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ORIGINAL ARTICLE

Changes in knowledge, attitude and involvement of fathers in supporting exclusive breastfeeding: a community-based intervention study in a rural area of Vietnam

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Abstract
Objectives To test the hypotheses of positive changes of fathers' knowledge, attitude and involvement in supporting exclusive breastfeeding (EBF) after receiving breastfeeding education materials and counseling services.
Methods A quasi-experimental, pre-test–post-test, non-equivalent control group design was used. At baseline, 251 and 241 pregnant women and their husbands were enrolled into the intervention and control groups, respectively. The 1-year intervention targeting fathers included mass media, game show-style community events, group and individual counseling at health facilities and home visits.
Results Compared to fathers in the control group, fathers in the intervention group had higher BF knowledge scores and higher attitude scores reflecting more positive attitudes toward early initiation of BF and 6 months EBF. Fathers in the intervention group were also more likely to report active involvement in supporting mothers to practice EBF during antenatal and postpartum periods.
Conclusions The community-based education model should be maintained and considered for conducting further test in wider application to mobilize fathers in supporting EBF.

Keywords Fathers · Knowledge · Attitude and practice · Breastfeeding promotion

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Introduction

The primary reasons underlying difficulties in increasing the prevalence of breastfeeding, especially exclusive breastfeeding (EBF) within the first 6 months, have been confirmed in a number of studies including cultural and religious barriers (Glover et al. 2009), family pressure and mistaken views held by mothers with regard to infant nutrition (Almroth et al. 2008).

Breastfeeding (BF) is very well acknowledged for short- and long term health benefits. Breastfed infants grow better, experience less sickness and have better survival rates than infants who are not properly breastfed or who are not breastfed at all. Studies from developing countries show that infants who are not breastfed are six to ten times (Bahl et al. 2005) more likely to die in the first few months of life than breastfed infants. Diarrhea (De Zoysa et al. 1991) and pneumonia (Bachrach et al. 2003) are more common and more severe in children who are artificially fed and are responsible for many of these deaths (López-Alarcón et al. 1997). It was also recognized that BF significantly contributes to cognitive development of children and adults (Anderson et al. 1999).

Mass advertisement campaigns by formula milk manufacturers exaggerating the benefits of milk-based artificial feeds, mothers lacking information and knowledge, health conditions afflicting mothers and children, as well as pressure forcing mothers to resume their career early discourage mothers from exclusively breastfeeding their children within the first 6 months (Dearden et al. 2002; Forster et al. 2006; Fjeld et al. 2008; Glover et al. 2009).

Recent studies carried out in Western countries have pointed out the importance of studying the relationship between the role of fathers/husbands in the nourishment

of children and infant health (Bar-Yam and Darby 1997; Fitzgerald et al. 1999). A study undertaken in Vietnam suggested that fathers' involvement in their children's health care decreased the likelihood of deficits in weight and length (Bich 2008). Other studies indicated the associations between breastfeeding and the fathers' role in family and factors such as their occupation, education levels and satisfaction with children's gender, interests and attitude to children's nutrition (Duong et al. 2004, 2005). The success of breastfeeding depends heavily on the husbands' psychological support, affection shown to their spouses (Ingram et al. 2008) and preference to breastfeeding (Dashti et al. 2014); breastfeeding is negatively affected if wives are not supported by their married partners (McIntyre et al. 1999). Furthermore, husbands play a key role in promoting breastfeeding in particular and indirectly through helping with child care, housework (Almroth et al. 2008) and other responsibilities that can help with breastfeeding success (Rempel and Rempel 2011). Father's knowledge (K) about breastfeeding, positive attitude (A) toward breastfeeding and involvement (or practice) (KAP) in supporting breastfeeding including practical and emotional support can significantly contribute to the mother's breastfeeding practices (Freed et al. 1992; Rivera Alvarado et al. 2006; Laanterä et al. 2010; Sherriff et al. 2014). Some factors including father's education level, parenting experience, parity and type of family are related to knowledge and attitude of fathers toward breastfeeding (Jimoh 2004; Laanterä et al. 2010; Taşpınar et al. 2012). Other studies suggest that fathers can serve as resources for child care and as active supporters for breastfeeding in the family (Bar-Yam and Darby 1997; Raj and Plicha 1998); moreover, health education programs could be developed to strengthen the knowledge and affect the attitude of fathers regarding their involvement in supporting breastfeeding (Giugliani et al. 1994; Raj and Plicha 1998; Clifford and McIntyre 2008; Laanterä et al. 2010). In developed countries, programs were recommended and implemented to promote paternal involvement in supporting EBF through educational interventions at obstetric clinics and work places, where fathers attended antenatal classes on how to support breastfeeding practices (Turan et al. 2001; Cohen et al. 2002; Susin and Giugliani 2008; Tohotoa et al. 2011) and infant development (Fletcher et al. 2014). However, the reports on the changes in KAP of fathers about breastfeeding as outcomes of interventions promoting paternal involvement in supporting breastfeeding practices are still limited. This study evaluates the results of the health education intervention aimed at improving paternal knowledge, attitude toward EFB and also involvement in supporting EBF.

