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Pilot Study on a Technology-Supported Breastfeeding Program and Its Impact on the Growth of Infants of Adolescent Mothers

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Abstract

Background: Adolescent mothers often exhibit low breastfeeding rates, leading to an increased likelihood of their infants being introduced to baby formula and food supplements prematurely.

Aim: This study examined the impact of an eight-week technology-supported breastfeeding program on the growth of infants born to adolescent mothers. It also evaluates the program's effect on the adolescent mothers' breastfeeding self-efficacy, success, and anxiety levels.

Methods: A randomized controlled trial was conducted with a total of 31 primiparous adolescent mothers and their infants, divided into an intervention group (IG=16) and a control group (CG=15). The intervention group received breastfeeding education, and an electronic booklet (e-booklet) was installed on their Android phones. Additional support included telephone interviews, motivational SMS messages, and telephone consultations on breastfeeding. Both groups were followed up face-to-face three times. The study data were collected using descriptive data forms, follow-up forms for infants' physical growth and breastfeeding, the Postpartum Breastfeeding Self-Efficacy Scale (PBSES), the Spielberger State Anxiety Inventory (STAI), and the LATCH Assessment Tool (evaluating Latch (L), Audible swallowing (A), Type of nipple (T), Comfort (C), and Hold (H)). The data were analyzed using chi-square analysis, Mann-Whitney U test, and Wilcoxon signed-rank test.

Results: The mean ages of the adolescent mothers in the IG and CG were 18.50 ± 0.63 and 18.40 ± 0.63 years, respectively. The mean gestational ages of the infants were 39.0 ± 0.96 weeks (IG) and 38.47 ± 0.74 weeks (CG), with mean birth weights of 3.08 ± 0.32 kg (IG) and 2.94 ± 0.33 kg (CG), respectively. At the third follow-up, infants in the IG showed significantly higher weight and height z-scores than those in the CG ($P < 0.05$). Adolescent mothers in the IG reported higher self-efficacy and breastfeeding success at the second and third follow-ups ($P=0.001$), and exhibited lower anxiety levels at the program's conclusion ($P=0.001$).

Conclusion: In the postpartum period, it is essential to identify adolescent mothers in the risk group by regularly evaluating their self-efficacy, anxiety levels, and breastfeeding successes. These mothers should receive support through appropriate nursing interventions early on. The use of technology by nurses providing breastfeeding education to adolescent mothers can enhance breastfeeding success and contribute to the healthy growth of infants. Implementation of a technology-based breastfeeding program for adolescent mothers represents a significant nursing intervention that benefits the health of both mothers and their infants.

Keywords: Adolescent mother, breastfeeding, growth, infant, program, technology

Introduction

Adolescent pregnancy poses a significant health challenge across both developed and developing countries. Recognized not only as an individual health issue but also as a contributing factor to public health problems and social risks, adolescent pregnancy and motherhood demand attention.[1] The adolescent birth rate, defined as the annual number of live births per 1,000 adolescent women, has seen a global decline from 65 in 1990 to 44 in 2018, further decreasing to 41.9 in 2023.[2] In the European region, this rate stands at 13.1, with Türkiye slightly higher at 15.2.[2] As of 2019, adolescents aged 15-19 years in low- and middle-income countries experience an estimated 21 million pregnancies annually, approximately 50% of which are unintended, leading to an estimated 12 million births.[3] Globally, in 2021, an estimated 14% of adolescent girls and young women gave birth before the age of 18.[4]

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Infants born to adolescent mothers may experience greater cognitive, social, emotional, and behavioral difficulties later in life.[5,6] The primary reasons for these problems include adolescent mothers engaging in risky behaviors, a lack of prenatal and postpartum breastfeeding education, low sensitivity and competence in infant nutrition by adolescent mothers, and insufficient knowledge about child health and development among these mothers.[7-9] Consequently, issues such as difficulties in initiating and maintaining lactation, reluctance towards breastfeeding, and negative perceptions and practices regarding breastfeeding are more common among adolescent mothers than among adult mothers.[10-13] Studies have shown that adolescent mothers possess less knowledge about breastfeeding and face more challenges with breast-related problems. These mothers exhibit lower rates of breastfeeding, and their infants are more likely to be introduced to baby formula and food supplements early.[7,14] This can adversely affect the healthy growth and development of the infant during the crucial first years of life.[8]

When considering the rates related to breastfeeding, it becomes apparent that low breastfeeding rates can be attributed to the lack of effective breastfeeding practices. Therefore, it is crucial to provide instruction and support to adolescent mothers, who are at a heightened risk. Research on breastfeeding education for adolescent mothers has shown that those who received breastfeeding developed positive views on breastfeeding, which led to increased rates and durations of breastfeeding. As a result, the growth and development of infants were positively impacted.[12,13,15,16]

