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RESEARCH ARTICLE

Effects of health promotion program on maternal attachment, parenting self-efficacy, infant development: a randomised controlled trial

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ABSTRACT

This study was designed to test the efficacy of the health promotion program used on maternal-infant attachment, parental self-efficacy, infant development. For this experimental study parallel-group randomised control design was used. Data was collected from 64 mother and their infants. The intervention group received the health promotion program in addition to standard care, the control group received only the standard care. Family Information Form, Prenatal Attachment Inventory, Maternal Attachment Inventory, Parenting Self-Efficacy Scale, and Denver II Developmental Screening Tests were used for the collection of the data. Pearson $\chi 2$ test, Yates corrected $\chi 2$ test, independent t-test, and Mcnemar test were used for analysing the collected data. The groups on maternal-infant attachment (d:1.20 [CI:0.671–1.736]), parental self-efficacy (d:1.37 [CI:0.835 to 1.925]), and development delays of infants ($p = .003$, C.V: 0.41) were found to be statistically significant. Health promotion program positively influenced the maternal attachment, parental self-efficacy, the development of the infants.

IMPACT STATEMENT

- **What is already known on this subject?** Pregnancy and postpartum is a difficult period for mothers. Mothers need support. Parenting self-efficacy and maternal attachment are important for improving infant health. Infant should be supported to prevent developmental delays.
- **What do the results of this study add?** With the education and support program applied before and after birth, mother and baby were evaluated together and multi-faceted support was provided.
- **What are the implications of these findings for clinical practice and/or further research?** Supporting parenting self-efficacy, maternal attachment and infant development should be started during pregnancy and should be continued in the postpartum period.

KEYWORDS

Maternal attachment; parenting self-efficacy; infant development; nursing intervention; trial; the health promotion

Introduction

Motherhood is the beginning of a process in which important responsibilities are assumed in women's life (Ozturk and Erci 2016). Women experience various difficulties in transition to motherhood such as self-efficacy, attachment, (Shorey et al. 2019) and protection and maintenance of infant health (Gilmer et al. 2016). Mothers need knowledge, skills and energy to fulfil their new responsibilities (Meleis 2010; Ozturk and Erci 2016). Accordingly, education programmes that start in the prenatal period and continue postpartum should be applied to expectant mothers (Amin et al. 2018).

It is important for mothers to learn infant care and to be able to perform the right practices in the development of infant health. This can be possible with comprehensive education programs that start in the prenatal period and continue in the postpartum period (Horwood et al. 2017). Attachment begins with fertilisation, continues increasingly during pregnancy and postpartum period (Yı lmaz and Beji 2013). Attachment during pregnancy and postpartum are related (Rossen et al. 2017). Nursing interventions that begin during pregnancy (Akbarzadeh et al. 2016; Shorey et al. 2019) or postpartum significantly increase the level of maternal –infant attachment (Cinar and Ozturk 2014; Ozturk and Erci 2016).

It signifies a loving bond between mother and baby. Attachment is one of the most important promoting factors in healthy infant development (Scharfe 2012). Mothers who have higher maternal attachment levels were sensitive, tender and participating parents, affecting the development of the baby positively in their early infancy period (Alhusen et al. 2013). Healthy attachment plays a key role in infant development (Brumariu 2015). Child development is defined as an orderly progression of skills (Grantham-McGregor et al. 2007). Parenting interventions early in life have beneficial effects on children's developments that can extend into adulthood (Engle et al. 2011). Improving maternal- infant attachment positively affects both infant development (Maas et al. 2016) and parental self-efficacy (Branjerdporn et al. 2017; Delavari et al. 2018). A study that examines the relationship between attachment and parental self-efficacy are recommended (Delavari et al. 2018).