Methods

Study settings

A quasi-experimental design was used to evaluate outcomes of the community-based intervention on knowledge, attitude and father's involvement in supporting breastfeeding. The study was carried out from May 2010 to September 2011 in two districts in Hai Duong Province in northern Vietnam. Chi Linh District served as the intervention site and Thanh Ha District served as the control; these districts do not share a border. The intervention site in Chi Linh was composed of those from three townships and four communes. The control group was located in seven wards/communes in Thanh Ha District. The two chosen districts had a similar population of about 160,000 in 2010, and their heath-care systems are similar. Prenatal services are provided regularly at antenatal visits in commune health centers, including general health checkups for pregnant women, tetanus vaccination, iron supplementation, breastfeeding and nutrition consultation.

Participants

Subjects consisted of males living and residing in the locations selected and having wives who were between 7 and 30 weeks of pregnancy by 1 August 2010. Subjects were considered to be ineligible if either they themselves or their spouses suffered from severe diseases, experienced mental or psychological disorders, had miscarriage, refused to cooperate or left the studied location. 492 fathers (251 from Chi Linh and 241 from Thanh Ha District) were regarded as meeting the set requirements along with the list of women at 7–30 weeks of pregnancy. During the post-intervention period, 46 fathers were removed from the study because they left the location or their wives suffered miscarriage.

Intervention

The intervention package targeting fathers was integrated within the routine health-care services provided by the local health staff within the Chi Linh District health system periphery and was carried out continuously during both the antenatal and postnatal periods. The intervention package consisted of several components including mass media communication; group counseling; individual counseling; and a social public event. In mass media communication, local community loudspeaker systems (two air times every week), posters (in the commune health center), pamphlet distribution and giveaways such as mugs and T-shirts conveying messages of breast milk and breastfeeding were used as awards for "more affectionate" fathers. Counseling

for fathers regarding breastfeeding at local health centers included group and individual counseling given by trained local health center workers during both prenatal and postnatal periods. Group counseling was offered on the 25th day of each month and integrated into local immunization activities and other maternal health-care services. The total number of group counseling sessions was 49, involving 545 fathers. Four individual counseling sessions were offered by trained village health workers during home visits, including one and three at the prenatal and postnatal period, respectively. During such sessions, village health workers discussed with fathers activities needed to be undertaken by fathers, difficulties involved and ways to assist their wives to overcome challenges to EBF. Paternal role enforcement and community mobilization were performed through public events, in collaboration with the Farmers' Association including fathers' contest to evaluate knowledge and paternal skills in supporting breastfeeding and to encourage more active involvement in supporting EBF. This intervention package has been described in detail elsewhere (Bich et al. 2014).

Measures and data collection

Table 1 shows the main variables collected and used in the analysis. Basic indicators at the individual and household levels were considered as potential predictors of fathers' involvement and potential confounders were collected at the baseline. Place of residence was defined as semi-urban vs. rural. The household (HH) size was the number of total household members present at the time of the study. In this study, the family was defined as an extended family if there were grandparents living in the household (more than two generations), and a nuclear family was defined as a two-generation family. Household economic status and father's income, education and employment were measured by the father's self reporting. The information collected from mothers were used to measure the basic characteristics of the children, including gender, birth weight, type of delivery and childbirth order.

