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Father support breastfeeding self-efficacy positively affects exclusive breastfeeding at 6 weeks postpartum and its influencing factors in Southeast China: a multi-centre, cross-sectional study

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Abstract

Background The exclusive breastfeeding condition in China is not optimism now. Maternal breastfeeding self-efficacy stands as a pivotal factor influencing exclusive breastfeeding. Interestingly, studies have suggested that father support breastfeeding self-efficacy is a pivotal mediator in infant breastfeeding. Thus, the current research aimed to investigate the association between father support breastfeeding self-efficacy and exclusive breastfeeding at six weeks postpartum, and the influencing factors of father support breastfeeding self-efficacy.

Methods This research was structured as a multi-centre cross-sectional study, involving 328 fathers, whose partners were six weeks postpartum, and recruited from two public hospitals in Southeast China. Self-designed demographic questionnaires, namely, Father Support Breastfeeding Self-Efficacy Scale-Short Form, Breastfeeding Knowledge Questionnaire, Positive Affect Scale and the 14-item Fatigue Scale, were applied. Descriptive statistics, Chi-square test, logistic regression univariate analysis and multiple linear regression were used to analyse data.

Results Results indicate a significant difference between the infant feeding methods at six weeks postpartum and fathers with different levels of support breastfeeding self-efficacy ($p < 0.05$). Particularly, father support breastfeeding self-efficacy positively affected exclusive breastfeeding at six weeks postpartum after adjusting all the demographic characteristics of fathers (OR: 2.407; 95% CI: 1.017–4.121). Moreover, results show that the significant influencing factors of father support breastfeeding self-efficacy include breastfeeding knowledge, fatigue, positive affect, successfully experienced helping mothers to breastfeed, spousal relationships and companionship time.

Conclusions High-level father support breastfeeding self-efficacy effectively increased exclusive breastfeeding rate at six weeks postpartum. To enhance the exclusive breastfeeding rate, nurses or midwives can endeavour to

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design educational programmes or take supportive interventions customised for fathers, such as enhancing their breastfeeding knowledge education, reducing fatigue and mobilising positive emotions, thereby bolstering paternal self-efficacy in breastfeeding.

Keywords Breastfeeding self-efficacy, Exclusive breastfeeding, Breastfeeding knowledge, Postpartum

Introduction

Breastfeeding is the vitality. Breastfeeding plays a crucial role in thwarting the triple challenges of malnutrition, infectious diseases and mortality [1]. Breast milk can provide nutrition for infants' development, and breastfeeding can foster the development of infants' healthy brain [1]. Consequently, infants can thrive and attain optimal development when they directly receive maternal breast milk [1]. Breastfeeding can also diminish the probability of future obesity and chronic illnesses for infants [2]. Furthermore, the interactive dynamics of breastfeeding and the unique life-enhancing attributes of breast milk can develop infants' healthy personality [3]. Nevertheless, non-exclusive breastfeeding may diminish the mother–infant attachment, thereby elevating infants' susceptibility to borderline personality disorder [4]. Moreover, breastfeeding facilitates birth spacing by eliciting the release of hormones in mothers' bodies during the suckling period and preventing ovulation, thereby leading to lactational amenorrhea [5]. Breastfeeding additionally contributes to safeguarding mothers from breast and ovarian cancers, type 2 diabetes and cardiovascular diseases [1, 6]. Breastfeeding provides enduring positive effects on children, mothers, families and the society [7]. Hence, the World Health Organization and the majority of national health authorities advocate for exclusive breastfeeding for infants up to six months, followed by the introduction of complementary foods in conjunction with sustained breastfeeding for at least two years [8, 9].

Breastfeeding has a noteworthy advantage for the long-term economy [7]. Globally, the unrealised benefits of breastfeeding for health and human development have resulted in an estimated annual loss of $341.3 billion [10]. The World Health Assembly (WHA) has established one of the global nutrition targets, in which the exclusive breastfeeding rate reaches 50% at least in the first 6 months by 2025 [11]. At total of 48% of infants worldwide between 0 and 5 months are exclusively breastfed [12]. Meanwhile, the National Health Commission of China issued the Action Plan for Promoting Breastfeeding (2021–2025), which proposes that the national exclusive breastfeeding rate of infants aged up to 6 months should exceed 50% by 2025 [13]. By 2025, the awareness rate of breastfeeding core knowledge should reach over 70%, and the breastfeeding support rate of maternal and infant family members should reach above 80% [13]. However, the breastfeeding situation in China is less than ideal owing to the lack of public awareness of breastfeeding, considerably short maternity leave for mothers and over-marketing of breast-milk substitutes [14]. The exclusive breastfeeding rate for infants within the first 6 months is only 29.2% [15]. Another Chinese study has shown that exclusive breastfeeding rates are 58.6% and 30.5% in infants aged 4 and 6 months, respectively [16]. Although the Chinese government has implemented numerous measures to promote breastfeeding, such as carrying out publicity and education, improving the service chain, enhancing policies and systems and strengthening industry supervision [13], it is still a critical imperative to enhance the exclusive breastfeeding rate.