The methods employed in breastfeeding education and counseling for adolescent mothers should be tailored to the characteristics of the target group. This approach enhances the effectiveness of the education and ensures its sustainability. In the adolescent period, the use of visual, tactile, and auditory sensations increases. Given adolescents' sense of curiosity, self-learning, inquisitiveness, interest in and access to technology, screen use, information acquisition, and learning methods, technology-based programs can serve as a method to improve their health behaviors.[17-19] At the same time, health-related information has become more accessible through technology, allowing users to decide when, where, and how they want to access information.[8] Technology-based methods include counseling services provided through web-based programs, computer video games, video CDs, tablets, mobile phones, text messages, applications, and phone calls.[18,20,21] Upon reviewing the literature, it is evident that technology is utilized in breastfeeding education, with adult mothers primarily benefiting from this education.[22-24] It has been determined that technology-based trainings provided to adult mothers positively increases their initiation and continuation rates of breastfeeding.[18,25-27] However, we could not find any studies in the literature that examined the impact of technology-based breastfeeding education on the physical development of infants in early infancy and the breastfeeding behavior of mothers.

In studies conducted in Türkiye, the factors affecting breastfeeding by adolescent mothers and the duration of breastfeeding were investigated, but no study was found that examines the effect of technology-based breastfeeding education on the physical development of infants in early infancy and the breastfeeding behaviors of the mother. Therefore, this study aimed to determine the impact of a technology-based breastfeeding program on the growth of infants of adolescent mothers and to examine the effects of the program on adolescent mothers' breastfeeding self-efficacy, breastfeeding success, and anxiety levels. Through technology-based breastfeeding programs, nurses can reduce infant feeding problems, increase adolescent mothers' breastfeeding self-confidence, and enhance their breastfeeding skills. Consequently, the physical development of their babies can be positively supported.

Research Hypotheses

Before and after the program, between the intervention and control groups, we hypothesize:

H_1: There is a difference in terms of the mean weight and height z-scores specific to the age and gender of the infants.

H_2: There is a difference between the mean scores of the mothers on the Postpartum Breastfeeding Self-Efficacy Scale.

H_3: There is a difference between the mean Spielberger State Anxiety Inventory scores of the mothers.

H_4: There is a difference between the mean scores of the mothers on the LATCH Breastfeeding Charting System and Documentation Tool (evaluating Latch (L), Audible swallowing (A), Type of nipple (T), Comfort (C), and Hold (H)).

H_5: There is a difference in the breastfeeding rates of the mothers.

Materials and Methods

Design of the Research

The research was conducted as a randomized controlled study in four primary care clinics (PCCs) in the Central Anatolia region of Türkiye from February 1, 2017, to August 31, 2017.

Sample of the Research

The study did not involve sample selection. All adolescent pregnant individuals and their infants who met the study criteria were included during the specified dates.

Inclusion criteria included adolescent mothers who:

a) are in the 15-19 age group
b) are Turkish
c) are registered at the primary care clinics
d) came for control within one week after birth
e) had a full-term infant
f) have their first live birth infant and no experience of breastfeeding
g) breastfeed or both breastfeed and use a nutritional supplement
h) use a smartphone
i) have agreed to participate in the study for two months

Exclusion criteria included adolescent mothers or infants with:

a) a physical or mental health problem in the adolescent mother
b) infants in the risky newborn category (below 2500 grams, infants born before the 37th week of gestation)
c) infants with intrauterine growth retardation or congenital health problems
d) adolescent mothers who experienced a significant life event in the last six months

Prior to the research, lists of adolescent pregnant women registered at four PCCs were created by the researchers in cooperation with PCC staff. Adolescent pregnant women listed as being in their 37th

week of gestation were contacted by PCC staff and informed about the research. Permission was obtained from each adolescent participant for researchers to contact them. Subsequently, researchers called the adolescents who agreed to participate in the research and provided them with detailed information about the study. Out of 49 registered adolescents who gave birth within the specified dates, only 43 were reached at the PCCs. Nine of these 43 adolescent mothers were excluded from the research because they did not meet the inclusion criteria, leaving 34 adolescent mothers to be included in the study (17 in the intervention group and 17 in the control group). After the research began, one adolescent mother from the intervention group and two from the control group were excluded from the sample due to absenteeism, resulting in a final sample of 31 adolescent mothers and their infants (16 in the intervention group and 15 in the control group) for the study (Figure 1). A post hoc power analysis was performed based on the LATCH Breastfeeding Charting System and Documentation Tool from a similar study in this filed after the research was completed.[28] The third follow-up of the LATCH Breastfeeding Charting System and Documentation Tool was analyzed, revealing a power analysis value of 0.99.

For randomization, adolescent mothers were stratified according to their age and educational status and then assigned to either the intervention or control group based on these similarities. The research commenced with the intervention group, which was selected by a drawing of lots. The first adolescent mother who arrived and met the research criteria was included in the intervention group, while the second adolescent mother, matching in age and education level, was included in the control group.

