

# **Mastitis in Chinese breastfeeding mothers: A prospective cohort study**

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## **ABSTRACT**

**Introduction:** Mastitis is a common problem encountered by breastfeeding mothers. This study investigated the incidence and risk factors of lactation mastitis among Chinese women.

**Methods:** A prospective cohort study on infant feeding practices was conducted during 2010 and 2011 in Jiangyou, Sichuan Province of China. Poisson regression analysis was performed to determine factors influencing the incidence of mastitis within six months postpartum.

**Results:** Of the 670 Chinese mothers who were breastfeeding at discharge, 42 women (6.3%) experienced at least one episode of mastitis during the first six months after delivery. The cumulative incidence of mastitis was 10.3%. Mothers with a cracked and sore nipple (incidence rate ratio (IRR) 2.24, 95% confidence interval (CI) 1.38 to 3.63) and those who felt stressed (IRR 3.15, 95% CI 1.56 to 6.37) appeared to sustain more episodes of mastitis.

**Conclusion:** The incidence of lactation mastitis was low among Chinese mothers. To further reduce the risk of mastitis, instructions on the correct positioning of the baby during breastfeeding should be emphasized. Providing new mothers with guidance on how to cope with stress may also prevent the recurrence of the condition.

**Key words:** Chinese women; incidence; mastitis; risk factors

## **Introduction**

Mastitis is an inflammation condition of the breast tissue.<sup>1</sup> It is clinically characterized by a tender, hot, swollen, wedge-shaped area of the breast in conjunction with ‘influenza-like’ symptoms, such as fever and malaise.<sup>2</sup> Lactation mastitis is a common problem encountered by 3 to 24% of breastfeeding mothers.<sup>2-5</sup> The resulting pain and discomfort may lead to breastfeeding cessation by affected mothers.<sup>6</sup> In some cases, untreated or inadequately treated mastitis can progress to breast abscess or septicaemia.<sup>7</sup>

Nipple trauma, especially if colonized with *Staphylococcus aureus*, has been known to induce mastitis.<sup>6,8-10</sup> Other risk factors include unresolved engorgement,<sup>11</sup> past history of mastitis,<sup>6,9,10</sup> maternal stress and fatigue,<sup>7,8,11</sup> restriction from a tight bra,<sup>8</sup> and usage of cream on nipples.<sup>6,9</sup>

Unlike Western countries, there has been little information on lactation mastitis among Asian women. An extensive search of the English and Chinese literature has not revealed any published report on lactation mastitis in Chinese women. The aim of the present study was to investigate the incidence rate and risk factors of mastitis within six months postpartum in a population of Chinese breastfeeding mothers.

## **Materials and Methods**

A prospective cohort study on infant feeding practices was undertaken during 2010-2011 in Jiangyou, Sichuan Province of China. Between March and November 2010, mothers who

delivered single healthy babies at seven health facilities were recruited to participate in a face-to-face interview before discharge. “Healthy babies” referred to those who spent less than 4 days in the newborn intensive care unit. Follow-up interviews were then conducted at 1, 3 and 6 months postpartum by telephone. The structured baseline and follow-up questionnaires solicited detailed information on socio-demographic characteristics, infant feeding practices, mastitis and breast-related symptoms. “Breastfeeding duration” was defined as the total length of time an infant received any breastmilk at all.<sup>12</sup>

### ***Case definition***

The definition of mastitis cases was adopted from the literature.<sup>3,9</sup> Mastitis cases were defined as self-reported symptoms of a pink, tender, hot, swollen area of the breast, accompanied by one or more of the following: (i) an elevated temperature (either estimated or measured as being 38°C), or (ii) one of the constitutional symptoms of fever (body aches, headaches and chills), or (iii) diagnosis of mastitis from a medical practitioner. Symptoms must be present for a minimum duration of 24 hours.

### ***Risk factor exposure***

Demographic and clinical characteristics were obtained from the baseline questionnaire completed at discharge. For breastfeeding mothers with mastitis, data on potential risk factors (e.g. maternal stress) were based on the information recorded before their first episode of mastitis. For women who did not develop mastitis, their exposure data were taken from the questionnaire administered prior to the cessation of breastfeeding.

### ***Ethical considerations***

The study protocol was approved by the local health authorities and the Human Research Ethics Committee of Curtin University (approval number HR169/2009). An information letter explaining the project was given and read to each mother before obtaining her written consent. All participants were assured they could withdraw freely from the study at any time without prejudice.