The success of exclusive breastfeeding hinges on a confluence of factors, encompassing national policy, sociocultural elements and various factors related to the infant, mother and family [17–19]. Undoubtedly, mothers play a decisive role in exclusive breastfeeding success [20]. Maternal breastfeeding self-efficacy, defined as a mother's confidence in her ability to breastfeed her child [21]. Mothers with high levels of breastfeeding self-efficacy generally feel less anxiety and stress, and are more likely to actively seek help from family, friends and professionals to obtain breastfeeding-related knowledge, understand the correct feeding posture and techniques and improve breastfeeding success [21]. Additionally, when they face difficulties in breastfeeding (e.g. sore nipples or babies not latching), they show considerable perseverance, adopt a self-encouraging cognitive mode and actively cope with these challenges [22]. Therefore, maternal breastfeeding self-efficacy is one of the key and intervenable influencing factors for the success of breastfeeding.

Recent research has indicated that the influence of male partners on mothers significantly exceeds that of health educators in the breastfeeding process [20]. Particularly, fathers engage in the decision-making process of breastfeeding and also contribute to heightened rates of breastfeeding for typical and special newborns, especially in terms of exclusive breastfeeding rates and the duration of breastfeeding [23]. Moreover, the roles of father in breastfeeding evolves over time; they initially aid mothers in establishing breastfeeding and subsequently support them to continue breastfeeding through companionship and shared household responsibilities [23, 24]. Fathers' breastfeeding support is completely consistent with the themes of recent years' World Breastfeeding Week, including 'Empower Parents, Enable Breastfeeding' [25]; 'Protect Breastfeeding: A Shared Responsibility'

[26] and 'Helping Working Families, Enable Breastfeeding' [27]. All themes reinforce the importance of parents' collective effort to promote and protect breastfeeding for every infant. Although some fathers have expressed a desire to be actively involved in the breastfeeding process [28], they still frequently feel unprepared to support their partners' breastfeeding and experience a sense of exclusion from infant care [29]. Owing to lack of adequate preparation, fathers exhibit a diminished confidence in providing breastfeeding support, thereby increasing the likelihood of their partners discontinuing breastfeeding [28, 30]. Conversely, fathers with well-prepared and received support during the breastfeeding experience positively correlate with breastfeeding rates and duration [31]. The significance of fathers' support in breastfeeding and the promotion of infant health is unquestionably substantial [32]. Father support breastfeeding self-efficacy has been shown to be a pivotal mediator in infant feeding practices [33]. However, only a few published studies have focused on the role of father support breastfeeding self-efficacy on exclusive breastfeeding, especially for Chinese fathers and those of other Asian countries. Therefore, father support breastfeeding self-efficacy in China must be explored.

Breastfeeding self-efficacy theory has been used extensively in breastfeeding research and practice [34]. This theory states that breastfeeding self-efficacy is influenced by four factors: (a) performance accomplishments, such as previous successes experiences of breastfeeding behavior; (b) verbal persuasion, such as breastfeeding encouragement from influential others; (c) vicarious experiences, such as seeing other women breastfeeding successfully and (d) physiological/affective responses, such as depression, anxiety and fatigue [35]. However, only a few studies have explored the factors influencing father support breastfeeding self-efficacy. Previous studies have found that positive emotions and breastfeeding knowledge promote maternal breastfeeding self-efficacy, thereby increasing breastfeeding rates [36]. Meanwhile, fatigue reduces maternal breastfeeding self-efficacy and discourages mothers from breastfeeding [37]. Additionally, age and educational level were associated with paternal breastfeeding self-efficacy [38]. Therefore, this study based on breastfeeding self-efficacy theory aimed to investigate the association between father support breastfeeding self-efficacy and exclusive breastfeeding at six weeks postpartum; and the effects of paternal fatigue, positive emotions and breastfeeding knowledge on father support breastfeeding self-efficacy.

Methods

Study design and participants

This study was designed as a multi-centre, cross-sectional descriptive survey and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline (Supplementary material 1). This research was conducted between December 2021 and January 2023 and carried out in two public hospitals in China. All participants were screened based on predefined inclusion and exclusion criteria. The inclusion criteria are as follows: (a) fathers whose wives were at 6 weeks postpartum, (b) age exceeding 18 years and (c) fathers with normal intelligence and cognitive ability. Conversely, the exclusion criteria are as follows: (a) fathers diagnosed with various mental disorders, such as melancholia, severe anxiety, mania and bipolar affective disorder, as determined by clinicians following established guidelines for mental disorders diagnoses; and (b) fathers whose newborns or spouses had contraindications to breastfeeding.

Ethical approval

This study received approval from the ethics committee of the researcher's hospital (Approval No. 2020KY095-02). Participation in the study was entirely voluntary with willingness to provide informed consent, and the participants had the freedom to withdraw at any point. The study procedures strictly adhered to pertinent guidelines and regulations governing ethical research practices. Furthermore, all collected data were anonymised, ensuring that individual participants remained unidentifiable.

