

BREAST-FEEDING PATTERNS IN RURAL CHINA: A  
POPULATION BASED STUDY

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Master's thesis

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Dec 2017

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YTIAN ZHANG: BREAST-FEEDING PATTERNS IN RURAL CHINA: A  
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Master's Thesis, 49 pages

Supervisors: Dr. Subas Neupane, PhD, Docent

Health sciences (Public Health)

Nov 2017

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## ABSTRACT

**Background:** Breast-feeding is considered to contribute infant's health and development, protecting children from a variety of acute and chronic disorders as well as potential benefits for mothers. Breastfeeding has also potential to protect against childhood obesity; however, the evidence on the risk factors of breastfeeding remains unclear especially in the context of rural settings.

**Objective:** The objective of this study is to analyze the patterns and determinants of breastfeeding in three rural provinces of China.

**Methods:** A survey of new mothers in five rural counties among three province-level administrative divisions (Anhui, Shanxi, and Chongqing) in China was conducted in 2009. Data were collected by an interview after the interventions, including the demographic and pregnancy related characteristics of the mothers. Exclusive breastfeeding was measured by asking mothers the duration of the breastfeed only (in months) and categorized into two (0 to 5 months and 6 to 11 months). Logistic regression was used to model the relationship of measured characteristics to the duration of exclusive breastfeeding. Odds ratios (ORs) and their 95% confidence intervals (CIs) were reported as the measure of the associations.

**Results:** The rate for exclusive breastfeeding over 6 months is relatively low. Only 3.9% of the babies received exclusive breastfeeding for more than 6 months in Chongqing. The key demographic determinants vary significantly among provinces. In Anhui, maternal age was found to be positively associated with exclusive breastfeeding duration, and in Shaanxi

family income was found negatively associated with exclusive breastfeeding duration. Mothers with higher education level in this study were less likely to practice exclusive breastfeeding.

**Conclusion:** Exclusive breastfeeding over 6 months is relatively low in rural China, however the pattern largely varied by province. The key demographic determinants of exclusive breastfeeding include maternal age, education, occupation, as well as paternal occupation and family income.

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## **LIST OF COMMONLY USED ABBREVIATIONS**

BMI	Body Mass Index
WIC	The Special Supplemental Nutrition Program for Women, Infants, and Children
CDC	Center for disease control and prevention
SPSS	Statistical Package for the Social Sciences
UNICEF	United Nations Children Fund
WHO	World Health Organization
NHFPC	National Health and Family Planning Commission

# 1 INTRODUCTION

Nutrition plays a significant role in health and development of children. The risk of severe illness and mortality of young children can be increased by poor nutrition (WHO, 2008; Black et al, 2008). Inappropriate nutrition can cause various health problems such as obesity, and for many countries, it become an increasingly serious problem in public health (WHO, 2008; Black et al, 2008). Breast-feeding provides health and developmental benefits for infants, and potential benefits for mothers, including protecting children from a variety of acute and chronic disorders (Jones & Steketee, 2003; Villegas & Gao, 2008). The World Health Organization (WHO) reported that neonatal mortality in low- and middle-income countries are 6 to 10 times higher if they are not breastfed (WHO, 2000; Bahl et al, 2005). Children who are artificially fed are exposed with higher risk to diarrhea and pneumonia, which may lead to early deaths. Breastfeeding can provide protection to infant against a number of other acute infections, e.g. otitis media, Haemophilus influenza meningitis and urinary tract infection (Oddy et al., 2004, Gdalevich et al., 2001). Moreover, breastfed children have a lower risk of long-term diseases such as asthma and other atopic conditions, type 1 diabetes, celiac disease, uncreative colitis, Crohn disease and childhood leukaemia (Oddy et al., 2004, Gdalevich et al., 2001). It has also been reported that breastfeeding has both short-term and long-term positive influence on children's intelligence and mothers' health.

Breastfeeding is the natural way of infant nutrition supply from ancient times. During the industrialization from 18th to 19th century, women in urban centers of Western world began dispensing with breastfeeding due to their work requirements. From 1900 to 1960, breastfeeding rate declined significantly due to the increasingly negative social attitude towards the practice and the popularization of infant formula (WHO, 2003). After 1960s, a revival of breastfeeding rate was observed continuing to the 2000s, together with existing negative attitudes. WHO recommend exclusive breast-feeding up to 6 months of age, and continued breast-feeding with complementary food up to two years age or beyond (WHO, 2001). However poor breastfeeding and complementary feeding practices are widely

reported, and the worldwide exclusive breastfeeding rate for first 6 months by estimation is only 34.8% (Bhandari, 2004). Complementary foods are often introduced inappropriately, either too early or too late and are often nutritionally inadequate and unsafe (WHO, 2009). Improvement of the situation has been observed from the data from 64 countries, which covering 69% births in the developing countries (WHO, 2009). The rate of exclusive breastfeeding for 6 months of life increased from 33% to 37% from 1996 to 2006 with Significant increases were made in sub-Saharan Africa, Latin America and the Caribbean (UNICEF, 2007).

China is a multi-cultural country with large population with unique history. Therefore, it has its own patterns of breastfeeding development. In China, the record shows that ‘any breast-feeding’ rate was originally over 80% in the 1950s. However, due to the prevailing use of breast-milk substitutes in the 1970s, breast-feeding rate experienced a dramatic decrease and reached bottom (13%) at late 1980s (Wang & Zhu,1991; Zhang & Liu, 2002). Promotion of breast-feeding became national priority in China after its importance had been realized in early 1990s (Naylor, 2001; Huang, 1995). In a review by Xu et al, 16 cohort studies of breastfeeding from different regions of China with similar methodology were summarized, indicating that during 1994-2000, the ‘any breastfeeding’ rate at four months had exceed 80% in most areas of China (Xu, Qiu, 2009). However, the rates of exclusive breast-feeding are still relatively low (Shi & Zhang, 2008). Moreover, due to the large landscape and significantly different development stages, the breastfeeding rates in different parts of China vary considerably, especially between more developed metropolis area on the East coast and less developed countryside in West China. The objective of this study is to analyze the patterns and determinants of breastfeeding in three rural provinces of China.