Information regarding fathers' knowledge of the significance and benefits of breast milk, initiation of breastfeeding (importance of early breastfeeding within the first hour after birth for the child and mother), definition of EBF and continuation of breastfeeding was collected from a structured interview involving fathers in the intervention and control sites. Because there were no existing standard tools to measure the knowledge of the father on exclusive breastfeeding, 22 items, from the recommendations of WHO, were used to measure the knowledge of the fathers on EBF (World Health Organization 1998). The maximum score given to each item ranged from 1 to 4 based on the importance of the knowledge judged by experts' opinion. The father gained a maximum score for each item if he answered/gave correct responses to the corresponding questions (yes/no and multiple choice questions). The reliability of the fathers' knowledge scale (Cronbach's alpha) was 0.70. The total fathers' knowledge score ranged from 0 to 38.

Attitudes toward BF included paternal opinions on statements regarding the importance of early BF initiation, EBF and necessity to support their partners for good practices. The attitudes were assessed by questions on a five-point scale. For positive questions, scores ranged from 1 with "totally disagree" to 5 with "totally agree", and a reverse scale was used for negative questions. To measure the effect of intervention on the improvement of paternal attitudes toward exclusive breastfeeding, the

Table 1 Main variables and collection points in the intervention study in Chi Linh District (intervention, $n = 239$) and Thanh Ha District (control, $n = 230$), Hai Duong Province

Variable domain	Variables collected at baseline	Variables collected at post-test
Basic characteristics	Household residence, economics and family type	Infant gender, birth weight, type of delivery, birth order
	Demographic characteristics of the couple	
Fathers' breastfeeding knowledge	Father's knowledge about the importance of breastfeeding and exclusive breastfeeding (22 items)	Father's knowledge about the importance of breastfeeding and exclusive breastfeeding (22 items)
Three attitude subscales	Toward initiation of breastfeeding (5 items)	Toward initiation of breastfeeding (5 items)
	Toward 6-month exclusive breastfeeding (2 items)	Toward 6-month exclusive breastfeeding (2 items)
	Toward supporting wife in breastfeeding (3 items)	Toward supporting wife in breastfeeding (3 items)
Fathers' involvement in supporting exclusive breastfeeding	Supporting breastfeeding at the delivery of the previous child (7 items)	Supporting breastfeeding during the antenatal period (3 items)
		Supporting breastfeeding at delivery (3 items)
		Supporting breastfeeding in the postpartum period (7 items)

(Vietnam 2010)

score of each item on each subscale was summed up to get the total score of each subscale. To further verify the dimensions and eliminate unnecessary items assessing attitude, factor analysis for 16 items of three subscales was carried out. As a result, there were five, three and two items left in the subscales of "initiation of BF", "supporting wife in breastfeeding" and "6-month EBF", respectively. The loading factors of the included items were from 0.50 to 0.86. The reliability coefficients of the three separated subscales were 0.64, 0.64 and 0.73, respectively.

The fathers' practices (Table 1) to support their partners to breastfeed infants were activities they should perform during the antenatal period (a total of three questions, for example, "Did you accompany your wife for the health checkup?"), at birth of the infant (three questions, for example, "Did you buy formula milk for your newborn right after the delivery?") and during the postpartum period (seven questions, for example, "What did you do to support your wife to breastfeed?") to support the practice of mothers breastfeeding their babies within 1 h after birth and maintain EBF.

Questionnaire used to measure KAP of the fathers regarding breastfeeding was modified from standardized questionnaires used to measure KAP of mothers about breastfeeding and fathers' attitude and involvement in women and child care in previous studies in Vietnam (Bich 2008). All tools were pre-tested in areas of Chi Linh District excluded from the official study areas, to explore the reaction of interviewees and coherence and logic of the tools.

The post-test surveys were conducted in March and July 2011, and the subjects were fathers of babies who were 2.5–4 months old. Trained interviewers who did not participate in the implementation of the intervention activities conducted these surveys.

Data analysis

Data were fed into Epidata and then SPSS 13 for filtering, treatment and analysis. Chi-square test, t test and non-parametric Mann–Whitney test were used to examine paternal knowledge, attitudes, involvement and differences between the intervention and control sites. Multivariate analyses were conducted using ANCOVA linear regression for continuous outcomes (knowledge and attitude scores) and logistic regression for binary outcomes (father's involvement) adjusted for residence, HH economics, family type, paternal education and occupation, parity, child gender and birth weight. A p value of <0.05 was considered to be significant.