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Parental self-efficacy, the ability of mothers to care for newborns, (Leahy Warren 2005; Botha et al. 2020) are also one of the important components for a healthy transition to motherhood (Leahy Warren 2005; Ngai et al. 2010). Mothers with a high parental self-efficacy level in the postpartum period are more successful in dealing with difficulties in newborn care (Bandura 1997). Implemented intervention programmes significantly increase parental self-efficacy (Bloomfield and Kendall 2012). Early infant development is very important in terms of affecting all life (Branjerdporn et al. 2017). Developmental delays in the first months may be noticed late (Hamilton 2006; Limbos and Joyce 2011). Research shows that mothers have education needs in infant development (Zellman et al. 2014) and infant care (Silva and Carneiro 2018; Ahmed et al. 2019) and the education provided has positive effects on mothers (Yıldız and Akbayrak 2014; Shrestha et al. 2016; Eraky and Hassan 2018).

Purpose

The aim of this study is to evaluate the effectiveness of the health promotion program, which is applied from the 36th week of pregnancy until the sixth month after birth, on mother-infant attachment, parental self-efficacy and infant development.

Hypothesis

Hypothesis 1: There is difference between maternal attachment levels and parental self-efficacy perception levels of mothers receiving health promotion program and mothers receiving standard care.

Hypothesis 2: There is a difference in the Devver II Developmental Screening Test results between the infants of mothers receiving health promotion program and infants of mothers receiving standard care.

Methods

The present study was designed as 2-arm, parallel-group randomised controlled trial (RCT). The trial was registered in ClinicalTrials.gov (NCT04109651). The study was carried out in a family health centre in Konya, Turkey, between October 2018 and August 2019.

Participants

Participants were recruited in a family health centre in Konya. The inclusion criteria were (1) over 18 years old, (2) gestational age of 36 week at time of enrolment and (3) infants younger than 6 months. Exclusion criteria were (1) medical and psychiatric history during pregnancy as identified by medical records; (2) risk of preterm birth; (3) multiple pregnancy, (4) carried from the region.

Sample size calculation

The sample size was calculated using the G-power program (3.1.9.2) and *a priori* based on 2 independent groups within factors (Faul et al. 2007). In this study, mother-infant attachment was the primary outcome. To achieve a medium effect size of 0.80 on the primary outcome of maternal –infant attachment (Sercekus and Baskale 2016) power of 80% at the significance level of 0.05, a minimum of 26 participants in each group was required (Kilic 2014). Accounting for a 20% loss of participants during the study, a total of 64 pregnant women (intervention group, $n=32$; control group, $n=32$) were involved.

Randomisation

The stratified randomisation method was employed in the present study. Randomisation was stratified by parity and level of education (primipara and multipara, primary school and high, respectively respectively). Eight quadruple blocks were created by randomisation method with permutation blocked. After the created blocks, pregnant women (1:1 allocation ratio) were randomly assigned to intervention or control groups using the random numbers table obtained on the computer (www.random.org). The study was not blind for participants and researchers. The participants were aware of which group they belonged to. The researcher could not be blinded because he managed the process and conducted a screening test. In the evaluation of the data, the study groups were coded and the analyzes were done by an independent statistician and the blind technique was applied. After the analysis and interpretation of the data was completed, the codes of the intervention and control groups were announced. Figure 1: Trial CONSORT flow diagram. Multiparous mothers were assigned to the intervention and control groups on a balanced basis.

Intervention

Control group

The control group received routine care only. The routine care involved prenatal and postnatal support by nurses and midwives in the family health centre and a follow-up (36 gestation week and 6-month postdelivery). The content of the support focussed on providing didactic information on newborn screening tests, immunisation, and breastfeeding advice during the follow-up and family health centre visit.

Intervention group

The intervention group received a prenatal and postnatal the health promotion program and plus routine care and studies on the prenatal and postnatal needs of mothers (Barimani et al. 2017; Slomian et al. 2017; Salehi et al. 2018). Nine experts including six academic experts, a clinical obstetrician, one midwife and two mothers validated the contents of the intervention.