Measures

Sociodemographic questionnaire

The researchers formulated a sociodemographic questionnaire encompassing such factors as the fathers' age, education level, work type, monthly income (RMB), number of children, whether or not they have any experience in helping mothers to breastfeed successfully, whether their family and friends have any experience in helping their spouses to breastfeed successfully, type of delivery in spouses, whether or not they live with their spouses, spousal relationships, paternity leave, whether or not they have participated in the training on breastfeeding knowledge and companionship time. Particularly, whether family and friends have any experience in helping their spouses to breastfeed successfully was defined that father's family, friends had knowledge or skill help for their spouse to breastfeed successfully.

Exclusive breastfeeding

Exclusive breastfeeding was determined by asking the mother what she has fed her baby in the last 24 h and what she usually feeds her baby [39]. In this study, the subjects were fathers. The infant feeding method was determined by asking the participants' wives what they fed their babies in the last 24 h and what they usually feed them. Exclusive breastfeeding was defined as no food

or liquid other than breast milk (not even water) given to infants. This definition includes feeding expressed breast milk and undiluted drops or syrups consisting of vitamins, minerals supplements or medicines. Exclusive breastfeeding was evaluated at six weeks postpartum.

Father Support Breastfeeding Self-Efficacy Scale-Short Form

The Father Support Breastfeeding Self-Efficacy Scale-Short Form (FBSES-SF) was used to measure the support breastfeeding self-efficacy of fathers, which includes 14 items and 2 subscales: technical and intrapersonal thought dimensions [33]. It was scored using a 5-point Likert scale, and the total score of the questionnaire was 14–70. Meanwhile, increased scores signify enhanced support for fathers' breastfeeding self-efficacy. We referred to a previous study [40] and classified fathers support breastfeeding self-efficacy into two levels: low level (scores ranging from 14 to 42) and high level (scores ranging from 43 to 70), with the average score as a criterion. The Chinese version of the Father Support Breastfeeding Self-efficacy Scale has been shown acceptable psychometric properties [41]. In the current study, Cronbach's alpha value was 0.953.

Breastfeeding Knowledge Questionnaire

The Breastfeeding Knowledge Questionnaire (BKQ) was used to measure the breastfeeding knowledge of mothers [42]. BKQ comprised 2 subscales and 17 items: breastfeeding benefits and breastfeeding skills. Each item was scored 1 for correct responses and 0 for incorrect responses, for a total score range from 0 to 17. Higher scores indicate greater breastfeeding knowledge amongst mothers. In the current study, Cronbach's alpha value was 0.824.

Positive and Negative Affect Scale

The Positive and Negative Affect Scale (PNAS) was used to measure positive and negative affects [43]. PNAS comprised two subscales containing a combined total of 20 items: one measuring positive affect and the other negative affect. We only opted to utilise the positive affect subscale (positive affect scale (PAS)) to assess fathers' positive emotions. Responses were recorded using a 5-point Likert scale, resulting in a total score range from 10 to 50. Higher scores indicated a greater degree of positive emotion amongst fathers. We referred to a previous study and classified positive affect into two levels: low level (scores ranging from 10 to 30) and high level (scores ranging from 31 to 50) with the average score as a criterion. The Chinese version of the positive affect subscale has demonstrated satisfactory psychometric properties [44]. In the current study, Cronbach's alpha value was 0.903.

Fatigue Scale-14

The Fatigue Scale-14 (FS-14) developed by Chalder et al. [45] and was used to measure the severity of participants' fatigue over the last month, consisting of 14 items, including physical (items 1–8) and mental (items 9–14) fatigue. FS-14 utilised a 2-point Likert scale, yielding a total score range from 0 to 14. Elevated scores signify greater severity of fatigue. The Chinese version of FS-14 has demonstrated satisfactory psychometric properties [46]. We referred to a previous study [46] and classified fatigue severity into two levels: low (scores ranging from 0 to 7) and high (scores ranging from 8 to 14) with the average score as a criterion. In the current study, Cronbach's alpha value was 0.793.

Data collection

The questionnaire survey was conducted using the online survey platform, Wen Juan Xing [47], recognised as one of China's leading professional and free online survey platforms. Prior to the survey, participants in the two hospitals provided consent. Subsequently, researchers generated a quick response (QR) code for the survey through Wen Juan Xing. Data collectors recruited participants from the postpartum clinic based on the study's inclusion and exclusion criteria and provided them with an explanation of the study's purpose and significance. Participants were able to scan the QR codes of the questionnaires using WeChat and complete them online. Note that the Wen Juan Xing platform allowed only one submission per WeChat account, and participants were unable to submit incomplete or missing data.

Samples

On the basis of a prior investigation, the standard deviation of the FSBSE score was determined to be 11.02 amongst 76 fathers. To meet a specified criterion (Confidence interval = 0.90; Confidence interval precision = 10% of the standard deviation), a total of 269 fathers were required. Accounting for a non-response rate of 20%, the minimum sample size was calculated to be 323.