## **2 LITERATURE REVIEW**

For this review, the search strategy was to identify researches on exclusive breastfeeding practice in China and other developing countries. Key words search was implemented systematic through public portals such as Google Scholar, PubMed and World Health Organization (WHO). Following key words were included in the search: ‘child’, ‘rural China’, and ‘breastfeeding’. Additionally, relevant references cited by articles from searching results were also included.

### **2.1 Components and contents of Breast feeding**

There are two sets of internationally recognized definitions of various breastfeeding terms. The interagency Group for Action on Breastfeeding (IGAB) Consortium Definitions focus on the maternal/infant parameters related to the health outcomes and management issues associated with breastfeeding. In IGAB, breastfeeding practices are categorized into the following types:

1. Exclusive breastfeeding: No other liquid or solid from any other source enters the infant’s month.
2. Almost Exclusive: Allow occasional tastes of other liquids, traditional foods, vitamins, medicines, etc.
3. Full breastfeeding: Include exclusive and almost exclusive breastfeeding.
4. Full breast milk feeding (or fully breast milk fed): The infant receives expressed breast milk in addition to breastfeeding.
5. Partial: Mixed feeding, designated at high, medium, or low. Methods for classification suggested include percentage of calories from breastfeeding, percentage of feeds that are breastfeeds, etc. Any feeding of expressed breast milk would fall under this category.
6. Token: Minimal, occasional breastfeeds (for comfort or with less than 10 percent of the nutrition thereby provided.)



IGAB defines only breast-feeding and does not define other forms of feeding and differentiates breastfeeding from breast-milk feeding. The definition given by WHO primarily consider infant nutritional intake (Labbok, 2000), and does not consider the difference between breastfeeding and breast milk feeding. It defines breastfeeding as follows:

1. Breastfeeding: The child has received breast milk direct from the breast or expressed.
2. Exclusive breastfeeding: The infant has received only breast milk from the mother or a wet nurse, or expressed breast milk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines.
3. Predominant breastfeeding: The infant 's predominant source of nourishment has been breast milk. However, the infant may also have received water and water-based drinks, fruit juice; oral rehydration salts solution (ORS), drop and syrup forms of vitamins, minerals and medicines, and ritual fluids (in limited quantities). With the exception of fruit juice and sugar water, no food-based fluid is allowed under this definition.
4. Full breastfeeding: Exclusive breastfeeding and predominant breastfeeding together constitute full breastfeeding.
5. Complementary feeding: The child has received both breast milk and solid or semi-solid food.
6. Bottle-feeding: The child has received liquid or semi-solid food from a bottle with a nipple/teat.

There are additional categories introduced by WHO:

1. Full breastfeeding: infant is breastfed and may also receive small amount of culturally valued supplements- water, water-based drinks, fruit juice or ritualistic fluids.
2. Partial breastfeeding: mixed feeding with breast milk and other source of energy and nutrients.
3. Any breastfeeding: the child has received breast milk with or without other drink, formula or other infant food).

## **2.2 Evidence on impact of Breastfeeding**

Breast-feeding is the natural way of offering infants nutrients for growth, and it has clear impacts on children's health development (Horta, 2013).

### 2.2.1 Breastfeeding and short-term effect on Maternal and Child health

The short-term effects of breast-feeding are well-studied, and the benefits are supported by several studies. A systematic review conducted by Gdalevich & Mimouni (2001) confirmed that exclusive breast-feeding during early stage of infants' growth is accompanied with lower asthma rate during childhood. The protective effect from breast-feeding against the coeliac disease is suggested by Akobeng et al (2006). An earlier study by Kramer reached in a similar conclusion that full breast-feeding in the first 6 months after birth decreases morbidity from gastrointestinal and allergic diseases, without any negative effects on infants' growth (Kramer, & Kakuma, 2004). Moreover, a study by Edmond indicated that delayed breast-feeding increases risk of neonatal mortality significantly (Edmond & Zandoh, 2006). Dose-related protective effects of breast-feeding against infants' illness was investigated by Raisler, indicating that there may be a threshold level of breast-feeding to achieve the immunity benefits (Raisler, Alexander, 1999). A survey analyzed the data from 21036 mothers of children with age of 0–24 months in 105 counties of rural China. The researchers reported that the exclusive breastfeeding for babies under the age of 4 months decreased the risks of pneumonia and diarrhea. For children aged 4–6 months, the exclusive breastfeeding may decrease the risk of diarrhea as well (Wang, Wang, Kang, 2005).

### 2.2.2 Breastfeeding and long-term effect on Maternal and Child health.

In addition to the strong evidence of short-term effect, the long term developmental influence of breast-feeding is also discussed by recent studies. A systematic review conducted by Arenz et al, suggested small but consistent protective effect against obesity in children (Arenz & Ruckerl, 2004). Strong evidence of the association between breast-feeding and children's intelligence is claimed by Kramer et al (Kramer & Aboud, 2008). There are few studies

suggesting effects of breast-feeding in protecting children against diabetes and blood pressure, however the significance of these results remain to be investigated (Owen & Whincup, 2003; Owen & Martin, 2006)

Breast feeding may also provide benefits to mothers. For instance, according to the research by Villegas et al, breast-feeding may protect women from developing type 2 diabetes mellitus later in life (Villegas R & Gao YT, 2008). Moreover, there is evidence indicating protective effect of breast-feeding against breast cancers, although the biological mechanism remains unknown (Lipworth & Bailey, 2000).

### **2.3 Breastfeeding in China**

Breastfeeding is recognized as the common method of feeding babies. There is a strong relationship between breastfeeding and infant's health and future adulthood chronic disease prevention (WHO, 2001; Scott et al, 2001).

In past forty years, breastfeeding rates in China has changed over time. In urban and rural areas 'ever breastfed' rates were over 80% in the 1950s and 1960s (Xu, Qiu, Binns, 2009). However, during the 1970s, especially in larger cities, the rates began to decrease, due to the widespread of using breast milk substitutes (Wang & Zhu, 1991).

