

# Factors associated with breastfeeding duration: a prospective cohort study in Sichuan Province, China

Li Tang, Andy H Lee, Colin W Binns

Perth, Australia

**Background:** The World Health Organization (WHO) recommends exclusive breastfeeding for 6 months and continued breastfeeding thereafter with appropriate complementary foods for at least 2 years or longer. This study aimed to determine the factors associated with breastfeeding duration in Sichuan Province of China.

**Methods:** A prospective longitudinal study of 695 women, with a follow-up response rate of 71.9%, was conducted in Jianguo, Sichuan Province in the period of 2010-2011. Participants were interviewed at discharge and followed up by telephone at 1, 3, 6 and 12 months postpartum. Breastfeeding duration was estimated by the Kaplan-Meier method. Cox regression analyses were performed to identify factors associated with the breastfeeding duration.

**Results:** The median duration of "any breastfeeding" was 8.0 [95% confidence interval (CI): 7.8, 8.2] months. Maternal age less than 25 years [adjusted hazard ratio (HR): 1.61; 95% CI: 1.32, 1.96] and maternal return to work before 6 months postpartum (adjusted HR: 1.69; 95% CI: 1.32, 2.17) were associated with a shorter duration of breastfeeding. Women who delivered at hospital (adjusted HR: 1.33; 95% CI: 1.05, 1.67), introduced solid foods (adjusted HR: 1.30; 95% CI: 1.02, 1.64) and intended to stop breastfeeding within 6 months, or undecided how long to breastfeed (adjusted HR: 1.41; 95% CI: 1.16, 1.72), were more likely to terminate lactation within 1 year.

**Conclusions:** The duration of breastfeeding in Jianguo was far below the recommendation of the WHO. Education programs targeting vulnerable subgroups of mothers should be provided in Sichuan to help them maintain breastfeeding as long as possible.

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**Key words:** breastfeeding; cohort study; solid foods; working mother

## Introduction

The health benefits of breastfeeding for both the mother and infant have been documented extensively. Breastfeeding is associated with decreased incidence and severity of infectious diseases, such as diarrhoea, respiratory tract infections and otitis media.<sup>[1]</sup> Breastfed infants may also benefit from many long-term health advantages, including reduced risk of obesity, diabetes and increased performance in intelligence tests in childhood and adolescence.<sup>[1,2]</sup> The benefits for nursing mothers include reduced postpartum bleeding, faster return to pre-pregnancy weight, lower risk of breast cancer and ovarian cancer, as well as possibly decreased risk of hip fractures and osteoporosis in the postmenopausal period.<sup>[1,3,4]</sup> In recognition of these benefits, the World Health Organization (WHO) recommends exclusive breastfeeding for the first 6 months of life and continued breastfeeding thereafter with appropriate complementary foods for at least 2 years or longer.<sup>[5]</sup>

Despite high rates of breastfeeding initiation at over 90% in many parts of China,<sup>[6,7]</sup> the breastfeeding duration, ranging between 5 and 9 months across the country, fell significantly below ideal levels.<sup>[8,9]</sup> The median duration of breastfeeding in China was estimated to be 12 months in the 1930s. However, since the late 1970s, China had experienced a rapid decline in breastfeeding rate when the usage of breast milk substitutes became more widespread.<sup>[10]</sup> In response to the Chinese government's support for the Baby-Friendly Hospital Initiative, some increases in breastfeeding rate have been observed over the past two decades.<sup>[10]</sup>

Sichuan Province, located in Western China, is the largest agricultural province and the largest source of internal migrant workers. In addition to economic disparities between Western and Eastern China, maternal mortality ratio and infant mortality rate are higher

**Author Affiliations:** School of Public Health, Curtin University, Perth, Australia (Tang L, Lee AH, Binns CW)

**Corresponding Author:** Li Tang, School of Public Health, Curtin University, GPO Box U 1987, Perth, WA, Australia, 6845 (Tel: +61-8-92664180; Fax: +61-8-92662958; Email: Li.Tang@curtin.edu.au)