The health promotion programme consisted of 30–90 minute individual face-to-face educational (four times)

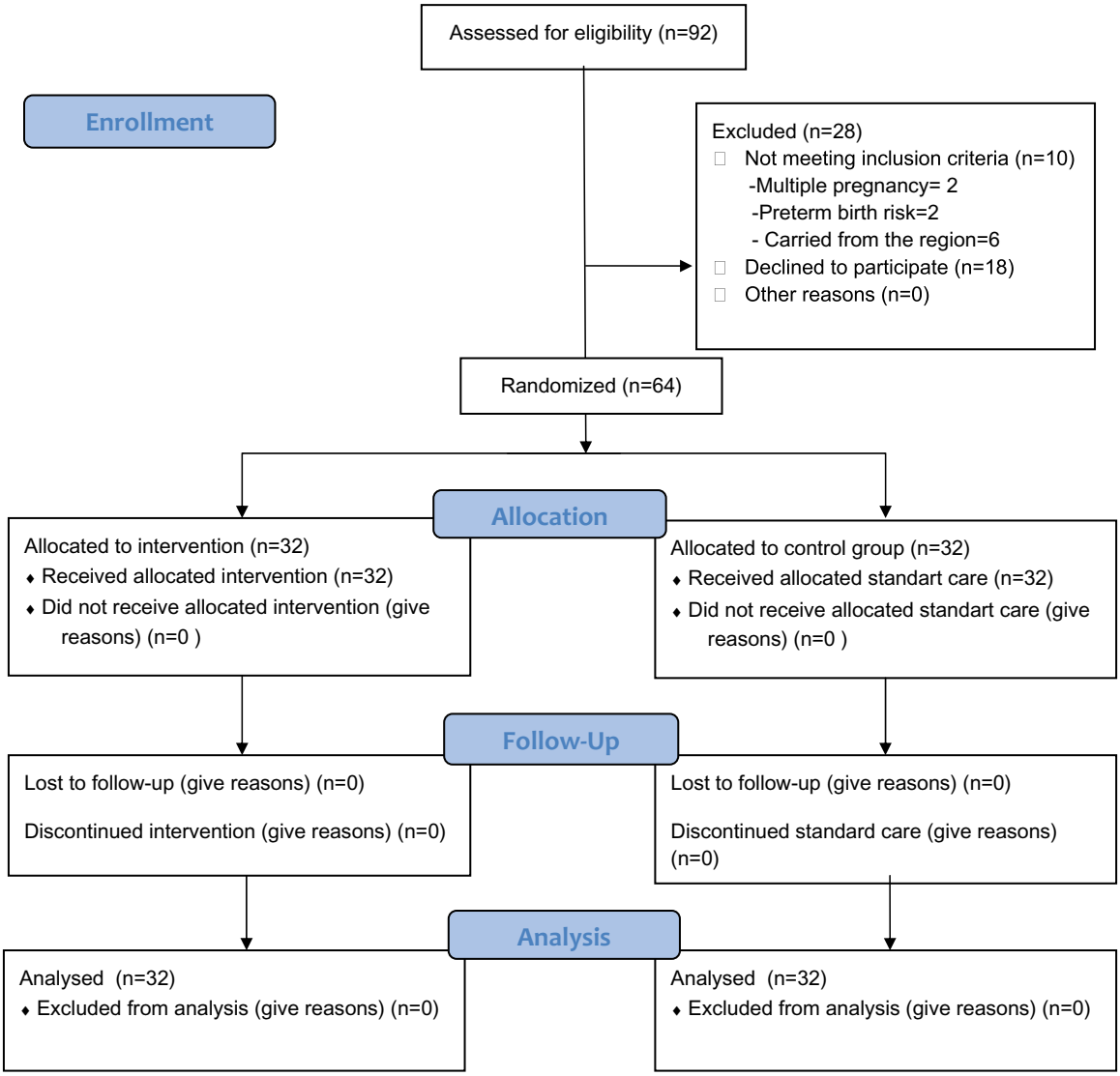

Figure 1. Trial CONSORT flow diagram.

sessions, education booklet and a follow-up phone call (once times and plus as needed). The first author conducted the face-to-face sessions for all mothers in the intervention group. The health promotion program topics covered included the importance and change of family dynamics before and postpartum, increasing baby development, breastfeeding, infant health, infant safety, attachment and self-efficacy and help-seeking behaviours. The health promotion programme was applied by the first author from the 36 weeks gestational week to the sixth postpartum month.