A breastfeeding education program operated in Beijing in 1983 in order to increase the breastfeeding rates, but it remained at a low level for another 10 years (Xu, Qiu, Binns, 2009). A survey covered 20 provinces in China showed that in 1984, the breastfeeding rates at four and six months were 42.5% and 34.4% in urban area, as for rural area the number were 69.95% and 60.35% (Liu, 1993).

The Chinese government set a target in the National Program of Action for Child Development in the early 1990s to address the decline in breastfeeding. The target was to achieve a

‘exclusive breastfeeding’ rate at 4 months of 80% national wide by 2000. (Niu, Zhao, Liu, 1993)

China started to establish the Baby Friendly Hospital movement during the 1990s. From 1992 to 1998, 6745 large or medium-sized hospitals and 3457 small hospitals initiated Baby Friendly services. Meanwhile many other initiatives begun to promote breastfeeding, for example Women and Child Health Protection Legislation, breastfeeding education program and society support program (Song, 1999). The breastfeeding rate in China started to increase in the 1990s. After the commencement of the Baby Friendly Hospital Initiative in Beijing, the data from Longfu Hospital in Beijing showed that the ‘any breastfeeding’ rate at 4 months increased significantly from 56% to 63% (from 1989-1992) to 83% (in 1993-1994), the ‘full breastfeeding’ rate increased from 28% to 40% during the program (Wang, Liang, Li, 1995).

The cohort study undertook in Chongqing in 2003 showed the ‘exclusive breastfeeding’ rate at four months were 64% which was higher than in 1999 (Liao, Xiao, Hu, Fei, 2003; Zhang, Wang, 2000).

A cohort study crossed 15 cities and regions in China reported that the ‘exclusive breastfeeding’ rate at 4 months in these place (except Luzhou) was below 80%, ranged from 11% to 80% (Niu, Zhao, Liu, 1993). The ‘any breastfeeding’ rates at four months in majority of the cities were reported over 80%. However, the ‘exclusive breastfeeding’ rate at four months did not reached the target by 80% (Xu, Qiu, Binns, 2009).

The data from the National Health and Family Planning Commission (NHFPC, 2014) illustrated that the rate of exclusive breastfeeding at 6 months in China's rural areas is only 30 percent, while the rate in China's urban areas is less than 16 percent. Researcher suggested in China the rate of exclusive breastfeeding is declining, in urban areas the decline is even bigger.

## 2.4 Factors affecting breastfeeding.

There are multiple factors influence breastfeeding duration. These factors are classified and presented into four groups: demographic variables, biological variables, social variables and psychological variables (Thulier, Mercer, 2009).

### 2.4.1 Demographic factors

The demographic factors which affect the breastfeeding patterns are race, maternal age, marital status, socioeconomic status, level of education, and effects of the Women, Infants and Children (WIC) (Thulier & Mercer, 2009).

- Race:

The data released by CDC of US showed that Asian women (16.1%) have the highest breastfeeding rates at 6 months, comparing the White (11.7%), Hispanic (11.6%), and Black women (7.9%) have the lowest rates. Despite the race, another study (Loiselle et.al. 2001) found that migration from one country to another may affect breastfeeding duration. Harely, et al (2007) found that Hispanic immigrants are more likely to breastfeed their baby compare with their counterparts who were born in U.S.

- Maternal Age

Amount of studies have found that maternal age is a predominant variable of breastfeeding duration (Scott et al, 2001; Thulier & Mercer, 2009; Doran & Schellenberg, 1998). It is reported that there is a positive association between breastfeeding duration and maternal age in developed countries (Doran & Schellenberg, 1998). A study in rural Africa concluded that older mothers are more likely to follow the advised duration of exclusive breastfeeding (Asfaw, Argaw & Kefene,2015). Moreover, the rate of mothers who provided exclusive breastfeeding

for six months or longer increased with higher maternal age (Dubois & Girard, 2003).

- Marital status:

It is reported that marital status can be an important factor which is associated with the practice of exclusive breastfeeding. In Nigeria, researchers found that single, divorced or widowed mothers are less likely to practice exclusive breastfeeding than the married mothers living with their husband and similar patterns were observed in DR Congo as well (Ajibade, 2013; Dhakal, 2017) . In developed countries, a study compared the difference in the incidence and the duration of breastfeeding across Canada, Australia, U.S. and Europe suggested married women had a higher incidence and duration of breastfeeding compared to unmarried women (Callen & Pinelli, 2004). These results indicate that husbands play influential roles in the practice of exclusive breast-feedings. Husbands are more often decision makers in family matters and more importantly they can provide financial support to promote and sustain exclusive breast-feedings. This assumption was supported by a study in Myanmar, which revealed that family member support contributed to adherence to exclusive breastfeeding by mothers (Thet, 2016).

- Education:

Educations of parents have a very strong impact on the perception of exclusive breastfeeding practice. Children with more educated parents are more likely to be exclusively breastfed than those children with less educated parents (Banu B, 2012).

Research data have shown that educated woman are more likely to breastfeed for longer periods of time (Scott & Binns, 1999; Susin et al., 1999). Literate mothers are more likely to obtain knowledge from reading healthcare materials such as promotional pamphlets, boasting media and billboards to aware the benefits of practicing EBF, and less likely to adhere the traditional beliefs and the local life-style where she lives, and therefore appreciate the merits of exclusive breastfeeding over

inclusive breastfeeding more than illiterate mothers (Aggarwal, 2008). Moreover, educated mothers are more likely to be well employed, with enough income to sustain the feeding practice (Ajibade, 2013). It is also claimed that father's education is necessary for improving the practice of exclusive breastfeeding, because the main household income earners are predominately male in a lot of regions with poor exclusive breastfeeding practice (Banu, 2012).