Data analysis

Researchers conducted data analysis using IBM SPSS version 26.0. Descriptive statistics, including frequency, percentage, mean (M) and standard deviation (SD), were utilised to characterise father support breastfeeding self-efficacy scores, breastfeeding knowledge scores, positive affect scores and levels of fatigue scores. Chi-square tests and logistic regression were utilised to investigate whether or not varying levels of father support for breastfeeding self-efficacy influenced infant feeding methods, with father support for breastfeeding self-efficacy serving as independent variable and fathers' demographic characteristics as covariates. Infant feeding methods

were designated as the dependent variable. Moreover, independent two-sample t-tests and one-way analysis of variance (ANOVA) were applied to assess disparities in father support for breastfeeding self-efficacy amongst the aforementioned independent variables. Stepwise multiple linear regression analysis was conducted to identify factors impacting father support for breastfeeding self-efficacy, with all independent variables included in the multivariable regression models. All statistical tests were two-sided, with p-values below 0.05 considered statistically significant.

Result

Participant characteristics

A total of 328 fathers were included for data analysis in this study. The participant characteristics are shown in Table 1. The age of most fathers was from 26 to 35 years (77.4%). Close to half of the participants hold bachelor's degrees, and the work type of 80.2% was day shift only. Most fathers had only one child, with monthly income above RMB 7000 (RMB 1=USD 0.1399), the minimum wage set in Fuzhou, China is RMB 2030 per month). A total of 77.7% of the fathers had experience in helping mothers to breastfeed successfully, and 60.1% of the fathers' family and friends had experience in helping their spouses to breastfeed successfully. Over half of the fathers had learnt of breastfeeding knowledge and 62.8%

Table 1 Father's baseline characteristics (*N*=328)

Variables	Categories	*N* (%)	t/F	*p*
Age(years)	20–25	18(5.5%)	1.707	0.148
	26–30	123(37.5%)		
	31–35	131(39.9%)		
	36–40	47(14.3%)		
	≥41	9(2.7%)		
Education level	Junior college degree or below	149(45.5%)	1.664	0.191
	Bachelor degree	150(45.7%)		
	Master degree or above	29(8.8%)		
Work type	Day shift only	263(80.2%)	-0.453	0.651
	Have night shift	65(19.8%)		
Monthly income (yuan)	<3000	4(1.2%)	1.953	0.101
	3000–4999	20(6.1%)		
	5000–6999	81(24.7%)		
	7000–9999	100(30.5%)		
	≥10,000	123(37.5%)		
The number of children	One	237(72.3%)	2.132	0.034
	Two or above	91(27.8%)		
Whether you have any experience in helping mother to breastfeed successfully	Yes	255(77.7%)	3.358	0.001
	No	73(22.3%)		
Whether your family and friends have any experience in helping their spouse to breastfeed successfully	Yes	197(60.1%)	1.29	0.198
	No	131(39.9%)		
Feeding mode	Exclusive breastfeeding	145(44.2%)	-1.611	0.108
	Not exclusively breastfed	183(55.8%)		
Type of delivery in spouse	Vaginal delivery	206(62.8%)	-0.677	0.499
	Caesarean section	122(37.2%)		
Whether live with spouse	Yes	310(94.5%)	-0.776	0.438
	No	18(5.5%)		
Spousal relationships	General and below	72(20.7%)	-6.354	0.001
	Good	256(78%)		
Whether participated in the training on breastfeeding knowledge	Yes	184(56.1%)	2.776	0.006
	No	144(43.9%)		
Paternity leave	<7 Days	79(24.1%)	5.413	0.05
	7–14 Days	128(39%)		
	≥15 Days	121(36.9%)		
Companionship time	<2 Hours	112(34.1%)	8.318	0.001
	2–4 Hours	57(17.4%)		
	>4 Hours	159(48.5%)		

Table 2 Descriptive statistics for each variable

Variables	Minimum value	Maximum value	Mean ± SD
FBSES-SF	14	70	53.52 ± 11.16
Technical dimension	9	45	33.95 ± 7.53
Intrapersonal thoughts dimension	5	25	19.56 ± 3.97
BKQ	0	17	11.21 ± 3.86
Breastfeeding skills	0	6	3.39 ± 1.54
Breastfeeding benefits	0	11	7.82 ± 2.79
FS-14	0	14	5.47 ± 3.24
Physical fatigue	0	6	3.29 ± 1.78
Mental fatigue	0	8	2.17 ± 1.95
PAS	10	50	33.66 ± 6.86

Abbreviation (1) FBSES-SF: the scores of Father Support BreastfeedingSelf-Efficacy Scale; (2) BKQ: the score of the Breastfeeding Knowledge Questionnaire; (3) PAS: the score of Positive Affect Scale; (4) FS-14: the score of the Fatigue Scale-14

of the fathers' spouses were vaginal delivery. Most fathers lived with their spouses and had a good relationship. A total of 75.9% of the fathers had over one-week paternity leave, and 48.5% of the fathers spent over four hours each day with perspirants and infants.