Results

Characteristics of the study population

492 eligible couples, husband and pregnant wife, were recruited at the baseline.

However due to out-migration and spontaneous abortion/stillbirth, 23 mothers (12 from intervention and 11 from control sites) were lost to follow-up, leaving 469 couples eligible.

At the baseline, households in the intervention area were more likely to be located in the semi-urban area (36.4 vs. 13.5 %; $p < 0.001$), but the proportion of mothers doing agricultural work in the intervention area was higher compared with the control area (31.4 vs. 17.4 %; $p < 0.001$) (Table 2). The characteristics of infants in the intervention and control groups were similar ($p > 0.05$), except for infant birth order with significantly more first-born children in the intervention group than in the control group (59.8 vs. 50.0 %; $p < 0.05$) (Table 3).

At the baseline paternal knowledge, attitude toward EBF and involvement in supporting EBF of the previous child were not significantly different between the intervention and control groups ($p > 0.05$) (data are not shown).

At the post-test (Table 4), in general, knowledge related to the importance of exclusive BF was significantly higher in the intervention group fathers, compared to the control group. The proportion of fathers in the intervention site who defined colostrum accurately (90.7 %) knew that the right timing for early initiation of breastfeeding (88.1 %) was also higher, compared to 81.0 and 73.6 %, respectively, among fathers in the control site. In particular, the percentage of fathers in the intervention site who correctly understood the definition of EBF (86.7 %) and duration of 6-month EBF (75.7 %) was much higher than that in the control site (59.3 and 35.2 %, respectively), with $p < 0.001$. In ANCOVA, compared to fathers in the control group, fathers in the intervention group had higher BF knowledge scores (unadjusted means: 25.8 vs. 19.5; $p < 0.001$ after adjustment) (Table 6).

Regarding paternal attitudes (Table 5), after the intervention, fathers in the intervention site had more favorable attitudes (who agree and strongly agree with the statements) toward initiation of breastfeeding ($p < 0.001$) and more favorable attitudes toward 6-month exclusive breastfeeding than fathers in the control site ($p < 0.001$).

As shown in Table 6, higher attitude scores reflecting more positive attitudes toward early initiation of BF (unadjusted means: 19.9 vs. 18.2; possible score range: 3–25; $p < 0.001$ after adjustment) and EBF of the infant through to 6 months of age (unadjusted means: 6.4 vs. 5.1; possible score range: 2–10; $p < 0.001$ after adjustment) were found in the intervention group.

Table 2 Basic socio-demographic characteristics of study subjects at baseline in Chi Linh District (intervention, $n = 239$) and Thanh Ha District (control, $n = 230$), Hai Duong Province

Characteristics	Total	Study sites		p value
		Intervention n (%)	Control n (%)	
Residence				
Semi-Urban	118 (25.2)	87 (36.4)	31 (13.5)	<0.001
Rural	351 (74.8)	152 (63.6)	199 (86.5)	
Family type				
Nuclear	204 (43.5)	103 (43.1)	101 (43.9)	
Extended	265 (56.5)	136 (56.9)	129 (56.1)	0.86
Household economics				
Non-poor	407 (86.8)	208 (87.0)	199 (86.5)	
Poor	65 (13.2)	31 (13.0)	31 (13.5)	0.93
Paternal employment				
Farmer	113 (24.1)	60 (25.1)	53 (23.0)	
Non-farmer	356 (75.9)	179 (74.9)	177 (77.0)	0.60
Paternal education				
Less than high school	236 (50.3)	116 (48.5)	120 (52.2)	
High school and above	233 (49.7)	123 (51.5)	110 (47.8)	0.43
Economic role of father				
Main income producer	341 (72.7)	173 (72.4)	168 (73.0)	
Not a main producer	128 (27.3)	66 (27.6)	62 (27.0)	0.87
Paternal age	469	28.92 ± 5.11	29.41 ± 5.50	0.32
Maternal age	469	25.41 ± 4.39	25.46 ± 5.06	0.89
Maternal employment				
Farmer	115 (24.5)	75 (31.4)	40 (17.4)	
Non-farmer	354 (75.5)	164 (68.6)	190 (82.6)	<0.001
Maternal education				
Less than high school	248 (52.9)	120 (50.2)	128 (55.7)	
High school and above	221 (47.1)	119 (49.8)	102 (44.3)	0.24

