

Effectiveness of a prenatal education programme on breastfeeding outcomes in Taiwan

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Aims. The objectives of this study were to design a structured prenatal education programme on breastfeeding and to evaluate the effectiveness of the programme. Indicators of effectiveness were selected based on Kirkpatrick's Training Evaluation Model, including satisfaction with the programme, breastfeeding knowledge, breastfeeding attitude, breastfeeding satisfaction, breastfeeding problems and rate of exclusive breastfeeding.

Methods. This study applied a quasi-experimental design. The experimental group included 46 women who received a 90-minute group educational programme on breastfeeding during their 20th–36th week of pregnancy. Each experimental subject was matched by a control subject according to age, educational level, work status and pregnancy gestational age. Control subjects did not receive any intervention. Data were collected through self-administered questionnaires at preintervention, postintervention, three days postpartum and one month postpartum.

Results. Satisfaction with the programme was high. The experimental group had higher scores in breastfeeding knowledge and breastfeeding attitude at three days postpartum. The experimental group showed higher breastfeeding satisfaction at three days and one month postpartum. There were no significant differences in experiencing breastfeeding problems. The rate of exclusive breastfeeding was higher for the experimental group at three days and one month postpartum, but the differences were not statistically significant.

Conclusion. This study demonstrated the effectiveness of a prenatal education programme on maternal knowledge, attitude and satisfaction toward breastfeeding.

Relevance to clinical practice. Other hospitals could apply this model to plan and evaluate their prenatal education programme on breastfeeding.

Key words: breastfeeding, evaluation research, midwifery, nurses, nursing, patient education

Introduction

Comparing the 1960s with the 1980s, there has been a significant decline in the prevalence of breastfeeding in Taiwan. Previous surveys in Taiwan have shown a drop in the breastfeeding initiation rate from 94.5% in 1960 to 30.8% in 1989 (exclusive breastfeeding: 5.8%, partial breastfeeding: 25.0%; Chen & Chi 2000). Since 1992, the central government has launched national programmes to promote breastfeeding in Taiwan. A national survey in 2003 found that the prevalence of exclusive and partial breastfeeding (to any degree) was 17.9% and 47.0% during the hospital stay, 22.3% and 48.4% at one month and 16.7% and 17.4% at three months, respectively (Chien *et al.* 2005). These results demonstrate the need to improve breastfeeding in Taiwan further, especially for increasing exclusive breastfeeding and duration of breastfeeding.

In modern society, breastfeeding is no longer an automatic action and is viewed as something that needs to be acquired through learning (Zwelling 1996). Ho and Holroyd (2002) reported that mothers' knowledge and skills affected their confidence in breastfeeding. Prenatal education, providing appropriate knowledge and skills, increased mothers' confidence and enhanced positive attitudes about breastfeeding and increased the rate of breastfeeding (Chan-Yip & Kramer 1983, Di 2001, Chezem *et al.* 2003). A national survey in Taiwan found that mothers who attended prenatal breastfeeding classes had a higher rate of breastfeeding at one month after delivery, while only 9.8% of women ever participated in such classes (Chu *et al.* 2005). A study including 35 hospitals in Northern Taiwan reported wide variations in course content, class length and number of participants among these hospital-based prenatal education programmes. Some prenatal programmes included fewer than 20 minutes of lecture, did not include skill training, some were individual-based and some had more than 100 participants (Feng *et al.* 1999). Although many hospitals provided prenatal educational programmes, few programmes had comprehensive evaluation data available.

The objectives of this study were to design a structured prenatal education programme on breastfeeding and to

evaluate the effectiveness of the programme based on Kirkpatrick's Training Evaluation Model (Kirkpatrick 1987). According to the Model, four levels of evaluation were applied, including reaction, learning, behaviour and results. The indicators of programme effectiveness were categorized by the four levels. They were satisfied with the programme (reaction), knowledge and attitude toward breastfeeding (learning), breastfeeding problems and satisfaction with breastfeeding (behaviour) and rate of exclusive breastfeeding (results). In future, other hospitals could apply this method as a model to plan and evaluate their prenatal education programme on breastfeeding.