Father support breastfeeding self-efficacy, breastfeeding knowledge, positive affect and fatigue status at six weeks postpartum

The mean scores of father support breastfeeding self-efficacy and its technical dimension and intrapersonal thoughts dimension were 53.52 (SD = 11.16), 33.95 (SD = 7.53) and 19.56 (SD = 3.97), respectively. Most fathers reported high level of support breastfeeding self-efficacy (83.54%), whilst only 16.46% of fathers had a low level of support breastfeeding self-efficacy. The mean scores of breastfeeding knowledge questionnaire and its breastfeeding skills and breastfeeding benefits were 11.21 (SD = 3.86), 3.39 (SD = 1.54) and 7.82 (SD = 2.79), respectively. The mean scores of positive affect was 33.66 (SD = 6.86). Most fathers reported high level of positive affect (68.29%), whilst only 31.71% of the fathers had a low level of positive affect. The mean scores of fatigue and its physical fatigue dimension and mental fatigue dimension were 5.47 (SD = 3.24), 3.29 (SD = 1.78) and 2.17 (SD = 1.95), respectively. Most fathers reported a low level of fatigue (73.48%), whilst only 26.52% of the fathers had a high level of fatigue (Table 2).

Fatigue and positive affect related to father support breastfeeding self-efficacy

The relationship between fatigue and father support breastfeeding self-efficacy is shown in Fig. 1. The results reveal significant differences between father support breastfeeding self-efficacy scores and technical dimension, intrapersonal thoughts dimensions' score and different levels of fatigue ($p < 0.05$). Additionally, 26.2% of the fathers reported high fatigue and 73.78% reported low fatigue.

The relationship between positive affect and father support breastfeeding self-efficacy is shown in Fig. 1. The results show significant difference in father support breastfeeding self-efficacy scores and technical dimension, intrapersonal thoughts dimensions' score and different levels of positive affect ($p < 0.05$). Most fathers reported a high level of positive affect (68.29%).

Influencing factors of father support breastfeeding self-efficacy

The result of the analyses of multicollinearity show that all predictive variables' variance inflation factors were below 2. This outcome suggested no severe problem of multicollinearity in this study. All variables were entered in the linear regression model for analysis (stepwise multiple). After adjusted analysis, several significant factors influencing father support breastfeeding self-efficacy

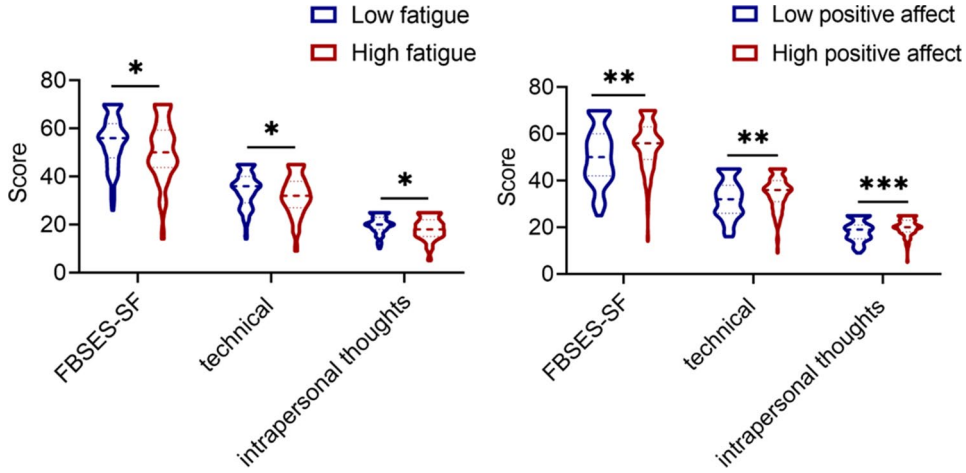


Fig. 1 The association between fatigue, positive affect and father support breastfeeding self-efficacy ($N = 328$) *$p<0.05$, **$p<0.01$, ***$p<0.001$

Table 3 Multiple linear regression analysis for the factors of father support breastfeeding self-efficacy ($N=328$)

Variable	Unstandardized coefficients		Standardization coefficient	t	*p*
	Beta	SE	Beta		
BKQ	0.561	0.148	0.194	3.790	<0.001
FS-14	-0.433	0.173	-0.126	-2.501	0.013
PAS	3.197	1.202	0.134	2.659	0.008
Have any experience in helping mother to breastfeed successfully	3.700	1.321	0.138	2.800	0.005
Good spouse relationship	6.064	1.393	0.225	4.352	<0.001
Companionship time (2–4 h)	1.704	0.652	0.137	2.614	0.009

$R^2=0.245$, Adjusted $R^2=0.226$, $F=12.931$

Abbreviations SE standard error; BKQ: the score of the Breastfeeding Knowledge Questionnaire; FS-14: the score of the Fatigue Scale-14; PAS: the score of Positive Affect Scale