Data Collection Tools

The tools used for data collection include: the Descriptive Characteristics Form, Data Collection Form for Infant and Breastfeeding, Follow-up Form for Breastfeeding and Physical

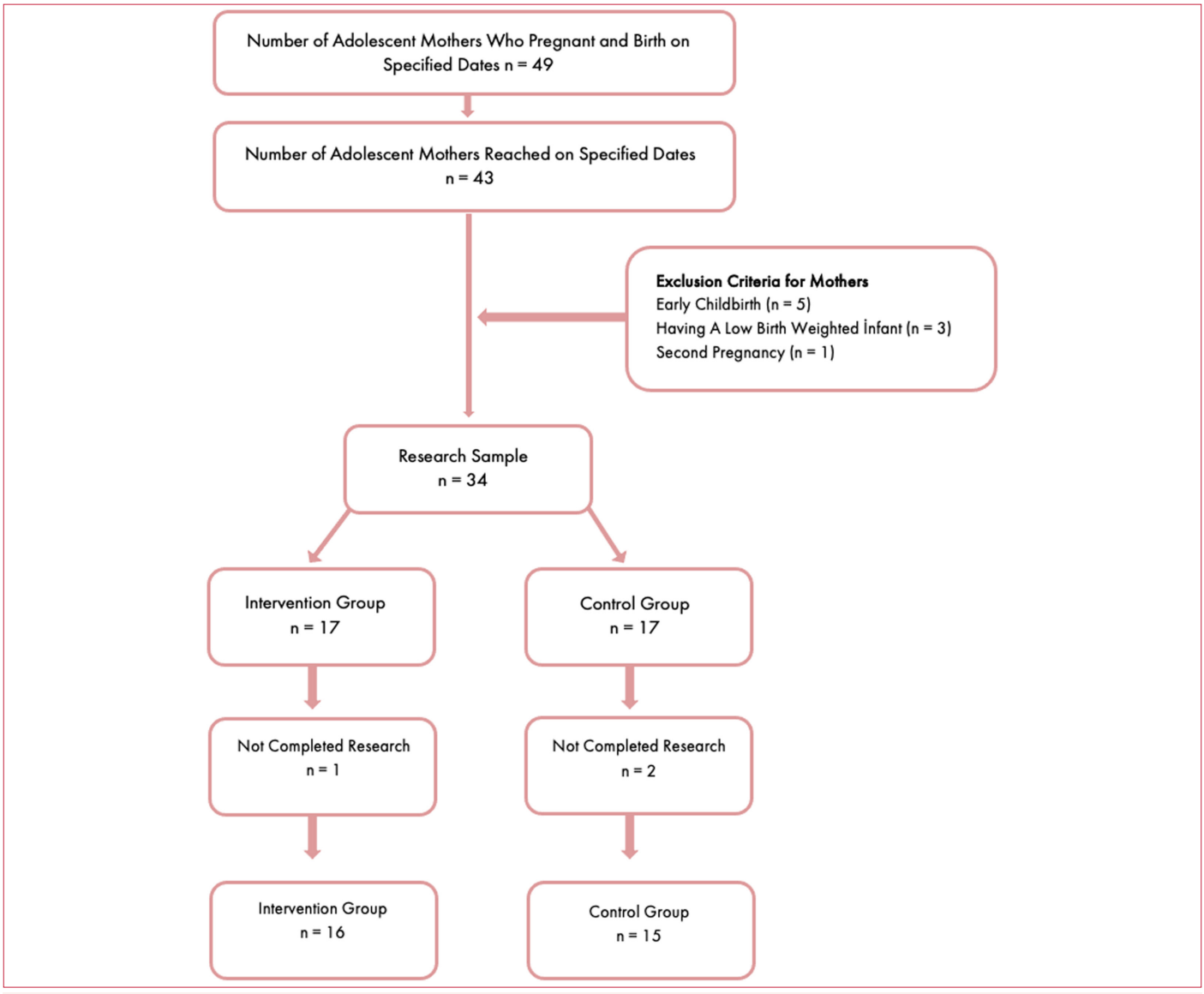

Figure 1. CONSORT Flow Diagram of the study.

Development of the Infant, Postpartum Breastfeeding Self-Efficacy Scale, Spielberger State Anxiety Inventory, and the LATCH Breastfeeding Charting System and Documentation Tool.

The Form was created by the researchers based on a literature review. This form contains five close-ended questions related to the mother's age, educational status, family type, income status, and working status.[8,12,29] For the infant, it includes four questions about gender, birth weight and week, and age in days.[12,15,30]

The Follow-up Form for Breastfeeding and Physical Development of the Infant is used to record the infant's height and weight, frequency of breastfeeding, duration of breastfeeding, breastfeeding status, reason for starting formula, and formula frequency, as recorded by the researchers (RÇ, EKT).[7,13,15]

The Postpartum Breastfeeding Self-Efficacy Scale (BSES) was developed by Dennis in 2003. The 14-item scale evaluates breastfeeding self-efficacy on a 5-point Likert scale, with scores ranging from 14 to 70. Higher scores indicate greater breastfeeding self-efficacy. Dennis (2003) recommended its use in the postpartum period. The original Cronbach's alpha value of the scale was 0.94.[31] In the Turkish validity study of the BSES by Aluş Tokat, Okumuş, and Dennis (2010), the Cronbach's alpha value was found to be 0.86, confirming the scale's suitability for the Turkish culture. As a result of the literature review, studies were found in which the scale was used with adolescent mothers.[29,32,33] In our study, the Cronbach's alpha value of the scale was found to be 0.99.