- Other socio-economic status:

It was reported that mother from socio-economic class with higher occupations typically had more positive attitude towards breast-feeding. Household income also plays important role in terms of attitudes towards breast-feeding. As the household income increase, the mothers attitude became more favorable towards breast-feeding (Sittlington, 2016)

Researchers have also shown that women from lower socioeconomic groups have decreased incidence and duration of breastfeeding (Coulibaly, Segguin, Zunzunegui, & Gauvin, 2006). Although it was studied that even low-income mothers usually acknowledge the health benefits of breastfeeding, the practice were affected by multiple barriers, which include lack of peer and family support, return to work or study, lack of conductive information to breastfeeding, and poverty with poor living conditions (Li, 2005).

- The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC):

There is a research compared rates of breastfeeding between women who participated in the WIC Special Supplemental Nutrition Program with those mothers who were not enrolled in WIC from 1978 to 2003, indicating that WIC participants had by an average of  $23.6 \pm 4.4$  percentage lower rates for the initiation of breastfeeding

compared to those non-WIC mothers. (Ryan, Zhou, 2006). The same research also revealed the WIC status was the strongest negative determinant of breastfeeding for mothers of infants 6 months of age. Mother not in the program were more than twice as likely to breastfeed their babies at 6 months age compared to the enrolled mothers.

#### 2.4.2 Biological factors

Biological factors refer to inadequate milk supply, infant health, maternal obesity, the physical challenges of breastfeeding, parity, maternal smoking, and mode of delivery (Thulier & Mercer, 2009).

- Inadequate milk supply:

The issue of insufficient milk supply is related to primary or secondary causes. A primary inability to fully breastfeed is related to anatomic breast abnormalities or hormonal demerit. These problems may affect up to 5% of women. Secondary causes of insufficient milk supply are related to problems in breastfeeding management. (Neifert, 2001) Comparing the situation in China, ‘perceived breast milk insufficiency’ is the most common reason for suspending ‘exclusive breastfeeding’ or ‘any breastfeeding’ (Xiang et al., 2001). It is described as a feeling of a mother that her supply is short to satisfy the baby (Hill & Humenick, 1989). Another study showed that the most common reason for Japanese women living in Perth, Australia deciding to cease breastfeeding was ‘insufficient breast milk’(Utaka et al., 2005). However, the reason ‘insufficient breast milk’ can just be an excuse; it may not reveal the true reason for discontinuing breastfeeding when the mothers need a socially acceptable reason to stop breastfeeding (Binns, Scott, 2002).

- Infant health:



Significant infant health problems may make breastfeeding difficult. A study showed that when babies were in a neonatal intensive care unit (NICU) in the U.S., parents without medical insurance faced extra barriers due to lack of breast pumps and regular contact with the babies (Merewood, Philipp, Chawala and Cimo, 2003). Similarly, mother or child illness were the main reasons for ceasing breastfeeding or utilizing complementary food in China (Xiang et al. 2001). In Beijing, health problem of the mothers or baby ranked third in the reasons for terminating breastfeeding with a 14-20% share of all reasons (Liu, Lin & Liang, 1999). In Shanghai, this reason ranked second for terminating breastfeeding and third for introducing complementary food at early time in Shanghai (Wu, Zhou & Zhu, 2001). New mothers experienced common breast problems such as sore and inverted nipples, and mastitis in breastfeeding especially in the first month (Wu, Zhou & Zhu, 2001). A study showed that physical challenges of breastfeeding have a negative association with breastfeeding duration for some women (Gatrell, 2007). The discomfort caused by sore nipples, mastitis, engorgement, and plugged ducts are the reasons for stopping breastfeeding (Simard et al, 2005; Wambach et al., 2005).

- Maternal obesity:

Researchers found that there is an association between high prepregnant body mass index of the mother and early weaning. (Baker et al., 2007)

In a study of maternal obesity before conception, a study theorized that excess maternal fatness may affect the development of the mammary gland. Maternal adiposity may also cause hormonal and metabolic abnormalities which may lead to delayed milk production. Preterm birth or birth of a large baby are also associated with breastfeeding difficulties (Rasmussen, 2007).

- Maternal smoking:

Maternal smoking can also decrease the duration of breastfeeding. A study demonstrated that smoking is strongly associated with weaning by 10 weeks (Scott et al. 2006). The association between increased risk of short exclusive breast-feeding practice and smoking was reported in Sweden, and similarly, it was indicated in the previous national dietary survey among infants in Norway, that the odds of exclusive breastfeeding at 4 months of age for smoking mothers were significantly lower than non-smoking mothers (Huus, 2008). Consistent negative association between breastfeeding and mother's smoking has been reported in multiple studies (Dennis, 2002; Thulier, 2009). Maternal smoking was found to be a stable variable due to its negative association with exclusive breast-feeding at every month from 3 to 5 months of age and with breast-feeding from 2 to 12 months of age (Kristiansen, 2010).

- Parity:

Some researchers have reported that increased parity may lead to a longer duration of breastfeeding. They found that prior breastfeeding experience may arouse continued breastfeeding at 6 weeks of postpartum (Hass et al., 2006). The data from the Third National Health and Nutrition Examination Survey revealed that multiparous women were less likely to initiate breastfeeding, even if they prefer breastfeeding their babies for a longer duration (Li et al., 2001). However, the reported association between parity and breast-feeding is inconsistent. No association was observed in Sweden (Ekström et al., 2003) or China (Guo et al., 2010). Moreover, some studies reported negative association indicating that primiparous mothers were more likely to imitate and continue exclusive breast-feeding (Ever-Hadani et al., 1994, Tarrant et al., 2010).