Methods

Study participants

This study applied a quasi-experimental design. Participants were recruited from a prenatal clinic of a medical centre in Taipei City. Women who were between 20–36 weeks of pregnancy, over 20 years of age, first-time mothers, currently married, without pregnancy complications and who intended to breastfeed were asked to attend a 90-minute educational programme on breastfeeding. The experimental group was composed of those women who attended the educational programme. Each experimental woman was matched by a control subject based on their age group (20–26, 27–33 and ≥ 34 years of age), educational level (high school and below, vocational school, university or above), work status (full-time job, part-time job or none) and pregnancy gestational age (four-week intervals). The control group was selected from those women who did not attend the educational programme. The control group received the usual prenatal care and the experimental group received usual prenatal care and the educational programme on breastfeeding. Written informed consent was obtained from all the participants. This study was approved by the institutional review board at Taipei Veterans General Hospital. Data were collected from April to July, 2003. The resultant samples included 46 women in the experimental and control groups each.

The educational programme

After extensive review of the literature, a structured educational programme on breastfeeding was designed. The programme duration was 90 minutes, including 50 minutes for lecture and skill training, 20 minutes for group discussion and skill practicum and the last 20 minutes for a tour of the postpartum ward. During the site visit, breastfeeding practices at the postpartum ward (e.g. rooming-in, early feeding and others) were introduced and several women who were successful in breastfeeding shared their experience, having given their permission in advance. The programme aimed at providing correct knowledge and skills of breastfeeding. Three aspects of breastfeeding education: knowledge, affective and skill aspects were considered. Programme contents for the knowledge aspect included benefits and importance of breastfeeding, mechanism of lactation, ways to maintain quality and quantity of milk secretion, ways to tell whether the infant was getting enough, nutrition intake for breastfeeding mothers, management of breast-milk leaking and how to combine work and breastfeeding. Programme contents for the affective aspect included motivation enhancement for breastfeeding, dangers associated with bottle use and formula feeding and common misconceptions about breastfeeding. Programme contents for the skill aspect included demonstration of correct position and effective sucking for breastfeeding. During the group discussion, frequently encountered problems and solutions were discussed.

The instruction used a Power Point presentation, a model breast and baby dolls. The programme instructor was an experienced obstetric nurse, who received 12 hours of training on breastfeeding for health professionals provided by the Bureau of Health of Taipei City. The contents of the programme were reviewed and modified by three experts, including a nurse educator, a head nurse of a postpartum ward and an obstetrician. The instructor rehearsed teaching the programme in front of colleagues three times. It was planned to recruit 11–15 persons in a session. Four sessions were given by the same instructor to recruit enough experimental subjects.

Applying Kirkpatrick's training evaluation model

This study applied Kirkpatrick's Training Evaluation Model to design the programme evaluation. Training Evaluation Model was first developed by Kirkpatrick in the 1960s and this evaluation model is still widely used (Kirkpatrick 1987, Curran & Fleet 2005). The model proposed four levels of evaluation: reaction, learning, behaviour and result. Level one is reaction, which refers to learners' responses to contents

of the course. Level two is learning, which refers to learners' understanding of the course content. Level three is behaviour, which refers to learners' change in behaviour after completing the course. Level four is results, which refers to the outcomes of behaviour change corresponding to the purpose of the programme. Based on this evaluation model, indicators of programme effectiveness selected for this study were satisfaction toward the programme (reaction), knowledge and attitude with breastfeeding (learning), breastfeeding problems and satisfaction with breastfeeding (behaviour) and rate of exclusive breastfeeding (results).