The Spielberger State Anxiety Inventory (STAI) was developed by Spielberger, Gorsuch, and Lushene in 1970 and consists of 20 items for assessing state-trait anxiety. The scale rates the severity of emotions and behaviors for each item as (1) None, (2) A little, (3) Very, and (4) Completely, asking participants to select one of these options. The lowest possible score is 20, and the highest is 80, with a high score indicating a high level of anxiety. The adaptation, validity, and reliability study of the STAI for Turkish was conducted by Öner and Le Compte in 1983, and the Cronbach's alpha value of the scale was found to be 0.94.[34] The original Cronbach's alpha value of the scale ranges between 0.89 and 0.95.[35] It was determined that the scale has been used with pregnant and nursing mothers to determine anxiety status.[36-38] In our study, the Cronbach's alpha value of the scale was found to be 0.97.

The LATCH Breastfeeding Charting System and Documentation Tool was developed by Jensen, Wallace, and Kelsay in 1994. This measurement tool consists of five assessment criteria, with each item rated from 0 to 2 points, and the maximum total score is 10. A high LATCH score indicates successful breastfeeding.[39] The original Cronbach's alpha value of the scale was found to be 0.93. The reliability for Türkiye was established by Yenal and Okumuş (2003), with a Cronbach's alpha value of 0.95.[40] Literature review revealed that the scale has been frequently used to assess mothers' breastfeeding success.[41-44] In our study, the Cronbach's alpha value of the scale was found to be 0.99.

Application of Data Collection Tools

Three face-to-face interviews were conducted with the adolescent mothers in both the intervention and control groups at the first, fourth, and eighth weeks after the birth of the infant. Data collection tools were applied to both groups during these interviews. The applied forms and the program flow diagram are shown in Figure 2. On average, the application of the forms lasted 30 minutes. For the follow-up of the physical development of infants, their height and weight measurements were taken by the researchers (RÇ, EKT). The measurement was performed twice for the same infant to ensure accuracy.

Height and Weight Measurements: Before the measurement, a calibration check was performed by ensuring the number zero was displayed on the infant weighing panel for adjustment control. The infant's clothes were completely removed for the measurement, leaving only a dry diaper on. After the measurement, the dry diaper was weighed, and its weight was deducted from the body weight.[45,46] The infant stadiometer was placed on a flat surface, and measurements were performed with the infant lying down. The infant's head vertex made contact with the headboard of the stadiometer, ensuring the back of the head, back, hips, legs, and heels were in full contact with the ground. The heels were positioned at a 90-degree angle to the hard surface, and the knees were pressed lightly to allow the movable footboard to fit under the infant's sole.[45,46]

Implementation of the Program

Within the framework of the eight-week program, the adolescent mothers in both the intervention and control groups underwent three face-to-face interviews. An eight-week technology-based breastfeeding program was implemented for the adolescent mothers in the intervention group. During the implementation of the program, the interviews were initiated in a room with the mother, the baby (and the mother's relative, if requested), and the educator. The first interview lasted, on average, 45 minutes. In the first week of the program, adolescent mothers in the intervention group underwent an initial face-to-face assessment by the researcher before receiving breastfeeding training. This assessment covered the descriptive characteristics of the mother and infant, the physical development of the infant, the breastfeeding status of the adolescent mother, postpartum breastfeeding self-efficacy, breastfeeding success using the LATCH breastfeeding diagnosis and assessment tool, and state anxiety. Once data collection was completed, face-to-face breastfeeding training was provided. The training utilized interactive methods, figures, pictures, and models to enrich the learning experience. After the training, the "Breastfeeding Guide for Adolescent Mothers" booklet was distributed to each mother as written material, and a PDF version was uploaded to the mother's Android mobile phone. The adolescent mother's breastfeeding success was re-evaluated at the end of the first interview using the LATCH breastfeeding tool. The second face-to-face interview occurred in the fourth week, focusing on the physical development of the baby and the adolescent mother's breastfeeding practices. Additionally, the mother's breastfeeding success was evaluated using the LATCH tool. During this interview, breastfeeding counseling was provided based on the adolescent mother's needs, and her suggestions for solving any problems were discussed. The third face-to-face interview, conducted in the eighth week, served as the final assessment. In this session, various scales and forms were used to evaluate the physical development of the baby, the breastfeeding status of the adolescent mother, postpartum breastfeeding self-efficacy, breastfeeding success using the LATCH tool, and state anxiety. Additionally, a breastfeeding program evaluation form was administered to gather the adolescent mothers' opinions about the program. Telephone interviews were also conducted