The health promotion program is prepared to support the factors that facilitate the transition of women to motherhood and to eliminate the difficult transition to motherhood factors. With health promotion program, it was aimed to increase the development of the infant increase the maternal -infant attachment, and the self-efficacy and at the same time to ensure healthy output of the transitioning mother (Barimani et al. 2017). Important matters regarding transition to motherhood are the health and psychosocial development of children and the way parents support their parent roles and improve their skills and strengths (Barimani et al. 2017).

Prenatal and postnatal the health promotion program, family health centre was held in the education room. At education, mothers were given an educational booklet to reinforce what was learned. Questions about individual needs were answered. Mothers were advised to read the educational booklet. In the program, the first education session was held face to face during the 36 week of gestation (about 90 minutes) and in the first week postpartum (consolidate-about 15 minutes). The second education session (about 30 minutes) was held at the end of the first month and the third education session (about 30 minutes) at the end of the second month. A follow-up phone call (approximately 10 minutes), which was the fourth session after face-to-face sessions, was held at the end of the fourth month. An outlined education and phone call protocol was strictly followed and the same paediatric nurse delivered all follow-up to ensure standardisation.

Outcome measures

Outcomes were measured at three time points: Baseline (36 gestational age- FIF and PAI), at 8 weeks postpartum (Denver II Test, MAI, PSES), and at 24 weeks postpartum (Denver II Test, MAI, PSES). Figure 1 shows Trial CONSORT flow diagram.

Family Information Form (FIF)

Family Information Form, from the socio-demographic characteristics of pregnant women; age, education, employment status, income status. Obstetric; maternal preparatory education, presence of a model on maternity, important life events before, birth style and parity.

Prenatal Attachment Inventory (PAI)

Developed by Muller in 1993, each item is a four-point Likert type 21 item scale, scored between 1 and 4. The lowest 21 points and the highest 84 points are obtained from the scale (Muller 1993). Increasing the scale score indicates that the level of attachment has increased. The Turkish validity and reliability study of the scale was performed by Yı lmaz and Beji (2013). Cronbach alpha reliability value of the scale is 0.84 (Yı lmazand Beji 2013).

Maternal Attachment Inventory (MAI)

The scale is a 26-item self-report measure, designed to assess maternal attachment in the postpartum period (Muller 1994). It is a 4-point Likert type and the lowest 26 points and the highest 104 points can be obtained from the scale. A high score on the scale indicates that maternal attachment is high. The Turkish validity and reliability study of the scale was performed by Kavlak and Sirin (2009). The internal consistency Cronbach alpha value of the scale is 0.77–0.82 (Kavlak and Sirin 2009).

Parenting Self-Efficacy Scale (PSES)

The scale, which was developed by Kı lı çaslan and Işmen Gazioğlu in 2008, consists of a 5-point Likert type, 18 items. The lowest score is 18, the highest is 90. The internal consistency Cronbach alpha value of the scale is 0.85 (Kı lı carslan Celikkol and Ismen Gazioglu 2008).

Denver II Developmental Screening Test

It is an international development screening test used to evaluate and monitor the development of children aged 0–6. It is a test consisting of four parts, including the gross and fine motor, cognitive and language, and personal/social, and 134 items. According to the test results, the child is classified as normal or delayed. Turkey was made by standardisation and Yalaz heart Anlar (Yalaz et al. 2009).