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in Sichuan Province.<sup>[11]</sup> To date, there have been no published cohort studies on breastfeeding duration in Sichuan. Previous cross-sectional surveys found that the durations of "any breastfeeding" were 5.5 and 7.6 months in its provincial capital city Chengdu and rural areas, respectively.<sup>[12]</sup>

Moreover, comparatively little is known about the factors associated with breastfeeding duration in Sichuan Province. Based on previous studies undertaken in Chinese societies, maternal age was shown to be positively associated with breastfeeding duration;<sup>[9,13]</sup> however, return to employment before the end of 6 months postpartum and introduction of complementary feeds within 3 months postpartum were risk factors for discontinuing breastfeeding.<sup>[9,14]</sup> No association has been found between breastfeeding duration and family income, gender of infant or method of delivery.<sup>[9,13,15,16]</sup> Results are inconsistent for the effects of maternal education and paternal feeding preference on breastfeeding cessation.<sup>[9,16]</sup> Although parity and mother's intended breastfeeding duration have been reported to be associated with the duration of breastfeeding in some Western countries,<sup>[17,18]</sup> evidence is lacking for the Chinese population.

The objective of the present cohort study was to provide answers to the questions: which sociodemographic, psychosocial, biomedical and hospital variables had positive and negative influences on breastfeeding? what is the effect of premature introduction of solid foods before 6 months postpartum on breastfeeding duration? It was hypothesized that older women, those with lower family income, women who intended to breastfeed longer, as well as those giving breast milk as first feed, were more likely to breastfeed longer, but conversely for mothers who introduced solid foods to their infant before 6 months postpartum. The study findings could provide an evidence base for the development of breastfeeding promotion strategies in Sichuan Province.

## Methods

A prospective cohort study of breastfeeding was undertaken during the period of 2010-2011 in Jiangyou, Sichuan Province. Jiangyou is a county-level city with a population of 880 000 located 160 km north of Chengdu. The annual per capita income of rural residents in Jiangyou was approximately 960 US dollars, slightly higher than the average provincial level of 815 US dollars in 2011, according to the Sichuan Bureau of Statistics. Between March and November 2010, mothers who were aged 18 years and above and delivered single infants at four hospitals and three township health centers in Jiangyou were invited to

participate in this study before discharge. Women were excluded if they were unable to answer the questions due to limited understanding, illness or deemed unsuitable as advised by health professionals. In China, township health centres are state-owned institutions, which provide primary health care to the people living in rural areas.<sup>[19]</sup>

At discharge, a total of 695 eligible women consented to participate in the study (a response rate of 96%) and were interviewed face-to-face by the first author or one of the trained health facility staffs using a structured questionnaire.<sup>[20]</sup> Information sought at the baseline interview included sociodemographic and health characteristics, perceived father's attitude towards breastfeeding, maternal breastfeeding intention, method of delivery, infant feeding practices in early postpartum period and other data concerning the infant. The cohort was followed up by telephone interviews at 1, 3, 6 and 12 months postpartum to collect detailed information on infant feeding methods. The questions were taken from our previous studies in Xinjiang and Zhejiang, China, whose validity had been verified for Chinese mothers.<sup>[9,21]</sup> At the end of 12 months postpartum, 500 out of the 695 women (71.9%) remained in the cohort and 195 (28.1%) were lost to follow-up. Among the drop outs, 122 (62.6%) could no longer be reached by telephone; 71 (36.4%) withdrew from the study and 2 mothers (1.0%) were excluded because their infants were severely ill.

The project protocol was approved by the local health authorities and the Human Research Ethics Committee of Curtin University (approval number: HR 169/2009). An information letter explaining the project was given and read to each mother. Informed written consent was obtained before the commencement of the interview. All participants were assured of anonymity and that they could withdraw freely from the study at any time without prejudice.