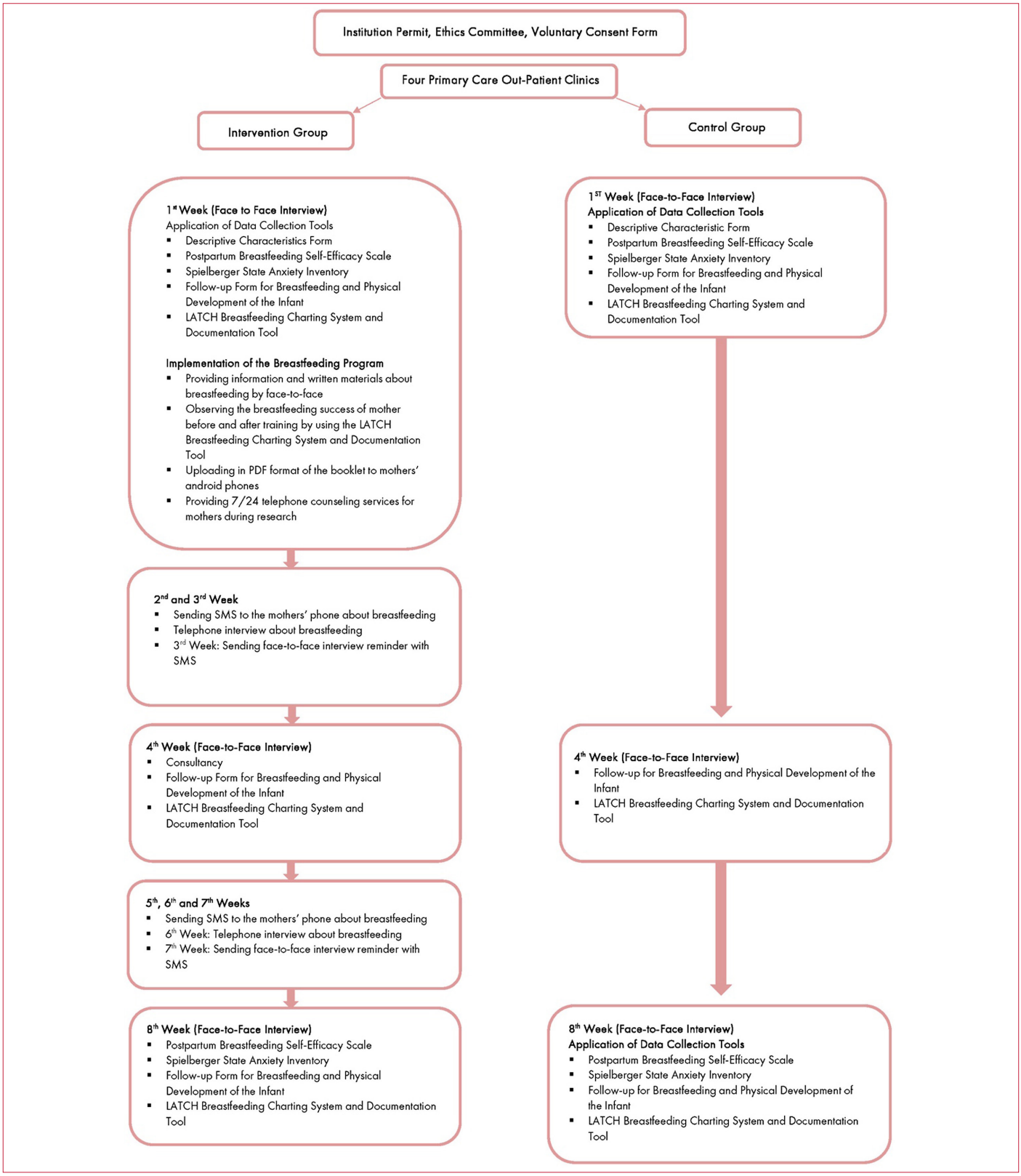

Figure 2. Implementation of the Program.

with the adolescent mothers at weeks 2, 3, and 6 to address any needs or problems related to infant care and breastfeeding, as well as to follow up on breastfeeding practices. These telephone interviews lasted, on average, 3-7 minutes. Mothers in the intervention group had access to 24/7 breastfeeding counseling via telephone as needed. Furthermore, meeting reminders and motivational text messages regarding breastfeeding were sent during weeks 2, 3, 4, 5, 6, 7, and 8.

The control group's adolescent mothers also participated in three face-to-face interviews. The first interview involved an introduction and the application of data collection forms. During this session, the fourth-week interview with the mother was scheduled. In the fourth-week interview, the physical development of the baby, the breastfeeding status of the adolescent mother, and breastfeeding success using the LATCH tool were evaluated. Subsequently, the eighth-week interview was scheduled. At this interview, various scales and forms were administered to assess the physical development of the baby, the breastfeeding status of the adolescent mother, postpartum breastfeeding self-efficacy, breastfeeding success with the LATCH tool, and state anxiety. Mothers in the control group received routine care and education provided at Family Health Centers (FHCs). At the end of the study, this group was given a printed version of the education booklet on breastfeeding.