Data collection

Data were collected from after obtaining Research Ethics Committee approval. The researcher shortlisted pregnant women potentially meeting the eligibility criteria based on the family health centre records. Then the women were invited to the family health centre and briefed on the research process. When the women agreed and gave the consent for participation, they were asked to complete questionnaires (FIF, PAI). During the routine follow-up of infant in family health centre, intermediate and final measurements were made. Interim measurements were made to mothers and their infant at the 2nd month postpartum. Nurses applied the MAI and PSES scales and the researcher Denver II test. Last measurements were made by nurses MAI and PSES at the 6th month. The researcher performed the Denver II test at 6 months.

Ethical considerations

The present study received official approval from the Research Ethics Committee (IRB Ref No: 2018/013). Written permission was obtained from the relevant family health centre where the research was carried out (IRB Ref No: 94723667-806.01.03). Written informed consent was obtained after verbally agreed to participate in the study. All participants were assured that participation in the study was voluntary and that they could choose to withdraw from the study at anytime without any negative consequences.

Statistical analysis

Statistical analyses were performed, using the statistical package for the social sciences (SPSS Version 22). In all analyses, *p*-value less than .05 was considered statistically significant. For the comparison of descriptive characteristics of both groups in the study, Pearson chi-square test and Chi-Square Test with Yates Correction were used for categorical variables, and *t*-test was used for numerical variables. In testing hypothesis, independent t test, Yates corrected chi-square test and Mcnemar test were used in independent groups. Effect sizes were calculated, and Cohen's *d* formula was used in this calculation. In calculating the effect sizes; The difference between groups is determined by using Cohen's *d* and the strength of a relationship Cramer's V statistics. Cohen defines effect size as small at $d \leq 0.20$, medium at $0.20 < d < 0.80$, and large at $d \geq 0.80$. Cohen defines effect size as small at Cramer's $V \leq 0.10$, medium at 0.30 $20 < V < 0.50$, and large at $V \geq 0.50$ (Cohen 1988).

Validity and reliability

In this study, the valid and reliable instruments were used to collect data. All contents used in the intervention were prepared by professionals and expert opinion was obtained. In the content validity index analysis, a conformity was found between the opinions of the experts ($p > .05$). Participants were randomly assigned to control and intervention groups and all the participants had an equal chance of receiving intervention. An intervention protocol was used to standardise the intervention.

Results

Comparison of socio-demographic and obstetric characteristics between groups

Comparisons between the socio-demographic and obstetric characteristics of the pregnants indicated that there was no statistically significant difference between the intervention and control groups ($p > .05$). The prenatal attachment level was significantly lower in the intervention group compared to the control group ($p = .002$) (Table 1).

Comparison of maternal attachment score and parenting Self-Efficacy scores

Compared with the mothers in the control group, it was determined that the mothers in the intervention group had a high maternal attachment level in the second and sixth months, the difference between the groups was significant ($p < .001$), and the effect size was high (respectively, d: 1.80, [CI: 1.221–2.383]; d: 1.20, [CI: 0.671–1.736]). Compared with the mothers in the control group, it was found that the mothers in the intervention group had high parental self-efficacy level in the second and sixth months, the difference between the groups was significant ($p < .001$) and the effect size was high (respectively, *d*:1.88 [CI: 1.290–2.467]; *d*:1.37 [CI: 0.835–1.925]) (Table 2).

Comparison of the Denver II developmental screening test results

In the comparison between the groups, there was no difference between the development level (developmental delays) of infants in the intervention and control groups in the second month measurement of Denver II test ($p > .05$), while there was a significant difference in the sixth month ($p = .003$) and had a medium effect size (V: 0.41) (Table 3).