Data were entered and analyzed using the SPSS package version 20 (IBM Corp., Armonk, NY, USA). Survival analysis was performed on women who initiated breastfeeding before discharge and life tables were used for breastfeeding rates. The Kaplan-Meier method was applied to calculate the median duration of "any breastfeeding". After univariate screening using crude hazard ratios (HR), backward stepwise Cox regression analysis was undertaken to ascertain the pertinent factors associated with "any breastfeeding" duration up to 1 year. An HR greater than 1 denotes an elevated risk of discontinuation of "any breastfeeding" before 12 months postpartum. Independent factors considered in the Cox regression model included sociodemographic variables (maternal age, education level, family income, mother's employment status after childbirth),

psychosocial variables (perceived paternal feeding preference by the mother, when the feeding decision was made, mother's intended duration of breastfeeding), biomedical variables (parity, method of delivery, infant gender, birth weight), hospital-related variables (place of delivery, attendance at antenatal classes, first feed) and when the infant was introduced to solid foods. These plausible factors were chosen from the literature and were applicable to Chinese mothers residing in rural Sichuan. "Any breastfeeding" was defined as feeding with breast milk (direct from the breast or expressed) with or without other drinks, formula or other infant foods.<sup>[22]</sup>

## Results

The 695 participants were aged between 18 and 44 years (median 24 years). Almost all (99.8%) participants were married, about half received more than 9 years of schooling, and 68.8% of them were employed. Approximately, 80% of mothers were delivering their first baby, and 98.4% had a gestation over 37 weeks. The infant gender ratio was about 1:1, with a birth weight of 94% within the range 2.5-4 kg. Compared to completers, women who were lost to follow-up tended to have a lower level of education, be unemployed and have more than one child. There were no differences in maternal age, monthly family income, delivery method, infant's gender or infant's birth weight between the two groups.

In total, 95.7% of women initiated breastfeeding before discharge. As previously reported, the breastfeeding rate at discharge was 93.5%, while more than 93.0% of the infants received fluids (mainly infant formula and water) other than breast milk as their first feed.<sup>[20,23]</sup> By 6 months, 65.1% of the women continued to breastfeed,

and at 12 months the "any breastfeeding" rate fell to 12.9%. The breastfeeding rates during the first 12 months postpartum by place of delivery are given in Table 1.

The median duration of "any breastfeeding" was 8.0 [95% confidence interval (CI): 7.8, 8.2] months. Table 2 shows the univariate associations between plausible independent variables and "any breastfeeding" duration. The univariate screening identified seven potential factors: maternal age, family income, parity, place of delivery, maternal intended breastfeeding duration, age when the infant was introduced to solid foods, and age of the infant when mother returned to work.

Backward stepwise multivariable Cox regression analysis was performed to ascertain those factors associated with the risk of discontinuing "any breastfeeding" before 12 months (Table 3). Significant sociodemographic factors included maternal age and the age of the infant when mother returned to work. Maternal age less than 25 years (adjusted HR: 1.61; 95% CI: 1.32, 1.96) and maternal return to work before 6 months postpartum (adjusted HR: 1.69; 95% CI: 1.32, 2.17) were independently associated with a shorter duration of "any breastfeeding".

An unexpected finding was that women who delivered at hospitals were more likely to discontinue breastfeeding within 1 year postpartum than those who gave birth at township health centers (adjusted HR: 1.33; 95% CI: 1.05, 1.67). Of the psychosocial factors investigated, intended duration of breastfeeding was statistically significant. Mothers who intended to stop breastfeeding within 6 months postpartum or were undecided about how long to breastfeed tended to terminate lactation earlier (adjusted HR: 1.41; 95% CI: 1.61, 1.72). In addition, mothers who introduced solid foods to their infant before 6 months postpartum would have a shorter duration of "any breastfeeding" (adjusted HR: 1.30; 95% CI: 1.02, 1.64).