- Mode of delivery:

Caesarean section has become increasingly common in China since the mid-1990s. A cohort study conducted in Shanghai indicated that breastfeeding rates at 1,6,12 months in the caesarean group with a Hazard Ratio of 1.21(95% CI: 1.10- 1.33),

which means the women in the caesarean group are more likely to stop exclusive breastfeeding earlier (Wang et al., 2006). The relationship between mode of delivery and breastfeeding has not been reported consistently. During the 1980s and the 1990s, reports suggested that Cesarean may delay the initiation of breastfeeding or interfere with the attempt to nurse. (Chen, Nommsen-Rivers, Dewey, & Lonnerdal, 1998). Data from a study showed that the relationship between Cesarean delivery, breastfeeding success, and duration is negative (Shawky & Abalkhail, 2003). Other studies have suggested that there is a negative relationship between a Cesarean delivery and initiating breastfeeding (Dennis, 2003). However, once breastfeeding has started the mode of the delivery cannot affect the duration (Dennis, 2003). The researchers even found out that Australian women who had the delivery by Caesarean were more likely to breastfeed for longer periods than those who had delivered vaginally, and they concluded that there was no correlation between the delivery mode and breastfeeding (Scott, Landers, Hughes, & Binns, 2001).

#### 2.4.3 Social factors

Several social factors are associated with breastfeeding duration, including maternal work outside home, working hours per week, constant and appropriate support from health care professionals, and breastfeeding support of the other maternal grandmother and close friends. In China, incorrect traditional perceptions were special factors affecting the ‘exclusive breastfeeding’ rate (Thulier & Mercer, 2009).

- Working:

Earlier findings have confirmed a negative correlation between working and breastfeeding duration. Women who returned to work before 6 months are less likely to provide 6-month exclusive breastfeeding and 12-month continuous breastfeeding after delivery (Scott et al., 2006).

In China, a mother returning to work is an important reason for ceasing breastfeeding or early introduction of complementary food (Wang, Xu, Mei, 2000). The maternity leave for working mothers comprises three months delivery leave and one-month lactation leave in China (Wang, Zhu, Tong, 1991). As ‘exclusive breastfeeding’ requires six months, the total four months leave is not enough. In some companies, especially in metropolitan cities, maternity leave is less than four months. In Zhong Shan City of Guangdong province, the average delivery leave is only about two months (67 days) and only 2.6% of work places provide breastfeeding room (Gu, 2003).

- Father’s knowledge, attitude, and support:

A cohort study identified a positive correlation between a father’s knowledge, attitude, and support and the chance of extending breastfeeding (Scott et al., 2006).

In a cohort study from the US, the researchers analyzed the correlation between the relationship characteristics and parental gender roles with breastfeeding duration. High relationship distress was found to lead to early breastfeeding cessation. Women who had greater relationship distress were more likely to stop breastfeeding before 4 months than other women (Sullivan et al., 2004)

- *Professional support:*

A lack of skilled professional support may decrease the duration of breastfeeding. A longitudinal survey in the US found that the risk factors associated with breastfeeding duration included the perceived attitudes of hospital staff toward breastfeeding which were associated to women’s breastfeeding experience. The results also revealed that even a perceived neutral attitude regarding breastfeeding from the health providers was related to stopping breastfeeding before 6 weeks, especially among mothers who originally attempted to breastfeed for a short time. (DiGirolamo, Grummer-Strawn,

& Fein, 2003)

In a Cochrane review, researchers tried to find the effectiveness of ways used to encourage women to breastfeed. Sufficient evidence was found to prove that prenatal education had made great effects on increasing breastfeeding initiation rates (Dyson, McCormick, & Renfrew, 2005). In another study, however, there were no evidence to prove that increased prenatal education can lead to an improved breastfeeding duration (Gill et al, 2007).

Professional support can improve duration as soon as breastfeeding has been initiated. Perez-Escamilla, Cobas, Balcazar & Benin (1999) found that early supportive postpartum experience in the hospital during first 2 weeks postpartum may prolong lactation and increase the length of exclusivity.

Similar results were found in Swiss and U.S studies which indicate that babies born in baby-friendly health facilities were more likely to accept longer breastfeeding duration (Merten, Dratva, Ackermann, 2005). Results from the Colorado, US showed that duration could be significantly increased when mothers experienced several specific hospital practices (Murray, Ricketts, & Dellaport, 2006).

In Sui Dynasty (581-618AD), the Chinese people already had the tradition of introducing complementary food early to infants (Hsiung, 1995). Even nowadays, in China the old traditional perceptions still strongly influence ‘exclusive breastfeeding’, especially in less developed and minority areas (Chen, Hu, 1996). In Hubei province, half of the women who introduced complementary food before four months reported that the most common reason was that they wanted to follow traditional feeding patterns (Wang, Xu, Mei, 2000). In a study from China, mothers had the concern that their breast milk was ‘too thin’ to meet their baby’s requirement; therefore, they attempted to add cereal to complement breast milk (Lin, Li, Wu, 1997). However, some mothers had the opinion that the baby should be weaned before being

one-year old (Dang, Yan, Wang, Zeng, Xie, 2001). Another erroneous attitude is 'breastfeeding is not good for mothers'. According to a survey from 1983 to 1985 at the Beijing Women Hospital, nearly half of mothers and the relatives considered breastfeeding as 'increased a mother's burden', and breastfeeding a baby may affect mother's health or destroy the mother's shape (Chen, Ji, 1993).

#### 2.4.4 Psychological factors

The psychological factors that may influence breastfeeding duration include prenatal maternal intention, mother's interest in breastfeeding and mother's confidence in the ability to breastfeed (Thulier & Mercer, 2009).

In a study focusing on the relationship between psychological factors and breastfeeding duration, the researchers reported that positive intent, attitudes, and beliefs had a positive influence on breastfeeding duration (Kronborg, Vaeth, 2004). Australian researchers reported that regarding breastfeeding, among all psychological factors the most important factors were prenatal maternal intention and interest in breastfeeding (Forster, McLanchlan, Lumley, 2006).

The same results were replicated in different studies. If women were at risk for premature cessation, they made up their mind to breastfeed later in their pregnancies, illustrated negative attitudes toward breastfeeding and were prone to bottle-feeding, as well as showed low confidence in their ability to breastfeed (Avery, Duckett, Dodgson, Savik, & Henly, 1998; Dennis, 2003).

### **3 AIMS OF THE STUDY**

The main aim of the study is to analyze the pattern and determinants of breast feeding in three provinces of rural China.