Data collection

At the time of recruitment, all participants answered background variables including age, pregnancy gestational age, educational level and work status. Neonatal information including infant birth weight, method of delivery, birth gestational age and infant gender were obtained from charts after delivery. Just before the educational programme started, women in the experimental group answered questionnaires on breastfeeding knowledge and breastfeeding attitudes. Immediately after the completion of the educational programme, women in the experimental group answered questionnaires on breastfeeding knowledge and attitude as well as satisfaction with the programme. Women in the control group answered questionnaires on breastfeeding knowledge and breastfeeding attitudes at the time of recruitment. Both groups of women answered questionnaires on breastfeeding status, breastfeeding problems, breastfeeding knowledge, breastfeeding attitude and satisfaction with breastfeeding at three days after delivery. At one month postpartum, both groups of women answered questionnaires on breastfeeding status, breastfeeding problems and satisfaction with breastfeeding.

Scales that measured breastfeeding knowledge were modified from the Breastfeeding Knowledge Scale (Gau 2004). The original scale demonstrated acceptable internal consistency in previous studies (Cronbach's alpha ranged from 0.75–0.78) (Gau 2004). To cover the contents of the educational programme, five knowledge-related questions were deleted and three skill-related questions were added. Five experts reviewed and rated the modified questionnaire. The ratings were based on a four-point Likert scale from 'very inappropriate' to 'very appropriate'. The content validity index as determined by the number of items that were rated as 'appropriate' and 'very appropriate' by total number of items was 0.95. The modified Breastfeeding Knowledge Scale included 28 items with dichotomous responses. Scores ranged from 0–28, with higher scores indicating better knowledge

and skills about breastfeeding. In this study, the Cronbach's alpha of the modified scale ranged from 0.70–0.85 at different time points.

Breastfeeding attitude was measured according to the Breastfeeding Attitude Scale (Huang *et al.* 2000). The construct validity of the scale was demonstrated by factor analysis. Internal consistency as assessed by Cronbach's alpha was 0.88 (Huang *et al.* 2000). For the purpose of this study, we omitted two items because these items repeated information contained in the Breastfeeding Knowledge Scale. The modified scale included 25 items with a four-point Likert scale. Scores ranged from 25–100, with higher scores indicating better attitudes. In this study, the Cronbach's alpha of the modified scale ranged from 0.89–0.92 at different time points.

Satisfaction with the educational programme was measured by a seven-item scale designed specifically for this study (Table 1). This scale applied a seven-point Likert scale from 1–7. Scores ranged from 7–49, with higher scores indicating greater satisfaction. The Cronbach's alpha was 0.85 in this study.

Breastfeeding problems were measured by the 18-item Breastfeeding Problem Scale (Wambach 1998). The construct validity of the scale was demonstrated by factor analysis. Internal consistency as assessed by Cronbach's alpha was 0.82 (Wambach 1998). This scale applied a five-point Likert scale from 0–4. Scores ranged from 0–72, with higher scores indicating more problems. In this study, the Cronbach's alpha was 0.85 and 0.83 at three days and one month postpartum respectively.

Satisfaction with breastfeeding was measured by the 30-item Maternal Breastfeeding Evaluation Scale (Leff *et al.* 1994, Tsai *et al.* 2000). The construct validity of the scale was demonstrated by factor analysis. Internal consistency as assessed by Cronbach's alpha was 0.85 (Tsai *et al.* 2000). This scale applied a five-point Likert scale from 1–5. Scores ranged from 30–150, with higher scores indicating higher satisfaction. In this study, the Cronbach's alpha was 0.85 and 0.86 at three days and three months postpartum, respectively.