**Table 1.** "Any breastfeeding" rates (95% confidence interval, CI) during the first 12 months by place of delivery

Age (mon)	Hospital			Township health center			Total		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
0	449	95.0	93.0, 97.1	216	95.2	92.3, 98.1	665	95.1	93.4, 96.7
1	414	92.5	90.0, 95.0	190	93.1	89.7, 96.6	604	92.7	90.7, 94.7
2	399	89.2	86.3, 92.2	176	88.9	84.5, 93.3	575	89.1	86.7, 91.6
3	385	83.9	80.4, 87.3	167	87.8	83.2, 92.4	552	85.1	82.3, 87.8
4	355	79.6	75.8, 83.4	160	83.4	78.1, 88.7	515	80.8	77.7, 83.9
5	336	72.7	68.5, 76.9	152	77.9	72.0, 83.8	488	74.3	70.8, 77.7
6	303	63.4	58.8, 68.1	142	69.0	62.1, 75.8	445	65.1	61.2, 69.0
7	227	50.0	45.1, 55.0	87	59.4	51.7, 67.2	314	52.7	48.4, 56.9
8	179	34.9	30.1, 39.8	75	43.6	35.4, 51.8	254	37.3	33.1, 41.5
9	125	28.8	24.2, 33.4	55	34.1	26.1, 42.1	180	30.3	26.3, 34.3
10	103	17.0	13.2, 20.9	43	27.7	20.1, 35.4	146	19.9	16.4, 23.4
11	61	13.9	10.4, 17.5	35	25.8	18.4, 33.2	96	17.1	13.8, 20.4
12	39	10.9	7.7, 14.1	23	18.2	11.6, 24.9	62	12.9	9.9, 15.8

## Determinants of breastfeeding duration

**Table 2.** "Any breastfeeding" durations and risk of discontinuing breastfeeding at 12 months in relation to potential factors

Variables	<i>n</i>	Median duration (mon) (95% CI)	Crude HR (95% CI)	<i>P</i>
Maternal age, y				
<25	380	7.8 (7.5, 8.0)	1.49 (1.23, 1.79)	<0.001
≥25	285	8.5 (8.0, 9.0)	1.00	
Maternal education				
High school or lower	585	8.0 (7.8, 8.2)	0.96 (0.74, 1.25)	0.581
University	80	7.5 (6.5, 8.5)	1.00	
Monthly family income, RMB				
≤3000	328	8.0 (7.7, 8.3)	0.80 (0.67, 0.96)	0.018
>3000	286	7.8 (7.4, 8.1)	1.00	
Parity				
Primiparous	533	7.8 (7.5, 8.0)	1.54 (1.20, 1.96)	<0.001
Multiparous	132	8.8 (7.4, 10.1)	1.00	
Gender of infant				
Male	328	8.0 (7.8, 8.2)	0.95 (0.80, 1.14)	0.740
Female	337	8.0 (7.8, 8.2)	1.00	
Method of delivery				
Vaginal delivery	189	8.3 (7.8, 8.7)	0.93 (0.76, 1.12)	0.374
Caesarean section	476	8.0 (7.8, 8.2)	1.00	
Attendance at antenatal class				
No	547	8.0 (7.8, 8.2)	1.22 (0.96, 1.54)	0.056
Yes	121	8.0 (7.5, 8.5)	1.00	
Place of delivery				
Hospital	449	8.0 (7.8, 8.2)	1.28 (1.04, 1.59)	0.018
Township health center	216	8.5 (8.0, 9.0)	1.00	
Perceived paternal feeding preference				
Other*	85	7.3 (6.6, 7.9)	1.10 (0.83, 1.45)	0.434
Breastfeeding	580	8.0 (7.8, 8.2)	1.00	
Intended breastfeeding duration				
≤6 mon/undecided	312	7.5 (7.0, 8.0)	1.54 (1.28, 1.85)	<0.001
>6 mon	353	8.5 (8.1, 8.9)	1.00	
Timing of decision on feeding method				
Before pregnancy	373	8.0 (7.8, 8.2)	1.10 (0.88, 1.35)	0.392
During pregnancy or after childbirth	292	7.8 (7.3, 8.2)	1.00	
First feed				
Breastmilk	47	7.5 (6.4, 8.6)	1.15 (0.81, 1.64)	0.421
Others	618	8.0 (7.8, 8.2)	1.00	
Timing of solid foods introduction				
<6 mon	461	7.9 (7.6, 8.1)	1.33 (1.06, 1.64)	0.011
≥6 mon	144	8.0 (7.4, 8.6)	1.00	
Age of infant when mother returned to work				
<6 mon	97	6.0 (4.5, 7.5)	1.75 (1.39, 2.22)	<0.001
≥6 mon/unemployed	532	8.0 (7.8, 8.2)	1.00	

HR: hazards ratio; CI: confidence interval. \*: formula feeding or no preference given.