Data Analysis

The data collected from the study were analyzed using the Statistical Package for the Social Sciences (SPSS) 17.0 (IBM Corp., Armonk, New York, USA) software. In the descriptive analysis, variables were presented using percentages, means, and standard deviations. The Mann-Whitney U test was utilized for comparing groups, ordinal data, and in binary group comparisons. The Chi-square test was employed to compare nominal data between groups. Fisher's exact test was used for nominal data if the expected value was below 1, and more than 20% of the cells had frequencies less than 5.[47] A p-value of < 0.005 was considered statistically significant.

Content validity (scope validity) of the written training material was evaluated by consulting eight experts. A total of 24 items related to structural features, correct use of design principles, and proper use of design elements were examined in the evaluation of the educational material. Expert opinions were assessed using a 4-point Likert-type scale, with the average conformity score expected to be above 0.80 for each item.[47] In this study, expert opinion scores ranged between 0.87 and 1 for each item.

In the study, the infants' measurement values were evaluated based on the World Health Organization (WHO) z-score tables. The Anthro program available on the WHO website was utilized to determine the z-score values of the measurements.

Research Ethics

Necessary written permissions and approvals were obtained from the institutions affiliated with the Provincial Directorate of Public Health and from the Gazi University Ethics Committee (Approval Number: 77082166-302.08.01/13, Date: 11. 11. 2015). The study commenced after written and verbal consent was obtained from the adolescents included in the study. The Turkish validity and reliability studies of the scales used in the study were conducted, and the permissions for these scales were acquired from the relevant researchers. Mothers in the control group received written education material at the end of the study.

Results

The mean age of adolescent mothers in the intervention and control groups was found to be 18.50 ± 0.63 and 18.40 ± 0.63, respectively. No statistical difference was observed between the groups in terms of descriptive characteristics, indicating that the groups were homogeneous (Table 1).

Table 2 compares the weight and height z-scores of the infants in the intervention and control groups. At the second and third follow-ups, weight and height z-scores were between '-1 and 0' for the intervention group and '-1 and -2' for the control group. A statistically significant difference ($P < 0.05$) was observed in the intervention group compared to the control group regarding weight at the second and third follow-ups. Furthermore, the height z-score was significantly higher in the intervention group than in the control group at the third follow-up ($P < 0.05$) (Figure 3).

Table 3 presents the comparison of the breastfeeding status and formula use among adolescent mothers in the intervention and control groups. At the second and third follow-ups, the number of adolescent mothers exclusively breastfeeding their infants was higher in the intervention group than in the control group, with this difference being statistically significant ($P < 0.001$). Regarding the use of baby formula alone, at the third follow-up, the number of adolescent mothers in the control group was significantly higher than in the intervention group ($P=0.001$).

Table 4 compares the mean scores of self-efficacy, trait anxiety, and LATCH among adolescent mothers in the intervention and control groups. At the third follow-up, adolescent mothers in the intervention group had higher self-efficacy scores and lower trait anxiety scores compared to those in the control group, with the difference being statistically significant ($P=0.001$). In terms of LATCH scores, the mean score at the second and third follow-ups was higher in the intervention group than in the control group, again showing a statistically significant difference ($P=0.001$).

Discussion

The development of technology, the increasing need to search for and access information, the time constraints of health professionals, and the high costs have heightened the demand for technology-based programs in health education. The integration of technology into health education has significantly influenced the success of educational endeavors and the satisfaction levels of participants.[17-19,48] Given the declining rates of breastfeeding, the need for innovative methods and effective education is becoming increasingly apparent. In particular, the use of technology-based programs in training significantly enhances the breastfeeding success of adolescent mothers, who are considered at risk in this area. Given adolescent mothers' keen interest in technology, easy access to it, and frequent usage, employing technology-based programs as a training method notably improves outcomes for this group, which is at risk in terms of breastfeeding.[21]

In our study, it was observed that the weight z-score of infants in the intervention group was higher at the second and third follow-ups, and the height z-score was higher at the third follow-up compared to the control group. While there are no studies in the literature specifically

Table 1. Descriptive Characteristics of Adolescent Mothers and Their Infants (n=31)

	Intervention Group (n=16)		Control Group (n=15)			
	X±SD	Min-Max	X±SD	Min-Max	U*	p
Adolescent Mothers' Age (year)	18,50±0,63	17-19	18,40±0,63	17-19	109,0	0,625
Infants Birth Week (week)	39,0±0,96	37-41	38,47±0,74	37-40	83,5	0,126
Age of Infants (day)**	6,93±1,65	5-10	6,06±1,03	5-9	86,5	0,161
Birth Weight of Infants	3,08±0,32	2,50-3,69	2,94±0,33	2,55-3,64	88,5	0,213
	n	**%**	**n**	**%**	**χ^2**	**p**
Education Level of Mothers***						
Primary school	2	12,5	3	20,0		
Secondary school	13	81,3	10	66,6	-----	-----
High school	1	6,2	2	13,4		
Family Structure						
Nuclear family	4	25,0	8	53,4	1,561	0,211
Extended family	12	75,0	7	46,6		
Employment Status						
Not working	16	100,0	15	100,0	-----	-----
Income Status ****						
Income lower than expenses	5	31,3	6	40,0	0,018	0,894
Income equal to expenses-Income higher than expenses	11	68,7	9	60,0		
Gender of Infants						
Female	9	56,3	7	46,6	0,030	0,862
Male	7	43,7	8	53,4		

*Mann Whitney U test was used.
**It was shown how old (days) was the infant in the first encounter in Primary Care Out-Patient Clinic.
***Statistical analysis could not be performed in four cells because n < 5.
****The income level of the family was determined according to the statement of the mothers.