Table 1 Satisfaction toward the programme ($n = 46$)

Items	Mean	SD
Knowledge gained from the course	6.50	0.75
Actual help from the course	6.39	0.74
Course contents	6.18	0.87
Use of teaching appliances	6.17	0.80
Instructor's teaching style	6.03	0.85
Time arrangement	6.00	0.90
Duration of the class	5.90	0.81

Data analysis

Individual variables were described by percentages, means and standard deviations (SD). Differences in background characteristics between the two groups were examined by Student's *t*-test and the chi-squared test. Differences in breastfeeding knowledge, breastfeeding attitudes, satisfaction toward breastfeeding and breastfeeding problems between groups were examined by Student's *t*-test. For breastfeeding knowledge and breastfeeding attitudes, as the time points of pretest and three days after delivery were considered, to take into account the pretest differences, linear regression using generalized estimating equations was performed. The chi-squared test was used to examine the differences in rates of exclusive breastfeeding between groups. Statistical analyses were performed using the Statistical Product and Service Solutions for Windows (SPSS) 12.0 software package (SPSS Inc., Chicago, IL, USA), except for linear regression, which used generalized estimating equations and was performed using SAS 8.0 software (SAS Co., Cary, NC, USA).

Results

Characteristics of the study participants

The mean ages of the study participants were 31.17 (SD 4.0) years for the experimental group and 31.20 (SD 3.8) years for the control group ($p = 0.97$). Because of the matching, the distributions of age, educational level and work status were similar for both groups. More than 65% of the women (65.2%) were 27–34 years of age, while another 21.7% were ≥ 35 years of age and 13.1% were 20–26 years of age. Most of the women (80.4%) had an educational level of vocational school or university, followed by those with high school or less (13.1%) and those with postgraduate degree (6.5%). Three-quarters of the study participants worked full time. Mean birth gestational age was 38.5 (SD 1.43) weeks for the experimental group and 38.8 (SD 1.47) weeks for the control group ($p = 0.14$). There were no significant differences between the two groups in infant gender, method of delivery or infant birth weight.

Satisfaction with the programme

Mean scores for items of satisfaction toward the programme are presented in Table 1 (mean scores were ordered from high to low). All items had a mean score of higher than 6, except for the time length of the class.

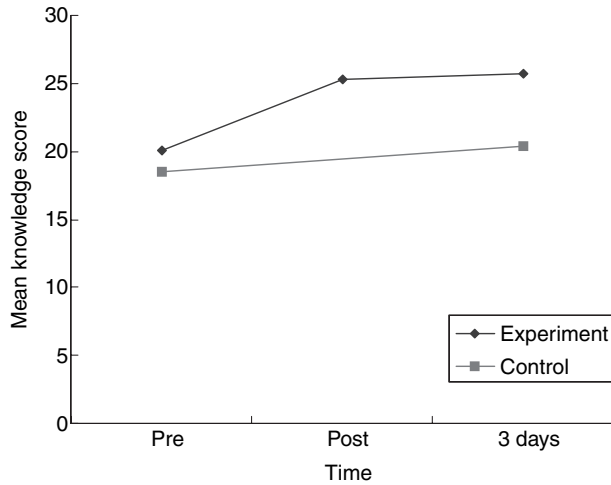


Figure 1 Group (experiment and control) by time (preintervention, postintervention and three days postpartum) effect for women's knowledge toward breastfeeding scores.

Breastfeeding knowledge

There were no significant differences between the two groups in mean knowledge scores at pretest (mean scores were 20.10 for the experimental group and 18.47 for the control group, $t = 0.99$, $p = 0.32$). At three days postpartum, women in the experimental group had significantly higher mean scores (mean scores were 25.73 for the experimental group and 20.34 for the control group, $t = 9.61$, $p = 0.001$; Fig. 1). The regression coefficients using generalized estimating equations were 2.38 (SE 0.78; $p = 0.002$) for group, 0.95 (SE 0.20, $p < 0.001$) for time and 2.34 (SE 0.38, $p < 0.001$) for group \times time.