### ***Statistical analysis***

Descriptive statistics were first applied to profile the characteristics of participants. Poisson regression analysis was then conducted to ascertain pertinent risk factors affecting the incidence rate of mastitis, i.e. the number of mastitis episodes over the breastfeeding duration within six months postpartum. Independent variables considered in the regression model were plausible risk factors from the literature. Both crude and adjusted incidence rate ratios (IRR) with corresponding 95% confidence intervals (CI) were used to assess the magnitude of the associations. All analyses were performed using the Statistical Package for the Social Sciences version 18.0.<sup>13</sup>

## **Results**

### ***Breastfeeding***

A total of 695 women (response rate 96%) agreed to participate in this study. They were aged between 18 and 44 years (median 24 years). Approximately 80% of women were delivering

their first baby and the caesarean section rate was 71.4%. Details of the sample characteristics were reported elsewhere.<sup>14</sup> Among the consenting mothers, 25 (3.6%) did not initiate breastfeeding or had already ceased breastfeeding before discharge from hospital. Of the 670 breastfeeding mothers, 574 women (85.7%) were followed up for six months and 445 of them (66.4%) still breastfed their infants at six months postpartum.

### ***Mastitis incidence***

Forty-two mothers (6.3%, 95% CI 4.5 to 8.1) reported at least one episode of mastitis during the first six months postpartum. Among them, 25 women (59.5%) experienced one episode of mastitis, 12 (28.6%) had two episodes, 2 (4.8%) had three episodes, 1 (2.4%) had four episodes and 2 (4.8%) reported a maximum of five episodes, giving 69 episodes in total, with approximately half of the initial episodes occurred within the first 4 weeks postpartum.

The cumulative incidence of mastitis was 10.3% (95% CI 8.0 to 12.6). Table 1 gives the incidence density of lactation mastitis. The incidence density was highest at 11.02 during the first four weeks, but dropped sharply to 6.50 in the next four weeks, and eventually decreased to 1.80 by 21-26 weeks postpartum.

### ***Factors associated with mastitis***

Table 2 presents the results of Poisson regression analysis accounting for individual breastfeeding duration. Maternal stress and nipple problem were significantly associated with the mastitis incidence ( $p = 0.001$ ). Stressed mothers appeared to sustain more episodes of

mastitis (adjusted IRR 3.15, 95% CI 1.56 to 6.37) compared to those who did not or seldom feel stressed. Similarly, mothers with a cracked and sore nipple experienced a higher risk of recurrent mastitis (adjusted IRR 2.24, 95% CI 1.38 to 3.63) than those without the problem. The interaction term between these two factors was found not significant and thus excluded in the final model.

## **Discussion**

The present prospective cohort study provides the first report of lactation mastitis among Chinese women. The observed incidence of 6.3% within six months postpartum was low when compared with rates in Western countries, such as Australia (20.6% during first three months;<sup>4</sup> 17.3% during first six months;<sup>15</sup> 20.0% during first six months<sup>9</sup>), the United States (9.5% during first twelve weeks<sup>6</sup>), New Zealand (23.7% during first year<sup>5</sup>) and Scotland (18.0% during first six months<sup>3</sup>). The disparities in reported rates between studies may be attributed to the differences in the underlying population, case definition adopted, and length of postpartum follow-up.

The significant association between mastitis and cracked and sore nipples was consistent with studies in other countries.<sup>8,9,15</sup> A break in the skin may provide a portal of entry for pathogenic organisms, which then leads to infection.<sup>5</sup> Nearly 30% of Chinese women reported cracked or sore nipples at discharge, similar to the proportion documented at one week postpartum in American women.<sup>6</sup> However, severe nipple pain and trauma that continue a few days after delivery should not be considered a normal part of breastfeeding.<sup>16</sup>

Persistent sore nipples are commonly caused by poor positioning of the infant and/or poor latch-on.<sup>17</sup> In this study, 70% of mothers were taught how to position and attach babies during hospital stay, but less than 63% were actually checked by nursing staff about proper attachment to the breast. To avoid uncomfortable breastfeeding experience and to lower the incidence of mastitis, maternal health practitioners should ensure mothers have developed appropriate breastfeeding techniques before discharge so that they can feed their infant without pain.<sup>18</sup>

Similar to previous studies,<sup>8,11</sup> maternal stress was found to be another factor significantly associated with lactation mastitis. Teaching mothers with newborns how to deal with stress and providing coping strategies may help to prevent new and recurrent episodes of mastitis. Moreover, family members, especially husbands, should be encouraged to provide assistance and emotional support for the Chinese women whenever necessary.

In our cohort, one mother stopped breastfeeding completely because of mastitis while nine other affected mothers temporarily changed to formula feeding. Among the 42 mothers who experienced mastitis, nearly 90% sought help or advice, and 70% had turned to health professionals for guidance. Although information on mastitis management was not collected from Chinese mothers, a previous cohort study in Scotland found approximately 10% of women were incorrectly advised by health professionals to either stop breastfeeding from the affected breast or to cease breastfeeding altogether.<sup>3</sup> It is important that all mothers receive the correct advice to deal with the problem. Generally, the best form of mastitis management



is frequent and effective milk removal as it reduces milk stasis.<sup>2</sup>

A past history of mastitis has been identified as a plausible risk factor of mastitis in the literature.<sup>6,9</sup> However, only 6 Chinese mothers in our sample had previously experienced lactation mastitis so that the impact of past history could not be determined. Similarly, because only a few breastfeeding mothers wore tight bra (4%) or applied cream on their nipples (1%), neither of these factors were considered in the Poisson regression model.