Chi-square tests applied to detect differences between intervention and control areas

(Vietnam 2010)

As shown in Table 7, during the pregnancy period, the proportions of fathers involved in taking care of the mothers in the intervention site were significantly higher than that in the control site. Around the time after birth, in the intervention site, the proportions of fathers "told the mother to breastfeed children", "did not asked others to buy formula milk" and "did not go by themselves to buy formula milk to feed the children" were 16.4, 57.5 and 61.1 %, respectively, compared with 8.3, 46.3 and 31.5 %, respectively, of the control fathers ($p < 0.01$). At the postpartum period, the proportions of fathers in the intervention group reported "helping mothers to breastfeed", "did not ask others to buy formula milk" and "telling other household members about the benefit of breastfeeding" were 34.4, 54.4 and 37.6 % respectively, compared with 16.7, 38.9 and 22.7 % respectively of those in the control group ($p < 0.001$). The proportions of fathers asking mother to breastfeed regularly during the postpartum period were higher in the intervention than in the control group ($p < 0.05$).

Table 7 also presents the summaries of 13 models showing the effects of the intervention on fathers' actions taking into account some basic differences at the baseline as well as potential confounding factors. In this analysis, the dependent variables were coded as 1 for success (good practice) and 0 for failure (bad practice). During the pregnancy period, in general, after controlling for potential confounding factors, fathers in the intervention site were about from 2.6 to 4 times more likely to be involved in various activities supporting BF including going out with the wife to social activities, buying food for the wife and talking with the wife about future child care. Fathers in the intervention site were also two times more likely to be involved in supporting EBF right after the delivery at the health facilities compared with the fathers in the control site. Regarding the effects of intervention on the

Table 3 Characteristics of children (June 2010) in Chi Linh District (intervention, $n = 239$) and Thanh Ha District (control, $n = 230$), Hai Duong Province

Child characteristics	Total	Intervention *n* (%)	Control *n* (%)	*p* value
Birth weight (g)				
>2500	456 (97.2)	234 (97.9)	222 (96.5)	0.36
≤2500	13 (2.8)	5 (2.1)	8 (3.5)	
Childbirth order				
First	258 (55.0)	143 (59.8)	115 (50.0)	0.03
Second or higher	211 (45.0)	96 (40.2)	115 (50.0)	
Gender				
Female	229 (48.8)	125 (52.3)	104 (45.2)	0.13
Male	240 (51.2)	114 (47.7)	126 (54.8)	
Type of delivery				
Cesarean section	113 (24.1)	59 (24.7)	54 (23.5)	0.76
Vaginal	356 (75.9)	180 (75.3)	176 (76.5)	

Chi-square test performed to assess differences between the intervention and control areas

(Vietnam 2010)

involvement of fathers in supporting EBF during the postpartum period, the fathers in the intervention site were about two times more likely to tell the mothers and household members about best breastfeeding practices as well as taking care of the mothers' health and nutrition.

Discussion

Fathers' breastfeeding knowledge improvements lay a firm foundation for their changed attitude and involvement in supporting breastfeeding within the first 6 months. Such findings reveal that fathers' breastfeeding knowledge can surely be improved in the studied site, which is consistent with results from previous studies examining the role of the father in breastfeeding support and infant care (Tohotoa et al. 2009). Some important knowledge of fathers about breastfeeding and exclusive breastfeeding were significantly improved after the intervention, especially knowledge about "initiation of BF within the 1st hour after birth", "resting and good mood help mother to produce more milk", "correct understanding about the meaning of exclusive BF" and "the time for EBF is 6 months". When the knowledge of the fathers was quantified, and ANCOVA was carried out, the results of the univariate ANCOVA showed the intervention effect on the improvement of fathers' knowledge in EBF controlling for the knowledge score at the baseline, the presence of the older child in the family and the fathers' education. These findings were also good evidence, indicating that fathers can learn more about EBF once they were encouraged and included in the breastfeeding education, which was also mentioned in the previous observational studies and reviews (Bar-Yam and Darby 1997; Turan et al. 2001; Tohotoa et al. 2009; Rempel and Rempel 2011; Amy and Ruth 2014; Sherriff et al. 2014) and other intervention studies (Sciacca et al. 1995).