#### **3.1 Specific Objectives**

- 1 To determine the prevalence of exclusive and non-exclusive breast feeding among new mothers
- 2 To analyze the factors associated with the breast-feeding patterns across three provinces
- 3 To analyze the difference of breast feeding patterns in three provinces

#### **3.2 Study Hypothesis**

$H_0$ : The determinants in this study have no significant association with the prevalence of exclusive breast-feeding among new mothers.

## **4 MATERIALS AND METHODS**

### **4.1 Data Collection**

The data for this study was collected from a survey of new mothers in five rural counties among three province-level administrative divisions (Anhui, Shanxi, and Chongqing) in China, including provinces and one municipality. The survey was used to evaluate prenatal care interventions under the ‘Structural hindlers to and Promoters of Good Maternal Care in Rural China’ (CHIMACA) project in 2007 and 2008 (Neupane et al, 2014; Neupane et al, 2016). The five counties were selected based on the levels of the poverty and consist of 94 townships that were cluster randomized into various prenatal care interventions. Data were collected by an interview after the interventions, and the information includes the use of maternal health care, care content, satisfaction, and barriers to use of care and women’s and their spouses’ background characteristics and women’s behavior during pregnancy. The total number of villages included in the survey were 485, targeting all women who had given birth during 2008. Total number of 5567 women were identified through doctors and family planning workers, using birth registers of township hospitals and by snowballing (i.e. the use of referrals from initial subjects to generate additional subjects), with 71% interviewed. Women were contacted in advance either by telephone or home visiting. At maximum two attempts were made for each individual. If the woman is not at home, a relative of the woman, if available, was interviewed as a proxy respondent, accounting for 7% of the study population.

The interviews were conducted by trained interviewers and each interview lasts for 20-30 min. The interview instrument was a 79-item structured questionnaire that was piloted and modified accordingly. The questionnaire for the relatives included 54 questions on the same topics. The questionnaire was made in English, translated into Chinese and checked against the English version by a bilingual researcher.

#### **4.1.1 Measurement of variables**



***Mother age*** is measured as the numerical value of years at the time of delivery. In analysis, the values are categorized into three groups, less than 25, 25 to 34, more than 34.

***Mother education level*** is measured as classified groups: illiteracy or semi- illiteracy, primary school, middle school, high school, college or higher. In analysis, the values are further categorized into three groups: illiteracy or semi- illiteracy/primary school, middle/high school, university.

***Father education level*** is measured as classified groups: illiteracy or semi- illiteracy, primary school, middle school, high school, college or higher. In analysis, the values are further categorized into three groups: illiteracy or semi- illiteracy/primary school, middle/high school, university.

***Mother occupation*** is measured as classified groups: farmer (agriculture, forestry, animal husbandry and fishery), city - farmer – laborer, rural farmer – laborer, urban and rural unemployed and semi-unemployed, industrialist without agricultural residence registration, private commercial household, attendant in the tertiary industry, governor of government agency or institution, senior or secondary executive in large or medium-sized enterprise(not the owner), owner of private enterprise, professional technical personnel, the staff of company or some kind of department, student, retired. In analysis, the values are further categorized into two groups: farmers, others.

***Father occupation*** is measured as classified groups: farmer (agriculture, forestry, animal husbandry and fishery), city - farmer – laborer, rural farmer – laborer, urban and rural unemployed and semi-unemployed, industrialist without agricultural residence registration, private commercial household, attendant in the tertiary industry, governor of government agency or institution, senior or secondary executive in large or medium-sized enterprise(not the owner), owner of private enterprise, professional technical personnel, the staff of company or some kind of department, student, retired. In analysis, the values are further categorized into two groups: farmers, others.

**Family total income** is measured as numerical values of CNY as the family total income from last year. In analysis, the values are categorized into three groups: less than 15000, 15000 – 30000, more than 30000.

**Baby gender** is measured as classified groups: male, female. In analysis, the same measurement is applied.

**First breastfeeding time** is measured as classified groups: within half an hour after birth, within 24 hours after birth, later than the 24 hours after birth, never. In analysis, the same measurement is applied.

**First prenatal care** is measured as numerical values of months. In analysis, the values are categorized into three groups: 1-3, 4-6, 7-10.

**Prenatal visits times** is measured as numerical values of counts. In analysis, the values are categorized into three groups: 0, 1-4, more than 5.

**Frequency of postnatal checkup** is measured as numerical values of counts. In analysis, the values are categorized into three groups: 0, 1-2, at least 3.

**Pregnancy weeks** is measured as numerical values of counts. In analysis, the values are categorized into three groups: 37, 37 to 42, more than 42.

**Mode of delivery** is measured as categorized groups: vaginal delivery, assisted delivery, cesarean section. In analysis, the values are categorized into two groups: normal vaginal birth, caesarean section.

**Birth weight** is measured as numerical values in kg. In analysis, the values are categorized into three groups: low birthweight, normal weight, overweight.

**Birth place** is measured as categorized groups: county level or above hospital, county or higher level maternal and child health care institution, township hospitals, the health room

in the village, home, on the way. In analysis, the values are categorized into two groups: county or higher-level hospital, township hospital and others.

*Baby healthy* at birth is measured as Boolean values. In analysis, the same measurement is applied.

*Exclusive breastfeeding* as an outcome variable was measured by asking mothers the duration of the breastfeed only (in months) using a question “How long did you breastfeed your baby” and the response were provided in months. In this analysis exclusive breastfeeding was categorized into two (0 to 5 months and 6 to 11 months).

## **4.2 Statistical analysis**

The descriptive statistics of the background variables including the outcome variable stratified by the study provinces were first reported. The significance level for the difference between the province was calculated by Person’s chi-squared test. Prevalence of exclusive breastfeeding were reported in numbers and percentages according to background characteristics and by pregnancy related variables. Logistic regression analysis was fitted to exam the associations. The odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated for the associations of maternal demographic characteristics and pregnancy related characteristics with exclusive breastfeeding stratified by province. All analysis was done using SPSS 22.