The reference group: Have not any experience in helping mother to breastfeed successfully, General and below spouse relationship, Companionship time<2 Hours

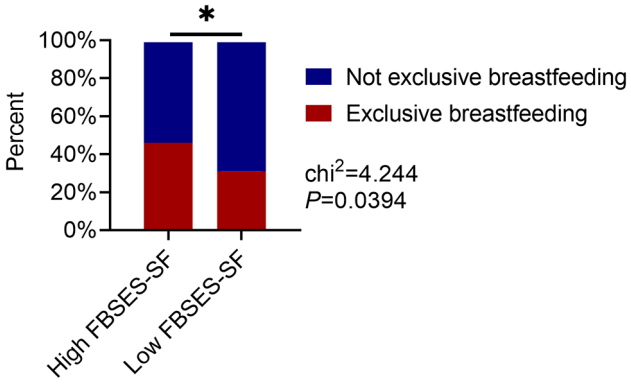


Fig. 2 The association between father support breastfeeding self-efficacy and infants feeding mode ($N=328$) *$p<0.05$

were identified. Specifically, breastfeeding knowledge (beta=0.561, $p<0.000$), positive affect (beta=3.197, $p=0.008$), successfully experience in helping mother to breastfeed (beta=3.700, $p=0.005$), spousal relationships (beta=6.064, $p<0.000$) and companionship time (beta=1.704, $p=0.009$) were positively associated with father support breastfeeding self-efficacy. However, fatigue negatively affected father support breastfeeding self-efficacy (beta=−0.433, $p=0.013$). This adjusted model explained 24.5% of the total variance of father support breastfeeding self-efficacy ($F=12.931$, $p<0.001$). The result is shown in Table 3 and supplementary material 2. Independent variable assignments in multivariate analysis of paternal support for breastfeeding self-efficacy are shown in supplementary material 3.

Exclusive breastfeeding status at six weeks postpartum and its association with father support breastfeeding self-efficacy

A total of 145 fathers reported their infants are exclusively breastfed at six weeks postpartum, and the exclusive breastfeeding rate was 44.2%. The relationship between exclusive breastfeeding at six weeks postpartum and father support breastfeeding self-efficacy is shown in Fig. 2; Table 4. Chi-square results revealed significant differences of the infant feeding methods at six weeks postpartum in fathers with different levels of support breastfeeding self-efficacy ($p<0.05$) (Fig. 2). This result indicates that in contrast to fathers with low levels of breastfeeding self-efficacy, fathers with high level of breastfeeding self-efficacy were more predisposed to support exclusive breastfeeding.

The binary logistic regression method was used, and the preceding factors (all participants' characteristics, father support breastfeeding self-efficacy, breastfeeding knowledge, positive affect and fatigue) were taken as covariates for the analysis of the influencing factors associated with exclusive breastfeeding at six weeks postpartum. The results indicate that father support breastfeeding self-efficacy (OR: 2.407; 95% CI: 1.017–4.121) was an independent predictor for exclusive breastfeeding

Table 4 Binary logistic regression analysis of factors associated with infant feeding pattern

Variable	B	SE	*p* value	Odds ratio	95% CI for odds ratio
Companionship time (<2 h)			0.015		
Companionship time (2–4 h)	0.852	0.366	0.020	2.343	1.144–4.801
Father support breastfeeding self-efficacy	0.716	0.357	0.045	2.047	1.017–4.121
Constant	19.684	18894.624	0.999	353630924.651	

Abbreviations SE standard error, B standardized regression coefficient

The reference group: Companionship time<2 h

at 6 weeks postpartum (Table 4). Additionally, companionship time (OR: 2.343; 95% CI: 1.144–4.801) also associated with exclusive breastfeeding at six weeks postpartum (Table 4).

Companionship time was an associated factor with father support breastfeeding self-efficacy and the type of infant feeding six weeks postpartum. An adjusted model was conducted to obtain the adjusted OR of father support breastfeeding self-efficacy on infant feeding type (Table 5). The results show that father support breastfeeding self-efficacy (OR: 1.908; 95% CI: 1.025–3.552) still was an independent predictor for exclusive breastfeeding at six weeks postpartum (Table 5).

Discussion

Key results and interpretation

To date, studies have rarely investigated the association between father support breastfeeding self-efficacy and exclusive breastfeeding at six weeks postpartum, and based on theory of breast-feeding self-efficacy to explore the influencing factors of fathers supporting breast-feeding self-efficacy. Our findings indicate that father support breastfeeding self-efficacy positively affected exclusive breastfeeding. Moreover, breastfeeding knowledge, positive affect, fatigue, successfully experience in helping mother to breastfeed, spousal relationships and companionship time were significantly influential factors of the father support breastfeeding self-efficacy.