At the post-test, fathers in the intervention site were more likely to have positive attitudes toward early initiation of breastfeeding and EBF, compared to the group of fathers in the control. Although items of statements used in this study were not identical to those used in other studies, the findings related to attitude differences toward breastfeeding and EBF somehow resemble the same pattern of paternal attitudes in other studies (Bar-Yam and Darby 1997). When two subscales of fathers' attitude toward "early initiation of BF" and "6-month EBF BF" were quantified and analyzed using the ANCOVA method, the results of the two models showed significant intervention effect on improvement of attitude of fathers toward "early initiation of BF" and EBF for 6 months after birth. The improvement of paternal attitude was also found in intervention studies where fathers in the intervention group were more likely to want their babies to be breastfed (Wolfberg et al. 2004) and their attitude was positively changed (Sciacca et al. 1995).

Compared to fathers in the control group, fathers in the intervention group were more likely to report that during their wife's pregnancy, they attended social activities with her, bought her favorite foods and discussed future child care; during the postpartum period, they told the mother to breastfeed within the first hour of birth, breastfeed regularly and correctly, helped the mother breastfeed, told household members about the benefits of BF, did not buy

Table 4 Knowledge of fathers about exclusive breastfeeding by site at the post-test in Chi Linh District (intervention, $n = 226$) and Thanh Ha District (control, $n = 216$), Hai Duong Province

No	Knowledge items	Control $N = 216$ n (%)	Intervention $N = 226$ n (%)	p value
1	Knew the time to breastfeed within 1 h after delivery	159 (73.6)	199 (88.1)	0.000
2	Knew the name of colostrum or "first milk"	175 (81.0)	205 (90.7)	0.003
	Benefits of early initiation of breastfeeding to the child			
3	Colostrum—best nutritious food for the newborn	154 (71.3)	185 (81.9)	0.009
4	Maintain breast milk supply for the child	15 (6.9)	64 (28.3)	0.000
5	Help to keep the child warm	6 (2.8)	37 (16.4)	0.000
	Benefits of early initiation of breastfeeding for the mother			
6	Accelerate contraction of uterus	13 (6.0)	46 (20.4)	0.000
7	Reduce psychological stress	12 (5.6)	45 (19.9)	0.000
8	Stimulate milk secretion and maintain the flow/drainage and production	128 (59.3)	175 (77.4)	0.000
9	Knew correct WHO exclusive breastfeeding definition	128 (59.3)	196 (86.7)	0.000
	Benefits of exclusive breastfeeding the newborn in the first month for the newborn and mother			
10	Exclusive breastfeeding helps child develop better	122 (56.5)	182 (80.5)	0.000
11	Exclusive breastfeeding helps to prevent infectious disease in the child	94 (43.5)	143 (63.3)	0.000
12	Exclusive breastfeeding fosters bonding between mother and child	9 (4.2)	52 (23.0)	0.000
13	Exclusive breastfeeding is an economical way of child feeding	9 (4.2)	38 (16.8)	0.000
	Know how to breastfeed			
14	Knew that the appropriate duration for exclusive breastfeeding is 6 months	76 (35.2)	171 (75.7)	0.000
15	Knew that the child had to be breastfed at daytime and nighttime	206 (95.4)	225 (99.6)	0.005
16	Knew that the frequency of breastfeeding was at least 8 times/day	18 (8.3)	53 (23.5)	0.000
17	Knew that the child can be breastfed by demand	167 (77.3)	163 (72.1)	0.21
	Actions mother takes to have more milk to breastfeed the child			
18	Eat better/more nutritious food to produce more milk	213 (98.6)	224 (99.1)	0.62
19	Mother should breastfeed children more	19 (8.8)	69 (30.5)	0.000
20	Mother should have more rest and or be in a good mood	82 (38.0)	131 (58.0)	0.000
	Continuation of breastfeeding			
21	Knew that the child should continue to be breastfed when it has diarrhea	191 (88.4)	204 (90.3)	0.53
22	Knew that the child should continue to be breastfed when it is sick	205 (94.9)	221 (97.8)	0.11