Breastfeeding attitudes

There were no significant differences between the two groups in mean attitude scores at pretest (mean scores were 74.04 for the experimental group and 70.96 for the control group, $t = 1.74$, $p = 0.08$). At three days postpartum, women in the experimental group had significantly higher attitude scores (mean scores were 80.21 for the experimental group and 75.65 for the control group, $t = 2.69$, $p = 0.008$; Fig. 2). The regression coefficients using generalized estimating equations were 1.80 (SE 1.67; $p = 0.28$) for group, 2.35 (SE 0.51, $p < 0.001$) for time and 1.79 (SE 0.67, $p = 0.008$) for group \times time.

Breastfeeding problems

There were no significant differences in mean scores of breastfeeding problems between the experimental and control

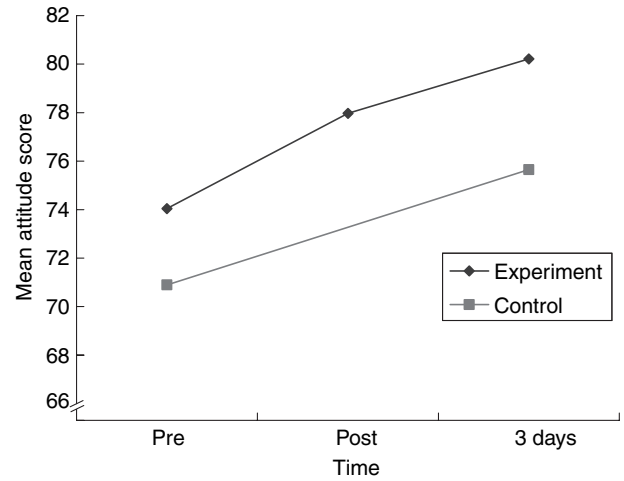


Figure 2 Group (experiment and control) by time (preintervention, postintervention and three days postpartum) effect for women's attitude toward breastfeeding scores.

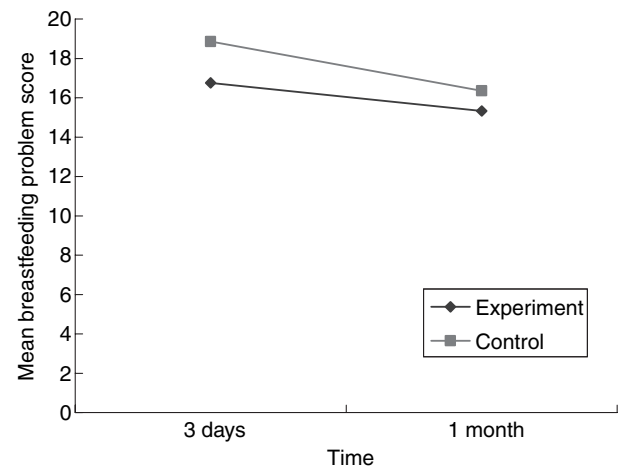


Figure 3 Group (experiment and control) by time (three days postpartum and one month postpartum) effect for women's breastfeeding problem scores.

groups at three days postpartum (16.76 vs. 18.84, $t = -1.13$, $p = 0.26$) and at one month after delivery (15.32 vs. 16.35, $t = -0.54$, $p = 0.59$; Fig. 3).

Satisfaction with breastfeeding

There were significant differences in mean scores of satisfaction with breastfeeding between the experimental and control groups at three days postpartum (122.65 vs. 115.06, $t = 2.79$, $p = 0.006$) and at one month after delivery (115.80 vs. 107.67, $t = 3.10$, $p = 0.003$; Fig. 4).