Table 2. Comparison of Weight and Height z Scores of İnfants in İntervention and Control Groups According to Follow-up (n=31)

	Intervention Group (n=16)		Control Group (n=15)			
	X±SD	Min-Mak	X±SD	Min-Mak	U*	p
Weight z score						
1st follow-up	-0,79±0,77	-1,87-0,64	-1,28±0,75	-2,45-0,34	73,5	0,066
2nd follow-up	-0,31±0,96	-1,32-2,17	-1,29±0,86	-2,57-0,41	48,5	**0,005**
3rd follow-up	-0,14±0,94	-1,65-1,85	-1,15±1,38	2,26-3,36	38,0	**0,001**
Height z score						
1st follow-up	-0,46±0,84	-1,73-1,07	-0,56±0,79	-1,82-0,82	114,5	0,828
2nd follow-up	-0,61±0,95	-1,88-1,51	-1,18±0,73	-2,01-0,17	72,0	0,058
3rd follow-up	-0,59±1,11	-2,00-1,92	-1,50±0,89	-2,49-0,78	55,0	**0,010**

*Mann Whitney U test was used.

Figure 3. Comparison of weight and height z scores of infants in the intervention and control groups according to the follow-ups.

addressing the effect of technology-based breastfeeding education on the development of infants of adolescent and adult mothers, there are studies that examine the impact of breastfeeding on infants' weight and height z-scores without providing breastfeeding education to adult mothers. In a study by Kalanda, Verhoeff, and Brabin,[49] it was found that the body weight z-score of infants at the third and sixth months who were fed with baby formula was lower than that of breastfed infants. Similarly, the height z-score of formula-fed infants was lower at the ninth month.[49] Kramer et al.[50] observed that the body weight z-score of breastfed infants began to increase after the first month compared to those fed with baby formula, reaching a peak at the third month. However, the difference between the groups gradually decreased and disappeared after 12 months.[50] Both Kalanda et al.[49] and Kramer et al.[50] reported that the weight and height z-scores of breastfed infants were higher than those fed with baby formula, findings that echo our results. Z-scores offer a standardized assessment by age and gender, and the measurements in our study, reflected as z-score values indicate that the education provided had a positive impact on infant growth. As a result, key factors such as the mother's 24-hour access to information and counseling significantly enhanced the adolescent mother's breastfeeding level and effectiveness, contributing to the infants' growth.

Table 3. Comparison of Status of Adolescent Mothers in the İntervention and Control Groups, in Terms of Breastfeeding and Formula Using (n=31)

	Intervention Group (n=16)		Control Group (n=15)			
	n	%	n	%	χ^2	p
Feeding Only Breastfeeding*						
1st follow-up	7	43,7	5	33,3	0,051	0,821
2nd follow-up	12	75,0	2	13,3	9,528	**0,002***
3rd follow-up	14	87,5	2	13,3	17,052	**0,001***
Feeding Only Baby Formula*						
1st follow-up	--	--	1	6,25	--	0,484*
2nd follow-up	1	6,25	5	33,3	--	0,083*
3rd follow-up	1	6,25	10	66,7	12,344	**0,001***

*Percentages were obtained in each row, for n=15 adolescent mothers in the intervention group and n=16 adolescent mothers in the control group.

Within the scope of this study, it was observed that after the implementation of the technology-based breastfeeding program, the number of adolescent mothers in the intervention group who breastfed their infants was higher at the second and third follow-ups compared to the control group. Two separate studies, which provided training and telephone counseling to support breastfeeding among adolescent mothers, were reviewed.[13,51] Wambach et al.[13] offered education to adolescent mothers twice during the prenatal period in a hospital

Table 4. Comparison of the Mean Scores of Adolescent Mothers' Self-efficacy, Trait Anxiety and LATCH in the İntervention and Control Groups (n=31)

	Intervention Group (n=16)		Control Group (n=15)			
	M±SD	Min-Mak	M±SD	Min-Mak	U*	p
Self-Efficacy						
1st follow-up	50,43±13,47	25-69	45,4±15,40	25-69	99,0	0,678
3rd follow-up	62,0±14,10	14-70	27,13±18,40	14-70	28,0	**0,001**
State Anxiety						
1st follow-up	42,5±11,53	25-65	43,60±12,89	26-69	109,5	0,406
3rd follow-up	25,31±6,25	20-38	43,53±17,49	22-68	37,0	**0,001**
LATCH						
1s follow-up	5,43±2,52	2-10	5,73±3,05	0-10	112,0	0,750
2nd follow-up	8,06±2,56	0-10	4,00±3,90	0-10	53,0	**0,007**
3rd follow-up	9,18±2,50	0-10	2,26±4,13	0-10	35,0	**0,001**