Chi-square tests performed to assess the differences between the intervention and control areas (Vietnam 2010)

formula and did not ask relatives or others to buy formula, took care of the mother's health and bought her favorite foods. Seven selected involvements of father in supporting EFB were considered as the role of the father in "family functioning" and were included in the advice of pediatricians to mobilize the involvement of fathers in the care and development of their children (Tohotoa et al. 2009): involvement in the care at birth (to remind mothers to breastfeed, requesting relatives to avoid buying formula milk for the infant, refraining from buying formula milk by themselves) and in the postpartum period (to regularly ask mothers to breastfeed, help mothers to breastfeed, refraining from buying formula milk, sharing with other household members the benefit of BF). At the post-test, proportions of fathers involved in the care at birth and the postpartum care were significantly higher, compared with those proportions in the control group. The results of 13 multiple logistic regression models showed that fathers in the intervention group were more likely to be involved in supporting exclusive breastfeeding in comparison with fathers in the control group. Interventions targeting fathers to determine the changes in actions taken by fathers in supporting breastfeeding are still limited. In some intervention programs where fathers were included, EBF rates were significantly improved (Wolfberg et al. 2004; Tohotoa et al. 2011) and fathers had more involvement in supporting women practicing breastfeeding (Sciacca et al. 1995; Turan et al. 2001).

In our study, fathers improved knowledge, attitude about/toward the importance of breastfeeding and actions

Table 5 Proportions of favorable attitudes of fathers toward early initiation of breastfeeding, 6 months exclusive breastfeeding and involvement in supporting exclusive breastfeeding at the post-test in Chi Linh District (intervention, $n = 226$) and Thanh Ha District (control, $n = 216$), Hai Duong Province

No	Item statement	Control $N = 216$ n (%)	Intervention $N = 226$ n (%)	p value
A	Early initiation of breastfeeding			
1	Colostrum is first milk that was stuck in the breast for a long time and needs to be squeezed before breastfeeding the child[a]	145 (67.1)	183 (81.0)	0.001
2	The child will be breastfed on colostrum when it is breastfed early	197 (91.2)	210 (92.9)	0.504
3	To breastfeed the child only when the milk comes (to the breasts)[a]	122 (56.5)	170 (75.2)	0.000
4	Breastfeeding the child right after birth may bring negative effect on the health of the mother[a]	186 (86.1)	206 (91.2)	0.095
5	Right after birth, the infant should drink/eat sugar, honey or herbal extracts before breastfeeding[a]	91 (42.1)	169 (74.8)	0.000
B	Six months exclusive breastfeeding			
6	Giving complementary food for the child before 6 months will make the child stronger[a]	69 (31.9)	126 (55.8)	0.000
7	At 6 months of age, if possible, formula milk should be given to the infant[a]	46 (21.3)	112 (49.6)	0.000
C	The involvement of father in supporting BF			
8	Feeding the child is the responsibility of both the wife and husband	208 (96.3)	217 (96.0)	0.879
9	The husband should share housework with the wife to give more time for the wife to breastfeed	202 (93.5)	220 (97.3)	0.053
10	The husband should sleep near the wife and the child to help the wife to breastfeed at night	191 (88.4)	194 (85.8)	0.418

Chi-square tests performed to assess differences between intervention and control areas

[a] Negative items; (Vietnam 2010)

Table 6 Paternal knowledge and attitude score between the intervention and control group at post-test in Chi Linh District (intervention, $n = 226$) and Thanh Ha District (control, $n = 216$), Hai Duong Province

Outcome	Number of items	Mean (SD) [SE]		Mean differences between intervention and control	p value
		Control $N = 216$	Intervention $N = 226$		
Knowledge score	22	19.5 (6.6) [0.45]	25.8 (6.4) [0.43]	6.3	<0.001
Attitude score					
Early initiation of breastfeeding	5	18.2 (3.1) [0.21]	19.9 (3.0) [0.20]	1.7	<0.001
6 months exclusive breastfeeding	2	5.1 (1.9) [0.13]	6.4 (1.8) [0.12]	1.3	<0.001
Supporting mother to breastfeed	3	12.5 (1.6) [0.11]	12.4 (1.7) [0.11]	−0.01	>0.05
General/total attitude (sum of three subscales)	10	35.8 (4.7) [0.32]	38.7 (4.8) [0.32]	2.9	<0.001