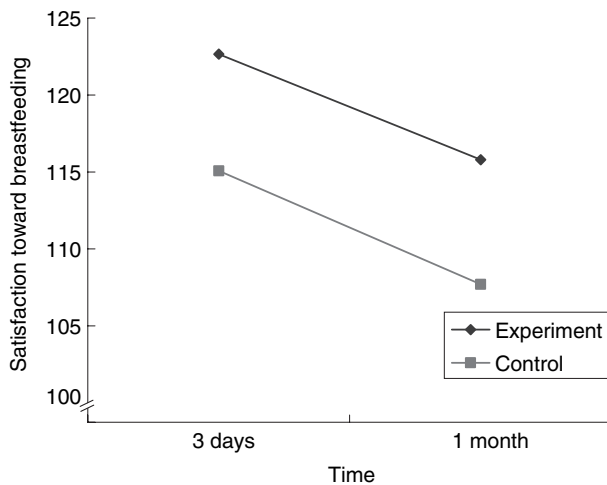


Figure 4 Group (experiment and control) by time (three days postpartum and one month postpartum) effect for women's satisfaction toward breastfeeding.

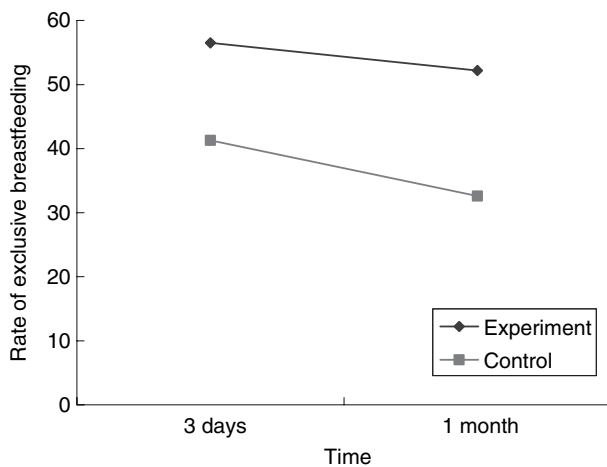


Figure 5 Group (experiment and control) by time (three days postpartum and one month postpartum) effect for women's rate of exclusive breastfeeding.

Rate of exclusive breastfeeding

The rate of exclusive breastfeeding was higher for the experimental group at three days (56.5% vs. 41.3%, $\chi^2 = 2.13$, $df = 1$, $p = 0.14$) and one month postpartum (52.2% vs. 32.6%, $\chi^2 = 3.60$, $df = 1$, $p = 0.06$; Fig. 5). But the differences only reached borderline significance at one month postpartum.

Discussion

This quasi-experimental study showed that a structured prenatal breastfeeding educational programme given during

the 20th–36th weeks of pregnancy was effective in increasing participants' breastfeeding knowledge and attitude at three days after delivery when compared with controls. Immediately after completion of the programme, knowledge and attitude scores improved for the experimental group, suggesting that the higher knowledge and attitude scores postpartum compared with the control group were due to the educational programme. As breastfeeding problems, satisfaction with breastfeeding and rate of breastfeeding could only be measured after the mothers actually experienced breastfeeding, there were no preintervention measures of these outcomes. Because the two groups did not differ significantly in baseline characteristics as well as in preintervention knowledge and attitude scores, we can be more certain that the differences between the experimental and control groups after delivery were due to the educational programme. Satisfaction with breastfeeding was significantly higher in the experimental group at both three days and one month postpartum suggesting the effectiveness of the programme in this aspect. The programme did not show a significant effect for breastfeeding problems, although women in the experimental group showed lower scores of breastfeeding problems at three days and one month after delivery, the differences between the two groups were not statistically significant. We selected the rate of exclusive breastfeeding as one of the outcome measures because the intention to breastfeed at recruitment was one of the inclusion criteria for the study participants. Additionally, the study hospital was a teaching hospital and was devoted to breastfeeding. Therefore, women who delivered at this hospital had a very high rate of breastfeeding initiation. In our samples, the rate of breastfeeding initiation was 100% at three days after delivery. Although the experimental group demonstrated higher rates of exclusive breastfeeding at both three days and one month after delivery, yet the differences only reached borderline significance at one month postpartum. This could be due to the limited sample size of this study. In addition, the limited duration of follow-up could be another reason.