## 5 RESULTS

Table 1 shows the frequency distribution of demographic characteristics of mothers across three provinces. The age structure of mothers was significantly different by provinces; in Anhui and Shaanxi province, highest proportion of women were aged from 25 to 34 years, whereas in Chongqing highest proportion of women were of the youngest age group. The distribution of maternal and father's educational level was significantly varied between three provinces, with Shaanxi had more educated mothers and fathers compared to Anhui and Chongqing. The occupation of mother and father was also differed significantly by province. According to mother's occupation, Shaanxi had more farmers (40%) but according to father's occupation Chongqing had comparatively more (20%) farmers. The family income structure was also significantly different by provinces. In Anhui province, a quarter (23.8%) of family earned more than 30000CYN, whereas in Chongqing and Shaanxi only 10% and 5.2% of the families fell into this income group. Moreover, the distribution of babies' gender is significantly differentiated between provinces, with Anhui has more (59.1%) female new born babies and Chongqing has more (54.4%) male new born babies.

**Table 1:** Demographic characteristics of mothers stratified by study provinces

Characteristics	N=3671	Anhui (n=1515)	Chongqing (n=544)	Shaanxi (n=1614)	p-value
<b>Mother age</b>					<0.001
<25	1471	567 (37.4)	248 (45.6)	656 (40.6)	
25-34	1839	765 (50.5)	227 (41.7)	847 (52.5)	
>=35	363	183 (12.1)	69 (12.7)	111 (6.9)	
<b>Mother education level</b>					<0.001

<b>illiteracy or semi-illiteracy/primary school</b>	805	430 (28.4)	120 (22.9)	255 (16.6)
<b>middle/high school</b>	2654	1050 (69.3)	384 (73.1)	1220 (79.5)
<b>university</b>	115	35 (2.3)	21 (4.0)	59 (3.8)
<b>Father education level</b>				<0.001
<b>illiteracy or semi-illiteracy/primary school</b>	459	227 (15.0)	85 (15.9)	147 (9.5)
<b>middle/high school</b>	2969	1225 (80.9)	427 (80.0)	1317 (84.7)
<b>university</b>	176	63 (4.2)	22 (4.1)	91 (5.9)
<b>Mother occupation</b>				<0.001
<b>farmers</b>	1165	352 (23.2)	156 (28.8)	657 (40.7)
<b>others</b>	2505	1163 (76.8)	386 (71.2)	956 (59.3)
<b>Father occupation</b>				0.031
<b>farmers</b>	611	233 (15.4)	110 (20.3)	268 (16.6)
<b>others</b>	3059	1282 (84.6)	432 (79.7)	1345 (83.4)

<b>Family total income</b>					<0.001
<b>&lt;15000 CYN</b>	1570	381 (27.8)	230 (48.9)	959 (64.3)	
<b>15000-30000 CYN</b>	1310	662 (48.4)	193 (41.1)	455 (30.5)	
<b>&gt;30000 CYN</b>	450	326 (23.8)	47 (10.0)	77 (5.2)	
<b>Baby gender</b>					<0.001
<b>male</b>	1690	619 (40.9)	295 (54.4)	776 (48.1)	
<b>female</b>	1980	896 (59.1)	247 (45.6)	837 (51.9)	

Table 2 describes the pregnancy related characteristics of mother by province. The rate of exclusive breastfeeding varies significantly between the three provinces, with Chongqing has a much higher (96.1%) the exclusive breastfeeding rate compared to Anhui (82.4%) and Shaanxi (78%). The distribution of first breastfeeding time was also significantly different by provinces, for instance, in Shaanxi a majority (70.6) of the mothers did not breastfeed their babies within 24 hours after the delivery, whereas in Chongqing more than half (51.6) of the mothers managed to breastfeed their babies within 24 hours after delivery. Moreover, the proportion of mothers who feed their babies within half an hour after the delivery in Chongqing was 13.2%, which was approximately four times of the number (3.0%) in Shaanxi. The distribution of first time prenatal care time was significantly varies between the three provinces, with mothers in Anhui had a lower rate (65.6%) in receiving first time prenatal care within 1-3 months compared to those in Chongqing (74.8%) and Shaanxi (76.7%). Considerable difference between the postnatal checkup patterns among the provinces was observed, for example, in Anhui and Shaanxi, more than half of the women did not take the postnatal checkup (68.9% in Anhui and 51.6% in Shaanxi), and the rate was much lower in Chongqing, only one third (38.4%) of the women did not take postnatal checkup. In terms of the delivery mode, it also varies significantly between provinces, as in Anhui most women had chosen caesarean section (71.2%) but vaginal birth was more popular in Chongqing (56.9%) and Shaanxi (76.6%).

The distribution of birthweight was also significantly differed by provinces, with Anhui (6.5%) has twice as many as over weighted babies than Chongqing (3.7%) and Shaanxi (3.1%). Similarly, the pattern varies significantly between the three provinces in terms of delivery place, for example, in Shaanxi more babies (73.8%) were delivered in county or higher-level hospital, and in Anhui (62.3%) and Chongqing (60.2%) more babies were delivered in Township hospital and others.

**Table 2:** Pregnancy related characteristics of mother by stratified by study provinces

<b>Characteristics</b>	<b>N=3671</b>	<b>Anhui</b>	<b>Chongqing</b>	<b>Shaanxi</b>	<b>p-value</b>
<b>Exclusive breastfeeding</b>					<0.001
0-5months	2851	1248(82.4)	489(96.1)	1114(78.0)	
6-11months	601	267(17.6)	20(3.9)	314(22.0)	
<b>First breastfeeding time</b>					<0.001
Within half an hour after the delivery	230	110(7.3)	71(13.2)	49(3.0)	
Within 24 hours after the delivery	893	404(26.7)	207(38.4)	282 (17.5)	
More than 24 hours after the delivery	2297	928(61.3)	233(43.2)	1136(70.6)	
never	242	73(4.8)	28(5.2)	141(8.8)	

