	22	31.4	18	25.7	23	32.9	23	37.1	
9 to 12 years	47	67.1	52	74.3	47	67.1	39	62.9	
Over 13 years	1	1.4	-	-	-	-	-	-	
Marital status									0.051**
Married	30	42.9	24	34.3	29	41.4	20	28.2	
Cohabiting	23	32.9	22	31.4	32	45.7	35	49.3	
Single	14	20.0	22	31.4	8	11.4	16	22.5	
Divorced	3	4.3	2	2.9	1	1.4	-	-	
Per capita income in minimum wages (\$)*									0.067**
0 - 1/4 SM	55	78.6	51	72.9	60	85.7	45	63.4	
1/4 - 1/2 SM	12	17.1	17	24.3	10	14.3	23	32.4	
1/2 - 1 SM	3	4.3	2	2.9	-	-	3	4.2	

Note: * US Dollar quote at \$ 3.15 on 9/20/2017. **Chi-square test ***Likelihood Ratio.

Table 2- Evolution of maternal self-efficacy scores during follow-up, Northeast, Brazil, 2017

Groups	Maternal Self-Efficacy Scores						p value*
	Average	Before [SD]	Median	Average	After [SD]	Median	
Booklet group	110.9	[10.0]	114.0	114.1	[8.0]	117.0	0.026
Video group	108.4	[8.3]	111.5	115.6	[5.0]	117.0	<0.001
Booklet and video group	110.8	[9.5]	113.0	117.4	[3.2]	118.0	<0.001
Comparison group	109.3	[10.5]	113.0	110.7	[8.1]	112.0	0.839
p value**		0.184			<0.001		

Note: *Comparison between the moments, within each group (Wilcoxon Test). **Comparison between groups, at each moment (Kruskal-Wallis test)

Table 3 - Comparison of maternal self-efficacy scores between the groups based on type of intervention (comparison group included), Northeast, Brazil, 2017

Groups	Maternal Self-Efficacy Scores							
	Mean	Before [SD]	Median	p value ¹	Mean	After [SD]	Median	p value ²
Booklet versus comparison								
Booklet	110.9	[10.0]	114.0		114.1	[8.0]	117.0	
Comparison	109.3	[10.5]	113.0	0.412	110.7	[8.1]	112.0	0.002
Video versus comparison								
Video	108.4	[9.5]	111.5		115.6	[5.0]	117.0	
Comparison	109.3	[10.5]	113.0	0.245	110.7	[8.1]	112.0	<0.001
Video and booklet versus comparison								
Video and booklet	110.8	[8.4]	113.0		117.4	[3.2]	118.0	
Comparison	109.3	[10.5]	113.0	0.782	110.7	[8.1]	112.0	<0.001

Note: *Comparison between groups (Mann-Whitney test)

Table 4 - Comparison of maternal self-efficacy scores between the groups based on type of intervention (comparison group not included), Northeast, Brazil, 2017

Groups	Maternal Self-Efficacy Scores							
	Mean	Before [SD]	Median	p value ¹	Mean	After [SD]	Median	p value ¹
Booklet versus video								
Booklet	110.9	[10.0]	114.0	0.032	114.1	[8.0]	117.0	0.852
Video	108.4	[9.5]	111.5		115.6	[5.0]	117.0	
Booklet versus video and booklet								
Booklet	110.9	[10.0]	114.0	0.465	114.1	[8.0]	117.0	0.008
Video and booklet	110.8	[8.4]	113.0		117.4	[3.2]	118.0	
Video and booklet versus video								
Video and booklet	110.8	[8.4]	113.0	0.119	117.4	[3.2]	118.0	0.010
Video	108.4	[9.5]	111.5		115.6	[5.0]	117.0	

Note: ¹Comparison between groups (Mann-Whitney test).

In addition, it was also possible to verify that the concomitant use of video and booklet was superior in increasing maternal self-efficacy when compared to the isolated use of each intervention.

DISCUSSION

In this study, it was possible to evaluate the effects of printed and audiovisual educational tools on maternal self-efficacy to prevent childhood diarrhea, isolate, and combined. There was an increase in maternal self-efficacy scores in all groups in which these interventions were applied, demonstrating the positive effect of such educational materials on mothers' self-efficacy to prevent diarrhea in their children.

Self-efficacy is one of the main issues in health promotion and a determinant factor that interferes in the individuals' actions and in the adherence of healthy behaviors by determining the individual's level of motivation⁽¹⁸⁾. Therefore, it is essential that health professionals, especially nurses, base their educational activities in this construct. This conduct is important since the greater the confidence to achieve a goal, the greater the efforts made by an individual to achieve a purpose⁽¹⁹⁻²⁰⁾.

The interventions investigated in this study can be used in the planning of actions to encourage adherence to behaviors capable of minimizing childhood diarrhea.

The importance of educational tools based on self-efficacy is recognized in the literature and research has shown that the use of these tools can facilitate learning and improve individuals' self-confidence^(17,20-21).

Corroborating this information and the results identified in this study, a research carried out in Australia sought to evaluate the effectiveness of a technology for instructing professionals in the care of people with autism. There was an increase in the participants' self-efficacy associated with the intervention⁽²²⁾.

It is noted that self-efficacy can be modified through health education and social support actions, which has encouraged the development of studies that evaluate the effects of educational interventions based on the Theory of Self-efficacy on maternal confidence in preventing childhood diarrhea⁽²³⁻²⁴⁾.