The prevalence of exclusive breastfeeding at 6 weeks postpartum was 44.2% in this study, which is similar to the proportion of Lebanon [48] and the UK [49]. As the infant matures, the exclusive breastfeeding rate is expected to progressively decline. The "Report on Relevant Factors of Breastfeeding from the China Development Research Foundation" indicated that the exclusive breastfeeding rate for infants within the first 6 months is only 29.2% [15], which is significantly below the recommended exclusive breastfeeding rate standard set by the WHO. The reasons are as follows. Firstly, the majority of women in the current society are compelled to discontinue breastfeeding and adhere to employment to secure a better future for their children [50]. Secondly, postpartum women commonly lack effective guidance of breastfeeding. Most healthcare professionals are under the overwhelming pressure of excessive workloads, leaving limited time and energy for fundamental tasks [51]. The current status of breastfeeding in China also indicates a lack of optimism. Consequently, enhancing the exclusive breastfeeding rate remains a critical task.

Most studies have demonstrated the relationship between maternal breastfeeding self-efficacy and breastfeeding outcomes [21, 52, 53]. However, the theory is that fathers' confidence in supporting their partners' breastfeeding would play a role in couples' decision to opt for breastfeeding as the preferred method of infant feeding according to the breastfeeding self-efficacy model [33]. The current study reinforces the aforementioned conclusion. We found father support breastfeeding self-efficacy is an independent factor affecting exclusive breastfeeding rate at six weeks postpartum. Higher breastfeeding self-efficacy of fathers will promote the exclusive breastfeeding rate via supporting their partners' needs, providing encouragement, being equipped with breastfeeding knowledge and providing emotional support through valuing their partners' efforts [20]. A previous study has found that mothers reported higher levels of breastfeeding self-efficacy than fathers [33]. Although most fathers may initially think that breastfeeding is the responsibility of mothers and will be 'natural', simple or easy, they do not realise that establishing breastfeeding takes effort for them [54]. Additionally, we observed a positive association between companionship time and exclusive breastfeeding at six weeks postpartum, which was consistent with prior studies [55]. Fathers' increased companionship time for their wives and children may enhance emotional support, thereby fostering mothers' confidence in breastfeeding and promoting breastfeeding continuation [55]. Additionally, fathers' company can alleviate mothers' burden, including household chores and childcare responsibilities, thereby creating a markedly supportive environment for breastfeeding [56]. From a policy viewpoint, workplaces are advised to contemplate the extension of paternity leave for expectant fathers at their discretion, offering the possibility of flexible work arrangements to increase father companionship time, thereby improving the exclusive breastfeeding rate. For health workers, they improve father support breastfeeding self-efficacy and maternal breastfeeding self-efficacy during the perinatal period or emphasise the importance of father companionship time during the postpartum period of their spouses.

We also found that the more knowledge about breastfeeding, the higher the fathers' breastfeeding self-efficacy, which was similar to previous studies from Brazil [57] and Ethiopia [58]. Fathers' relatively low self-efficacy may

Table 5 Binary logistic regression analysis of father support breastfeeding self-efficacy associated with infant feeding pattern

Variable	B	SE	*p* value	Odds ratio	95% CI for odds ratio
Father support breastfeeding self-efficacy	0.646	0.317	0.042	1.908	1.025–3.552
Constant	-0.778	0.293	0.008	0.459	

Abbreviations SE standard error, B standardized regression coefficient

relate to their perceptions of having inadequate knowledge [59]. Knowledge–belief–behavior theory holds that knowledge information can change beliefs and attitudes [60]. Fathers receiving information on the benefits of breastfeeding and obtaining basic breastfeeding support skills boost their confidence in supporting breastfeeding [58]. Meanwhile, a recent systematic review [61] has found that educational and supportive intervention can improve their breastfeeding self-efficacy. Therefore, nurses or midwives can provide educational and supportive interventions to improve fathers' breastfeeding knowledge and enhance their support breastfeeding self-efficacy.

Additionally, we found that fatigue and positive affect are important affect factors in predicting fathers support breastfeeding self-efficacy. For fatigue, this study indicated that more fatigue resulted in decreasing fathers support breastfeeding self-efficacy, which is consistent with Li et al. [62]. About 50.8% of fathers experienced persistent high fatigue during their spouses' labour [63]. Fatigue decreased in the early postpartum period owing to the recognised safety of the partners and newborn, along with the joy of welcoming a new life. However, as expectant fathers take on new roles, they may experience significant energy loss, resulting in continued fatigue for most of them [63]. Theory of breastfeeding self-efficacy posits that physiological responses influence individuals' perceived self-efficacy in breastfeeding [35]. Specifically, higher levels of fatigue corresponded to lower breastfeeding self-efficacy. For positive affect, we showed that fathers had higher levels of positive affect in higher breastfeeding self-efficacy. The significant relationship has been observed between reducing fathers support breastfeeding self-efficacy and increasing negative affect [64]. Negative affect, such as anxiety or depression, is apt to stimulate sympathetic nerves, thereby adding to muscle tension and increasing fatigue [65]. That is, negative affect may reduce fathers support breastfeeding self-efficacy owing to fatigue. This result underscores the intricate relationship between physiological responses and perceived breastfeeding capabilities. In positive spousal relationships, fathers showed greater self-efficacy in supporting breastfeeding compared with those in less favourable relationships, aligning with previous findings [66]. Meanwhile, we also found that compared with average and below levels of spousal relationship, good spousal relationship is associated with higher scores of fathers support breastfeeding self-efficacy. Hence, supportive interventions should be provided by nurses or midwives to relieve father fatigue and avoid negative affect, as well as emphasise the importance of good relationship between them and their spouse to further enhance father support breastfeeding self-efficacy.