Discussion

The focus of the health promotion program is to facilitate transitions throughout life. Therefore, the health promotion program intervention aims to facilitate the transition experience of women transitioning to motherhood and to control possible transition to motherhood factors. In this study, the effectiveness of nursing interventions on maternal attachment, parental self-efficacy and development of infants was evaluated within the scope of the health promotion program starting from 36 week of gestation until the sixth month postpartum. It was observed that the maternal attachment, parental self-efficacy and development levels in infants increased in the intervention group. In the study, prenatal attachment scale was applied to the groups before the intervention and the scale score of the pregnant women in the control group was found to be high. However, the level of attachment of the intervention group was higher in the second and sixth months compared to the control group after the intervention. It has been observed that nursing interventions, which are performed as follow-up to strengthen attachment, significantly increase maternal attachment and the effect size is high. The reason for the high effect in the study may be that the program starts in pregnancy and continues until the sixth month postpartum. Similarly, randomised controlled studies have found that nursing interventions that start during pregnancy (Akbarzadeh et al. 2016; Shorey et al. 2019) or postpartum increase the level of maternal attachment (Cinar and Ozturk 2014; Ozturk and Erci 2016). The result obtained in the study is similar to the results of many randomised controlled trials. On the other hand, some studies have found that educational programs do not affect postpartum maternal attachment (Salehi et al. 2017; Guney and Ucar 2019).

Meleis stated that mothers need knowledge, skills and energy to fulfil their new responsibilities (Meleis 2010). Accordingly, mothers should be supported with appropriate nursing interventions to increase parenting self-efficacy (Ngai et al. 2010; Amin et al. 2018; Hohlfeld et al. 2018; Botha et al. 2020) levels and facilitate their transition to motherhood. Parental self-efficacy level of the intervention group was found to be higher in the second and sixth months compared to the control group. It was observed that the health promotion program significantly increased parental self-efficacy and had a high effect size. According to the results of a similar study, it has been found that education programs contribute significantly to the self-efficacy of the parents (Ngai et al. 2010; Amin et al. 2018; Hohlfeld et al. 2018). In the study, it is considered that it is important that mothers in the intervention group have higher parental self-efficacy levels and that their mothers' training needs related to breastfeeding, infant care, infant development, common problems and infant safety are met. In addition, long follow-up time may have significantly affected parental self-efficacy. In the application of the health promotion program, mothers were not only trained, but the educational content was shown before the birth with appropriate models and educational materials, and it was checked by applying it to the mother in the postpartum period. Self-efficacy is affected by personal and social persuasion and approval. With the feedback received from the mother in the postpartum period, the positive practices of the mothers were approved, thus contributing to their self-efficacy levels.

There is a positive relationship between higher parental self-efficacy and knowledge of infant development (Hess et al. 2004). Also, according to a systematic review, maternal foetal attachment is an important predictor of the developmental outcomes of infants. And interventions to strengthen maternal foetal attachment affect baby development positively (Branjerdporn et al. 2017). In the study, the rate of infant with delay in development in the intervention group in the second month postpartum was found to be lower than the control group, but not significant. In the sixth month, when compared to the control group, the rate of infant with developmental delay was significantly lower in the intervention group. According to the results of the screening, on the developmental levels of the infants in the intervention and control groups it was a small effect in the second month and medium effect in the sixth month. The intervention was found to reduce developmental delays in

Table 1. Comparison of some baseline characteristics between groups ($n = 64$).

Characteristics	IG ($n = 32$) % (n)	CG ($n = 32$) % (n)	Test	p-Value
Age (year)				
Mean (SD)	28.7 (5.2)	28.0 (4.5)	0.620	0.538[a]
Range	18-39	20-38		
Educational status				
Primary/ secondary school	62.5 (20)	59.4 (19)	0.000	1.000[b]
High school/university	37.5 (12)	40.6 (13)		
Employment status				
Working	12.5 (4)	18.8 (6)	0.119	.731[c]
Not-working	87.5 (28)	81.3 (26)		
Family income				
Low	28.1 (9)	12.5 (4)	3.679	.159[c]
Middle	59.4 (19)	81.3 (26)		
High	12.5 (4)	6.3 (2)		
Parity				
Primipara	18.8 (6)	25.0 (8)	0.091	0.762[b]
Multipara	81.3 (26)	75.0 (24)		
Type of delivery				
Normal	71.9 (23)	68.8 (22)	0.000	1.000[b]
Cesarean	28.1 (9)	31.2 (10)		
Preparatory education for motherhood				
Yes	9.4 (3)	15.6 (5)	0.178	.708[c]
No	90.6 (29)	84.4 (27)		
Exemplary presence in maternity				
Exist	46.9 (15)	53.1 (17)	0.063	.803[b]
Absent	53.1 (17)	46.9 (15)		
The most important event experienced				
Motherhood	78.1 (25)	78.1 (25)	1.167	.558[c]
Get married	9.4 (3)	15.6 (5)		
Other	12.5 (4)	6.3 (2)		
PAI				
Mean (SD)	54.31 (5.87)	61.16 (10.26)	3.276	.002[a]