The ANCOVA adjusted for residence, household economics, baseline score, father's education, employment and childbirth order (Vietnam 2010)

supporting mothers to practice EBF as recommended (Jimoh 2004). The intervention design targeted men and provided them with information about breastfeeding and asked them to promote EBF based on life cycle and integrated approach (Amy and Ruth 2014), which is unique in Vietnam at this time. The control site was far from the intervention site and had many similarities in terms of socio-economic and health indicators. The surveyors were trained in one team and were blinded to the intervention activities. In addition, there was no new and specific breastfeeding promotion program carried out in any place of Hai Duong at the time of our intervention. Selection bias was not present in our study since all eligible couples, in both the intervention and control sites, were selected by the same sampling procedure.

Table 7 Logistic regression analyses displaying adjusted odds ratios (adjusted for residence, household economics, family type, paternal education and employment, child gender, childbirth order and birth weight) for fathers' practices in supporting exclusive breastfeeding in intervention study at Hai Duong Province

Practices	Control ($N = 216$) %	Intervention ($N = 226$) %	AOR (95 % CI) Ref = control	p value
During the pregnancy period				
Went with wife to social activities	85.6	94.2	2.89 (1.40–5.95)	<0.01
Bought favorable food and fruits for the wife	80.6	92.5	3.90 (2.00–7.58)	<0.001
Talked with the wife about future child care	83.3	92.5	2.82 (1.45–5.46)	<0.01
During birth				
Told mother to breastfeed early	8.3	16.4	2.61 (1.37–4.99)	<0.01
Did not ask relatives to buy formula	46.3	57.5	2.06 (1.36–3.13)	<0.001
Did not buy formula	31.5	61.1	3.42 (2.24–5.20)	<0.001
During the postpartum period				
Told mother to breastfeed regularly	84.7	90.7	1.88 (1.00–3.53)	<0.05
Told mother to breastfeed correctly	50.5	65.9	2.48 (1.61–3.83)	<0.001
Took care of the mother's health	46.3	57.1	1.91 (1.26–2.90)	<0.01
Helped mother to breastfeed	16.7	34.4	2.70 (1.65–4.41)	<0.001
Bought her favorable food or fruits	76.4	84.5	2.06 (1.21–3.48)	<0.01
Did not buy and ask others to buy formula	38.9	54.4	1.96 (1.30–2.95)	<0.001
Told household members about the benefits of breastfeeding	22.7	37.6	2.39 (1.52–3.79)	<0.001

(Vietnam 2010)

Limitation

We acknowledge that the current study design presents some limitations to the interpretation of the results. One limitation of this study is unequal exposure to the intervention as the gestational age ranged widely from 7 to 30 weeks, affecting fathers' knowledge in different stages of pregnancy. However, this limitation does not affect the validity of research findings when compared with the control site. The study also shows some slight differences in population characteristics between the intervention and control groups, with the control group being more likely to live in a rural setting and having a smaller proportion of first-born infants. However, these differences were taken into account in multivariate analyses modeling association between intervention and father's KAP. The lack of information on paternal involvement at baseline should be taken into account while interpreting the study results, since the involvement of fathers in supporting EBF of the previous child was similar between the intervention and control groups. This would indirectly support that the changes of fathers' practices at the post-test were due to the intervention. Although the designing of the survey tools was based on the tested tool of a previous father study, the validity of the tool would be more visible if similar information was compared with the mother's report on father's involvement.

Conclusions

The intervention was associated with improvements in fathers' BF knowledge, attitudes and practices rates. However, the results must be interpreted cautiously due to the non-randomized design of the study and the reliance on self-reported data. We suggest that the health education model targeting men should be replicated in the study areas and be tested again using a stronger study design and at larger scale to provide better evidence for national policy in promoting fathers' involvement in supporting EBF.

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Compliance with ethical standards

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Conflict of interest Author THB has received research grants from Bill & Melinda Gates Foundation to FHI 360. THB acted as principal investigator of the study, developed the study design and analyzed data together with NMC. We declare no conflict of interests.

Ethical approval Ethical approval for this study was obtained from the Institutional Review Board of the Hanoi School of Public Health. Verbal informed consent was chosen as an appropriate method to obtained consent from study subjects for participation in the study.

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