Our study also has clinical implications. This research emphasises the importance of exclusive breastfeeding. That is, fathers support breastfeeding self-efficacy is not the only factor affecting exclusive breastfeeding at six weeks postpartum in China. However, fathers with a high level of breastfeeding self-efficacy indicate that they have greater confidence and capability to engage in the breastfeeding process. This positive sense of involvement encourages fathers to assist mothers more frequently, offering emotional and substantive support, thereby increasing the likelihood of successful breastfeeding. Encouraging positive affect, improving the intimate relationship, gradually increasing fathers' breastfeeding knowledge and reducing fatigue may increase breastfeeding self-efficacy amongst fathers. A recent meta-analysis has revealed that educational programmes based on breastfeeding self-efficacy and planned behaviour theory effectively increase breastfeeding self-efficacy scores amongst mothers [67]. Hence, nurses or midwives should endeavour to design educational programmes for fathers based on breastfeeding self-efficacy and planned behavior theory, thereby enhancing paternal self-efficacy in breastfeeding and subsequently increasing the rate of exclusive breastfeeding. In consideration of accessibility, this programme/education may consider the integration of online and offline modalities used to promote fathers support breastfeeding self-efficacy [68]. Moreover, nurses or midwives should present educational and supportive interventions to improve father breastfeeding knowledge, relieve father fatigue and mobilise positive emotions, thereby enhancing father support breastfeeding self-efficacy.

Limitations

This study provides evidence of the relationship between father support breastfeeding self-efficacy and exclusive breastfeeding at six weeks postpartum. However, the conclusions drawn should be considered in the context of its limitations. Firstly, the utilisation of a cross-sectional design and a convenient sampling method within a singular setting may constrain the generalisability of the findings. Secondly, using self-reported questionnaires for data collection effectively identified paternal characteristics but introduced inherent subjectivity. To enhance objectivity, future research could broaden assessment sources, including evaluations from family members. Thirdly, this study disregarded the effect of care practices during hospital admission on the practice of breastfeeding in the sixth week. Future studies should consider such factors as the early start of breastfeeding, offer of supplements during the hospital stay and mother–child separation. Lastly, evaluating exclusive breastfeeding rates at six weeks postpartum is crucial. However, analysing breastfeeding initiation and duration over a longer time span

exceeds the scope of our current investigation. Future studies should include longitudinal research to comprehensively address these aspects.

Conclusion

Our findings support that high-level father support breastfeeding self-efficacy effectively increased exclusive breastfeeding rate at six weeks postpartum. Meanwhile, breastfeeding knowledge, positive affect, successfully experience in helping mothers to breastfeed, spousal relationships and companionship time were positively associated with father support breastfeeding self-efficacy. However, fatigue negatively affected father support breastfeeding self-efficacy. Hence, nurses or midwives should endeavour to design educational programmes or provide supportive interventions for fathers, thereby enhancing their self-efficacy in breastfeeding. Moreover, workplaces are advised to contemplate the extension of paternity leave for expectant fathers at their discretion, offering the possibility of flexible work arrangements. Educational and supportive measures aim to enhance fathers' breastfeeding knowledge education, reduce work fatigue and mobilise positive emotions, thereby ultimately boosting paternal self-efficacy in supporting breastfeeding. This aspect contributes to the promotion of exclusive breastfeeding rates.

Supplementary Information

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Supplementary Material 1: The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline

Supplementary Material 2: Table 4 Binary logistic regression analysis of factors associated with Infant feeding pattern

Supplementary Material 3: Independent variable assignment in multivariate analysis of paternal support for breastfeeding self-efficacy

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Author contributions
Z J and ZQX contributed to study design, statistical analysis, data interpretation, writing and revising manuscript. GSB contributed to study design, data interpretation and revising manuscript. WQS, LGH, LXW, LHM contributed to data collection, statistical analysis, data interpretation and revising manuscript. All authors contributed to the preparation of the manuscript and approved the final submitted version.

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Data availability
The data file from this study will be made available by the authors upon request.

Declarations

Ethics approval and consent to participate
The study conducted received approval from the Ethical Committee of Fujian Maternity and Child Health Hospital, College of Clinical Medicine for Obstetrics & Gynecology and Pediatrics, Fujian Medical University, Fuzhou City, China (Approval No.2020KY095-02). Informed consent from participants were obtained before initiating the survey.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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