Previous studies suggested that large class sizes and the didactic model of teaching inhibited learning in prenatal classes (Ho & Holroyd 2002). Breastfeeding support and skill reinforcement were emphasized in previous programmes (Sciaccia *et al.* 1995, Pugin *et al.* 1996, Duffy *et al.* 1997). Thus, this programme was designed to incorporate these components. Group teaching was limited to 11–15 women at a time. The bidirectional teaching style was applied, especially in skill practices and discussion sessions. New mothers who had successful breastfeeding experiences shared their experiences during the study group's visits to the postpartum ward. These efforts were reflected in the high overall

satisfaction with the educational programme among the experimental groups. The only item that had a mean score of less than six was 'duration of the programme.' After speaking with the participants, they felt that the final group discussion of 20 minutes was not enough to allow them to answer all their questions. Future programmes should consider a longer period of time for discussion or a separate session for questions.

The educational programme did not show an effect on breastfeeding problems. This suggests that increased knowledge from prenatal education is not enough to prevent problems arising from breastfeeding. Nonetheless, breastfeeding problems decreased between three days and one month after delivery (Fig. 3). Thus, lactation consultation for new mothers is important, especially during the first few days after delivery. Future programmes could incorporate the component of consultation after delivery with prenatal education to help mothers conquer breastfeeding problems and increase the duration of breastfeeding.

Few hospital-based prenatal educational programmes have examined their effectiveness systematically. We applied Kirkpatrick's Training Evaluation Model and selected indicators of programme effectiveness for all four levels (reaction, learning, behaviour and results). According to the American Society for Training and Development, 95% of nursing instruction provider evaluated clients' satisfaction toward a programme, 20% evaluated level of knowledge about the course contents and only 9% evaluated the impact of the training (McMurrer *et al.* 2000). Previous intervention studies on breastfeeding mostly focused on knowledge and rate of breastfeeding. Few studies applied an evaluative model that included a comprehensive set of indicators for evaluation of an educational programme. We found that, by applying an evaluative model, the evaluation was more complete and helped us gain insight into the effectiveness of the programme. For example, because of the high satisfaction with the educational programme (reaction), we were more confident that changes in other levels of indicators (such as knowledge of breastfeeding and satisfaction toward breastfeeding) were due to the programme.

Compared with other developed countries, the percentage of women receiving prenatal education in Taiwan was low. As most women in Taiwan deliver at hospitals, hospital-based prenatal breastfeeding education has the potential to access almost all pregnant women. The educational programme, as demonstrated by this study, was effective and at low cost. Thus, more efforts should be directed toward understanding why women do not attend prenatal breastfeeding classes and to attract more women to participate in prenatal educations.

Study limitations

This study is limited by a lack of random assignment of experimental and control group status. There was no concealment of group status. Additionally, the control group did not receive a placebo-like intervention. However, matching was applied to ensure the comparability between the two groups. Also the instructor did not personally involve in the data collection. Women were assured of confidentiality and encouraged to be honest in answering questions. However, biases may result from lack of randomization and placebo-like intervention. Randomized controlled trials are still needed to further establish the effectiveness of the programme. The study participants were from one medical centre, thus the generalizability to the population at large is a concern. Compared with the Taiwanese national data of women at reproductive age, our study participants appeared to be older and had a higher educational level.

Conclusion

A structured prenatal group educational programme on breastfeeding is effective in increasing participants' knowledge, attitude and satisfaction toward breastfeeding. But the programme was not effective for preventing breastfeeding problems. The programme effect on rate of exclusive breastfeeding was possible but needs to be confirmed by studies with a larger sample size and/or a longer period of follow-up.

Practice implications

This study evaluated a structured prenatal breastfeeding education programme using Kirkpatrick's Training Evaluation Model. This study could serve as a model for other hospitals to plan and evaluate their prenatal programmes.

Contributions

Study design: SSL, LYC; data analysis: SSL, LYC and manuscript preparation: SSL, LYC, CJT, CFL.

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