**Table 3.** Factors associated with "any breastfeeding" duration from backward stepwise Cox regression analysis

Variables	<i>n</i> (%)	Adjusted HR (95% CI)*	<i>P</i> *
Maternal age, y			
<25	303 (56.1%)	1.61 (1.32, 1.96)	<0.001
≥25	237 (43.9%)	1.00	
Place of delivery			
Hospital	380 (70.4%)	1.33 (1.05, 1.67)	0.016
Township health center	160 (29.6%)	1.00	
Intended breastfeeding duration			
≤6 mon/undecided	247 (45.7%)	1.41 (1.16, 1.72)	0.001
>6 mon	293 (54.3%)	1.00	
Timing of solid foods introduction			
<6 mon	414 (76.7%)	1.30 (1.02, 1.64)	0.031
≥6 mon	126 (23.3%)	1.00	
Age of infant when mother returned to work			
<6 mon	87 (16.1%)	1.69 (1.32, 2.17)	<0.001
≥6 mon/unemployed	453 (83.9%)	1.00	

HR: hazards ratio; CI: confidence interval. \*: variables excluded in the model were maternal education, monthly family income, parity, gender of infant, method of delivery, attendance at antenatal class, perceived paternal feeding preference, timing of decision on feeding method and first feed.

## Discussion

The "any breastfeeding" duration of 8.0 months observed in this study was similar to that reported in a previous cross-sectional survey in rural Sichuan (7.6 months).<sup>[12]</sup> It was longer than the duration observed in Zhejiang Province (180 days)<sup>[9]</sup> and Guangdong Province (6.1 months),<sup>[24]</sup> but was shorter than the duration reported for mothers residing in Shihezi, Xinjiang Uygur Autonomous Region (9.0 months).<sup>[8]</sup>

Compared to other countries and regions, the proportion of infants who were breastfed within the first 6 months of life in the present study was higher than those in Hong Kong, Australia and USA.<sup>[13,25,26]</sup> However, the sharp decline of "any breastfeeding" rate from 6 to 12 months postpartum in Jiangyou resulted in an equal or even lower proportion of infants receiving breast milk at the age of 12 months compared to others studies.<sup>[13,25,26]</sup> For example, the percentages of infants who were still receiving any breast milk at 1, 3, 6, 12 months in this study versus those from a recent prospective study in Hong Kong were 92.7% vs. 63.0%, 85.1% vs. 37.3%, 65.1% vs. 26.9%, and 12.9% vs. 12.5%, respectively.<sup>[13]</sup> The relatively high breastfeeding rates within 6 months and the low prevalence of breastfeeding at 12 months may reflect that mothers in Jiangyou had been aware of the necessity for breastfeeding, but were not well informed about the benefits of prolonged breastfeeding duration. To encourage a longer duration of breastfeeding, education programs should also emphasize the associated health benefits for mothers, such as lower risks of cardiovascular disease, diabetes, and certain cancers.<sup>[3,27]</sup>

Research in different cultures has found that older women are generally more likely to choose breastfeeding and breastfeed for a longer period than their younger counterparts.<sup>[18,28,29]</sup> Similarly, this study showed that mothers aged 25 years or above breastfed significantly longer than others aged below 25 years (median 8.5 vs. 7.8 months). While maternal age is a non-modifiable factor, proper breastfeeding education among younger mothers may improve breastfeeding practices in the rural area of Sichuan Province.