SD: standard deviation; PAI: Prenatal Attachment Inventory; IG: intervention group; CG: control group.
[a]Student t-test; [b]Pearson chi-square test; [c]Chi-Squared Test with Yates Continuity Correction.

Table 2. Comparison of maternal attachment and parenting self-efficacy scores between groups ($n = 64$).

Outcome	IG Mean (SD)	CG Mean (SD)	t	Effect size (95% CI)	p-Value
MAI					
2. Month	102.22 (2.51)	90.31 (9.00)	7.206	1.80 (1.221 to 2.383)	<.001
6. Month	103.16 (1.42)	98.25 (5.59)	4.814	1.20 (0.671 to 1.736)	<.001
PSES					
2. Month	86.66 (3.76)	76.81 (6.39)	7.511	1.88 (1.290 to 2.467)	<.001
6. Month	88.41 (2.41)	83.03 (4.99)	5.491	1.37 (0.835 to 1.925)	<.001

MAI: Maternal Attachment Inventory; PSES: Parenting Self-Efficacy Scale; IG: intervention group; CG: control group; t: Independent samples t-test; SD: standard deviation; CL: confidence interval.

Table 3. Comparison of Denver II Developmental Screening Test results between groups over time ($n = 64$).

Outcome	IG n (%)	CG n (%)	χ^2	p-Value	Cramer's V
Developmental Screening Test					
2. Month					
Normal	23 (71.9)	17 (53.1)	1.667	.197	0.19
Probable delay	9 (28.1)	15 (46.9)			
6. Month					
Normal	30 (93.8)	19 (59.4)	8.707	.003	0.41
Probable delay	2 (6.2)	13 (40.6)			
McNemar's p	*0.039*	*0.815*			

χ^2: Chi-squared Test with Yates Continuity Correction; Cramer's V: effect size for chi-square test.

the second and sixth months. It is seen in the literature that the rate of children with developmental delay is quite high (Celikkiran et al. 2015; Coelho et al. 2016; Kahraman et al. 2016). In infants at risk of developmental retardation, the level of exposure is reduced by early diagnosis and early intervention (Kahraman et al. 2016). A randomised controlled study found that nursing interventions had a small but significant effect on infant development (Norr et al. 2003). Pregnancy, birth and postpartum period; It provides unique opportunities to develop protective and empowering practices for infants' development, to acquire and develop necessary skills. Study results show that initiatives that support development are important.

Interventions starting from pregnancy and continuing in the postpartum period are necessary for transition to healthy motherhood. One of the most important indicators of a healthy transition to motherhood is having a healthy and high developmental infant. According to the results of the study, infant health and development can be optimised with appropriate nursing interventions to be presented to the parents in the prenatal and postpartum periods. Thus, mothers are provided with a healthy transition.

Limitations

This study was performed only in a family health centre in Konya Karatay, so the sample does not represent all pregnant women/mothers in the region. Lack of researcher and participant blindness, implementation of Denver II test by the researcher, termination of the study at the sixth month postpartum are the limitations of the research.

Conclusion

The study demonstrated the effectiveness of the prenatal and postnatal health promotion program in improving maternal attachment and parental self-efficacy and reducing postnatal developmental delays of infant. Nurses and midwives can focus on providing all types of functional support to promote maternal and infant well-being. The intervention used in this study revealed high effect sizes on the outcome. In this context, it is thought that it can be used in primary health care. Future studies could focus on the effects of this program on increasing implementation time.

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