*Mann Whitney U test was used.

setting and conducted five phone calls during the postpartum period. Their study concluded that the duration of breastfeeding and the rates of breastfeeding among adolescent mothers increased, along with more positive attitudes towards breastfeeding.[13] Meglio, McDermott, and Klein[51] conducted peer-assisted telephone interviews with adolescent mothers to examine the impact on breastfeeding. They found that while support increased breastfeeding rates, it did not affect the duration of breastfeeding.[51] Adolescence is a critical period for transitioning to abstract thinking, changing health behaviors, and acquiring, processing, and analyzing information. Therefore, effective health education can enhance positive health behaviors among adolescents, which may continue throughout their lives. In our study, we posit that implementing a technology-based breastfeeding program for adolescent mothers is beneficial in fostering positive breastfeeding behaviors.

Breastfeeding by adolescent mothers is very important, as they and their infants are considered at risk due to inadequate physical, social, and economic support for breastfeeding behavior. Numerous factors influence breastfeeding among adolescent mothers, including the level of anxiety they experience about breastfeeding, low self-confidence, the desire to breastfeed, belief in breastfeeding, and heightened anxiety levels associated with adolescence.[37,38,52-54] In this study, it was concluded that after the technology-based breastfeeding program (at the third follow-up), adolescent mothers in the intervention group had higher success and self-efficacy scores compared to those in the control group, while their trait anxiety scores were lower than those of mothers in the control group. It was observed that efforts to increase breastfeeding self-efficacy have positive effects on breastfeeding success and rates. Technology can be utilized to support adolescent mothers in improving breastfeeding practices and to encourage more extensive breastfeeding for the infants of adolescent mothers. Studies examining the effects of non-technology-based education on self-efficacy have found that adolescent mothers with high prenatal and postpartum self-efficacy initiate breastfeeding earlier and sustain it longer compared to those with low self-efficacy.[52,53] Breastfeeding success may be compromised in adolescent mothers due to issues with breastfeeding position, problems related to holding the infant, the infant's latch on the breast and nipple, and other difficulties such as engorgement, redness, cracked skin, bleeding, and pain, which may lead to discontinuation of breastfeeding or a decreased duration.[8,55] It was found that the LATCH score averages of adolescent mothers were lower than those of adult mothers in descriptive studies aiming to evaluate breastfeeding success of adolescent and adult mothers with the LATCH tool without using technology. These studies also revealed that mothers with higher LATCH scores had longer breastfeeding durations. Furthermore, they discovered that the self-efficacy and breastfeeding success of mothers who received breastfeeding counseling were higher.[11,28,54]

Adolescent motherhood can lead to physical changes in the individual, school dropout, problems with the social circle, role changes, economic difficulties, and risky behaviors in infant care and feeding (such as not breastfeeding, short breastfeeding duration, early introduction of supplementary foods, and beginning solid foods early). Adolescent mothers may experience mood changes, and the level of anxiety can be high among those who have difficulty adapting to these changes.[56-58] Studies examining the impact of adult mothers' anxiety on breastfeeding behavior without using technology have found an inverse relationship between breastfeeding and anxiety, with nursing adult mothers having lower anxiety scores.[37,38,59] These results align with ours. With the help of a technology-based breastfeeding program, 24/7 social support can be provided to the adolescent mother during the postpartum period, ensuring she receives accurate information when needed and boosting her self-confidence. It is believed that incorporating considerations of mothers' breastfeeding self-efficacy, success, and anxiety into technology-based programs developed by nurses can positively influence the program's success.

Strengths and Limitations

Our study, which aimed to determine the impact of a technology-based breastfeeding program on the growth of infants of adolescent mothers, is the first of its kind. Furthermore, the identification

of challenges within the technology-based program process and the development of solutions will pave the way for future technology-based studies.

The limitations of our study include its execution with a small number of adolescent mothers and infants from a specific region, which restricts the generalizability of the results. Additionally, the program's duration was only eight weeks.

Conclusion

Technology-based programs can effectively improve adolescent health. As a result, it was found that the program positively affected the height and weight z-scores of infants of adolescent mothers, increased adolescent mothers' breastfeeding success and self-efficacy, and decreased their anxiety levels. Long-term follow-up is recommended to assess the sustained effects of breastfeeding on infant growth.

Pediatric nurses play crucial roles in the planning, implementation, and evaluation of health education programs for adolescent mothers and their infants, encompassing counseling, care, education, research, collaboration, and support. In the postpartum period, it is essential to identify adolescent mothers in the risk group by regularly evaluating their self-efficacy, anxiety levels, and breastfeeding successes, and to provide them with timely and appropriate nursing interventions. Given this information, it is believed that offering technology-based breastfeeding support to adolescent mothers may contribute significantly to the health and growth of their infants. Therefore, we recommend the adoption of a technology-based breastfeeding program for adolescent mothers during the postpartum period.

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Informed Consent: Written and verbal consent was obtained from the adolescents included in the study.

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