No previous studies have evaluated the association between delivery location and the duration of breastfeeding in China. Township health centers typically have less resources than hospitals in terms of service and facilities, professionally trained staff, and medical equipment.<sup>[19]</sup> It was surprising to find that mothers who gave birth at township health centers breastfed longer than mothers who delivered at hospitals. In Jiangyou, an infant is usually taken to the same health facility of birth to receive regular health care services. The infant feeding advice that mothers obtained during their postnatal visits may have affected their breastfeeding behaviours.

Maternal intended breastfeeding duration has been

consistently reported as a strong predictor of actual breastfeeding duration.<sup>[28]</sup> We found that women who intended to breastfeed for longer than 6 months were more likely to continue breastfeeding beyond 12 months. Apart from advising expectant mothers to breastfeed longer in future breastfeeding education programs, knowledge of their intended breastfeeding duration may help to identify those at risk of early termination.

Feeding infants breast milk without any other foods or liquids for the first 6 months of life is recommended by the WHO to protect infants against morbidity, especially diarrhoea and respiratory illness.<sup>[30]</sup> In this study, solid foods introduction before 6 months was associated with a shorter duration of breastfeeding within the first year. The results appeared to be consistent with those of previous studies.<sup>[31,32]</sup> Approximately 76% of infants had been introduced to solid foods by 6 months of age in Jiangyou. The early introduction rate was similar to the rate of 77.6% documented in Xingjiang, China.<sup>[33]</sup> Many studies also found the universal practice of premature introduction of solid foods in other parts of China.<sup>[34-38]</sup> There is an urgent need to emphasize the disadvantages of early complementary feeding to Chinese mothers.

Consistent with previous studies,<sup>[14,39]</sup> early return to employment was a main barrier for extended breastfeeding in Jiangyou. The median age of infants when mothers returned to work was 16 weeks. Among mothers who went back to work within 6 months postpartum, 66.7% reported that they could continue breastfeeding. The main reasons of weaning given by the rest were "my work place is in another city" (39.5%), "I can't bring the baby to my workplace" (18.4%), "I don't have time to take care of the baby" (18.4%), and "I don't have time to breastfeed the baby" (15.8%). It is interesting to note that for mothers who breastfed their infants during work, less than 30% breastfed in an isolated room, 64.3% breastfed at home, and 7.1% in public place. Prolonging the maternity leave period would be an effective measure to extend the breastfeeding duration.<sup>[39]</sup> However, a realistic approach to deal with maternal early return to work is to make working environment friendly to nursing mothers.

Studies elsewhere in China have shown that the use of prelacteal feeds, which are any feeds given before the onset of copious breast milk secretion,<sup>[40]</sup> reduces the duration of breastfeeding.<sup>[9]</sup> However, we observed no significant difference in the duration of breastfeeding between infants who received breast milk as first feed and those who did not, which might be due to the high prevalence of prelacteal feeding (93%) in the study area. Similar high rates of prelacteal feeding have been reported in other regions of China.<sup>[40]</sup>

Several limitations should be considered in conjunction with the findings. Although Jiangyou is

a county-level city representative of rural Sichuan, the results may not necessarily be generalized to the entire Province because of variations in culture between ethnic and minority groups. Another limitation concerns the rate of loss to follow-up. At the end of 12 months, although contact was made with only 72% of the cohort, the longitudinal follow-up was considered successful given the high internal migration especially for Sichuan residents. The final sample was sufficient for multivariable analyses. Nevertheless, further research in other study locations with a longer follow-up period beyond one year is recommended to enable a better understanding of breastfeeding practices in Sichuan Province.

In conclusion, the "any breastfeeding" duration in Jianguyou was far below the recommendation of the WHO. The advantages of prolonged breastfeeding for at least two years need to be emphasized in future promotion strategies in Sichuan Province. Maternal age, employment status after childbirth, intended breastfeeding duration, place of delivery and the timing of solid foods introduction were associated with the duration of "any breastfeeding" in the study population. Education programs targeting vulnerable subgroups of mothers should be provided to help them maintain breastfeeding as long as possible.

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**Competing interest:** The authors declare no competing interests.

**Contributors:** TL undertook data collection, conducted the data analysis and drafted the manuscript. LAH and BCW designed and developed the study, and revised the manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication.

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