Several limitations should be taken into account when interpreting the results. The case definition was based on self-report symptoms. It is possible that some affected women were not identified, which might explain the apparently low incidence. The follow-up period for the cohort was limited to six months due to resource constraint. Moreover, the study was conducted in one location in China. Although Sichuan is one of the most populous provinces, China is a vast country with diverse regional and cultural characteristics, so that the findings may not necessarily apply to lactation women in other parts of China. Further prospective studies of Chinese breastfeeding mothers are recommended in other provinces with longer follow-up period and diagnosis of mastitis confirmed by medical practitioners.

## **Conclusion**

The incidence of lactation mastitis within 6 months postpartum was low in Chinese mothers. Maternal stress and cracked and sore nipples were significant risk factors associated with the development of mastitis during the course of breastfeeding. To prevent against mastitis and

uncomfortable breastfeeding experience, instructions on the correct positioning of the baby at the breast during feeding should be emphasized. Providing guidance to new mothers on how to cope with stress is also important to prevent the recurrence of the condition.

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Table 1. Incidence density of lactation mastitis in Chinese mothers within six months postpartum

	Number of mastitis episodes	Number of women breastfeeding-weeks	Incidence density ( $\times 1000$ )
0–4 weeks	27	2449	11.02
5–8 weeks	15	2308	6.50
9–12 weeks	11	2169	5.07
13–16 weeks	6	2060	2.91
17–20 weeks	6	1907	3.14
21–26 weeks	4	2221	1.80
Total	69	13114	

Table 2. Incidence rate ratio (IRR) of lactation mastitis in Chinese mothers (n = 670) within six months postpartum

Variables	Mastitis (n = 42)	No mastitis (n = 628)	Crude IRR (95% CI)	Adjusted IRR (95% CI)	p
<b>Age</b>					
< 25 years	26 (61.9%)	355 (56.5%)	1.00	1.00	
≥ 25 years	16 (38.1%)	273 (43.5%)	0.82 (0.50, 1.33)	0.64 (0.34, 1.20)	0.165
<b>Education level</b>					
high school or below	38 (90.5%)	552 (87.9%)	1.00	1.00	
university	4 (9.5%)	76 (12.1%)	0.57 (0.23, 1.41)	0.65 (0.24, 1.72)	0.383
<b>Occupation</b>					
unemployed	17 (40.5%)	193 (30.7%)	1.00	1.00	
employed	25 (59.5%)	435 (69.3%)	0.84 (0.51, 1.39)	0.99 (0.60, 1.65)	0.972
<b>Method of delivery</b>					
vaginal delivery	12 (28.6%)	179 (28.5%)	1.00	1.00	
caesarean section	30 (71.4%)	449 (71.5%)	1.01 (0.60, 1.70)	0.96 (0.67, 1.62)	0.879
<b>Parity</b>					
primiparous	32 (76.2%)	504 (80.3%)	1.00	1.00	
multiparous	10 (23.8%)	124 (19.7%)	1.39 (0.81, 2.38)	1.92 (0.95, 3.92)	0.071
<b>Stress</b>					
no/seldom	7 (16.7%)	220 (35.4%)	1.00	1.00	

sometimes/often/always 35 (83.3%) 402 (64.6%) 3.18 (1.58, 6.41) 3.15 (1.56, 6.37) 0.001

Cracked and sore nipple

no 20 (45.2%) 403 (64.8%) 1.00 1.00

yes 22 (52.4%) 219 (35.2%) 2.38 (1.48, 3.84) 2.24 (1.38, 3.63) 0.001

Engorgement

no 8 (19.0%) 161 (25.9%) 1.00 1.00

yes 34 (81.0%) 461 (74.1%) 1.81 (0.93, 3.54) 1.62 (0.82, 3.21) 0.164

Empty breasts regularly

no/seldom/sometimes 33 (78.6%) 442 (71.1%) 1.00 1.00

often/always 9 (21.4%) 180 (28.9%) 0.69 (0.38, 1.23) 0.73 (0.40, 1.33) 0.307

Breastfed over 30 min

no 34 (81.0%) 535 (86.0%) 1.00 1.00

yes 8 (19.0%) 87 (14.0%) 1.11 (0.58, 2.11) 1.17 (0.61, 2.25) 0.634

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CI: Confidence interval