A research carried out in Nigeria with 3000 parents of children under five years of age found that low educational level and inadequate knowledge significantly influenced the occurrence of diarrhea episodes. It is known that knowledge and beliefs, especially from mothers, are predictive factors for the prevention

of childhood diarrhea⁽²⁵⁾. Thus, it is important that professionals use educational tools capable of combining the dissemination of safe and appropriate information on the topic with the promotion of self-efficacy, in order to increase preventive and management behaviors.

Furthermore, according to the author of the theory, individuals with a high level of self-efficacy have the confidence to perform certain activities, in addition to demonstrating cognitive skills for problem solving, and yielding health promotion actions⁽¹²⁾.

When comparing educational interventions with each other, in isolation, it was found that there was no statistically significant difference between the groups. However, when comparing the simultaneous use of video and booklet with the other groups (isolated interventions), it appears that the combined intervention was superior in increasing maternal self-efficacy. This fact reflected positively on the decrease in diarrheal episodes during the follow-up period.

Combined educational technologies have been shown to be effective. In Fortaleza, this strategy was used to promote self-efficacy of puerperal women in the duration and exclusivity of breastfeeding. In this study, a telephone-based educational intervention was used in the experimental group with individual and routine guidance through a serial album and professional guidance sessions. The comparison group received only the usual care. It was evident that after the interventions there was a difference between the groups in the duration of breastfeeding at two months ($p = 0.035$). However, both groups did not show differences in exclusive breastfeeding at two ($p = 0.983$) and four months ($p = 0.573$). Finally, it was found that educational intervention by telephone was effective in improving self-efficacy and duration of breastfeeding, but not exclusivity⁽²⁶⁾.

Other combined interventions were used in a study to assess the effects during prenatal and postnatal on breastfeeding-related rates. This study, carried out in Croatia with 355 primiparous women, found that the use of a booklet-type educational intervention associated with the guidelines provided by telephone contact proved to be effective. The participants were allocated in 03 groups, the group receiving guidance on the educational booklet on breastfeeding and an educational booklet on pregnancy and monitoring with guidance by telephone contact called the intervention group. The group that received only the booklet with instructions on pregnancy followed by telephone contact was called the active control group. Finally, the group considered standard has not received any written material or can

telephone. Participants in the intervention group showed the greatest increase in attitudes considered positive regarding infant feeding and significantly higher self-efficacy in breastfeeding⁽²⁷⁾.

Therefore, the effectiveness of using combined educational interventions for health promotion is a reality. A research carried out in a maternity hospital in the city of Porto Velho, Rondônia, Brazil, reinforces this information when evaluating the application of educational intervention to promote self-efficacy in breastfeeding in hospitalized nursing mothers. It was found that the intervention group had a higher mean for self-efficacy in breastfeeding and a higher frequency of exclusive breastfeeding when compared with the comparison group⁽²⁸⁾.

Technologies in the field of health directed at mothers have gained prominence with regard to the care of children. Another investigation carried out with 104 puerperal women, assisted in a maternity hospital in a private hospital, corroborates this information by emphasizing that educational interventions contributed to the intervention group by presenting less difficulties in breastfeeding and a higher percentage of exclusive breastfeeding in any time observed when compared the control group. Therefore, educational interventions can positively favor the increase of maternal skills in breastfeeding, collaborating with mothers to minimize possible difficulties, should they arise⁽²⁹⁾.

Among the available educational technologies, videos and booklets are relevant teaching materials that can be used to motivate people's protagonism. For this, it is necessary that the information is succinct, easy to understand, and pertinent^(17,30).

It is perceived that when the health professional employs creativity and dialogue with mothers in the context of health education, the biological model is overcome. Associated with this process, the use of tools, such as educational interventions, to promote women's confidence modify and improve maternal self-efficacy to promote the health of their children⁽³¹⁾. In this way, positively influencing the reduction of diarrheal episodes.

However, it is important to consider that nurses, even with the collaboration of educational technologies, are the facilitators in health education actions. They are responsible for observing and identifying the main difficulties, fears, and doubts of the public to whom the educational activity is aimed⁽³²⁾.

Nursing is essential to promote the exchange and spread of knowledge about preventing diarrhea. In addition, the increase of maternal confidence through health education actions aiming at improving the mothers' knowledge to prevent diseases is a nursing role.

Study limitations

The major limitation of this study was the difficulty in establishing telephone contact with some mothers during the follow-up, as well as the fact that the study is unicentric. It is recommended that future studies be carried out using a longer period of monitoring of maternal self-efficacy in preventing childhood diarrhea.

Contributions to the field of nursing, health or public policy

The contribution of this research is to make it evident that the use of educational interventions can improve mothers' self-efficacy in preventing childhood diarrhea and in the proper management of this clinical condition. In addition, these interventions reinforce health education actions when used by health professionals as effective strategies to reduce diarrheal episodes.

CONCLUSION

It was concluded that the educational interventions used in this study were able to increase the self-efficacy scores of mothers to prevent childhood diarrhea within all intervention groups. It was also found that, after two months of collection, the level of self-efficacy of mothers in the intervention groups was higher than that achieved by the mothers in the comparison group.

Finally, mothers who watched the educational video in combination with reading an educational booklet achieved self-efficacy scores higher than those belonging to the groups in which each educational material was applied in an isolate manner. This reveals that the combined materials proved to be superior in promoting maternal self-efficacy. Such educational technologies should be used, as they are health education strategies for disseminating information in an attractive and motivating way, and as they have positive effects on maternal self-efficacy.

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