<b>First prenatal care</b>					<0.001
1-3 month	2575	974(65.6)	391(74.8)	1210(76.7)	
4-6 months	902	464(31.3)	115(22.0)	323(20.5)	
7-10 month	108	46(3.1)	17(3.3)	45(2.9)	
<b>Prenatal visits times</b>					0.166
No visit	49	16(1.1)	11(2.0)	22(1.4)	
1-4 visits	1111	443(29.2)	154(28.3)	514(31.8)	
5+ visits	2513	1056(69.7)	379(69.7)	1078(66.8)	
<b>Frequency of postnatal check up</b>					<0.001
0	2054	1044(68.9)	192(35.5)	818(51.6)	
1-2 times	905	372(24.6)	208(38.4)	325(20.5)	
>=3 times	683	99(6.5)	141(26.1)	443(27.9)	
<b>Pregnancy weeks</b>					<0.001
<37 weeks	203	134(8.8)	32(7.2)	37(3.2)	
37-42 weeks	2899	1375(90.8)	415(92.8)	1109(94.9)	
>42 weeks	29	6(.4)	0(0)	23(2.0)	
<b>Mode of delivery</b>					<0.001



Normal vaginal birth	1964	437(28.8)	306(56.9)	1221(76.6)
Caesarean section	1682	1078(71.2)	232(43.1)	372(23.4)
<b>Birth weight</b>				<0.001
low birthweight	105	39(2.6)	21(3.9)	45(2.8)
normal weight	3369	1377(90.9)	494(92.3)	1498(94.0)
overweight	169	99(6.5)	20(3.7)	50(3.1)
<b>Birth place</b>				<0.001
County or higher-level hospital	1977	571(37.7)	216(39.8)	1190(73.8)
Township hospital and others	1694	944(62.3)	327(60.2)	423(26.2)
<b>Baby healthy at birth</b>				0.009
yes	3548	1477(97.5)	529(97.8)	1542(95.8)
no	118	38(2.5)	12(2.2)	68(4.2)

Table 3 shows the Prevalence of exclusive breastfeeding of mother in each category of demographic related characteristics by provinces. The age structures of mothers who gave exclusive breastfeeding were similar in all three provinces. Most of the mothers were aged between 25-34, and the smallest age groups were those mothers aged over 35. In terms of education level, the distributions were similar among the provinces, most of the exclusive breastfeeding mothers and their spouses had middle/high school level of education. In Anhui and Shaanxi, there are more non-farmer mothers gave exclusive

breastfeeding to their babies than mothers who were farmers. In all three provinces, there are more non-farmer fathers than farmer fathers whose babies were exclusive fed. The distribution of family income for exclusive breastfeeding mothers are significantly different among the province: in Anhui, most of these families had annual income between 15000-30000CNY (49.2%), and there are relatively higher portion (19.9%) of families with annul income more than 30000CNY than in Chongqing (5.6%) and Shaanxi (4.4), whereas in Chongqing (66.7%) and Shaanxi (67.1%), most of the exclusive breastfeeding mothers had annual income less than 30000CNY. In all three provinces, there are more female babies received exclusive breastfeeding than male babies.

**Table 3:** Prevalence of exclusive breastfeeding of mother of different demographic characteristics by provinces

Characteristics	Exclusive breast feeding				p-value
	Total	Anhui (n=267)	Chongqing (n=20)	Shaanxi (n=314)	
<b>Mother age</b>					0.004
<25	224 (37.3)	85(31.8)	8 (40.0)	131 (41.7)	
25-34	312 (52.1)	141 (52.8)	9 (45.0)	163 (51.9)	
>=35	64 (10.6)	41 (15.4)	3 (15.0)	20 (6.4)	
<b>Mother education level</b>					0.001
illiteracy or semi-illiteracy/primary school	151 (25.7)	91 (34.1)	5 (25.0)	55 (18.3)	
middle/high school	426 (72.4)	173 (64.8)	15(75.0)	238 (79.1)	
university	11 (1.9)	3 (1.1)	0 (0)	8 (2.7)	

<b>Father education level</b>	N=587	N=267	N=20	N=300	0.079
<b>illiteracy or semi-illiteracy/primary school</b>	70 (11.9)	42 (15.7)	3 (15.0)	25 (8.3)	
middle/high school	494 (84.2)	215 (80.5)	17 (85.0)	262 (87.3)	
university	23 (3.9)	10 (3.7)	0 (0)	13 (4.3)	
<b>Mother occupation</b>	N=600	N=267	N=20	N=313	0.002
farmers	217 (36.2)	77 (28.8)	11(55.0)	129(41.2)	
others	383 (63.8)	190 (71.2)	9(45.0)	184(58.8)	
<b>Father occupation</b>	N=601	N=267	N=20	N=314	0.002
farmers	114 (19.0)	57 (21.3)	9(45.0)	48(15.3)	
others	487 (81.0)	210 (78.7)	11(55.0)	266(84.7)	
<b>Family total income</b>	N=559	N=246	N=18	N=295	<0.001
<15000 CYN	286 (51.2)	76 (30.9)	12(66.7)	198(67.1)	
15000-30000 CYN	210 (37.6)	121 (49.2)	5(27.8)	84(28.5)	
>30000 CYN	63 (11.3)	49 (19.9)	1(5.6)	13(4.4)	
<b>Baby gender</b>	N=600	N=267	N=20	N=313	0.016
male	259(43.2)	98 (36.7)	9(45.0)	152(48.6)	

female	341(56.8)	169 (63.3)	11(55.0)	161(51.4)
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Table 4 shows the Prevalence of exclusive breastfeeding of mother in each category of pregnancy related characteristics by provinces. The first breastfeeding time varies significantly among the provinces: in Chongqing, exclusive breast-feeding mothers were more likely to feed their babies between half an hour and 24 hours after delivery, and the portion of mothers who fed their babies within half an hour is relatively higher (15.0%) than Anhui (5.5%) and Shaanxi (5.1%). In all these three provinces, most exclusive breastfeeding mothers had their first pre-natal care between the first one to three months of pregnancy and most exclusive breastfeeding mothers had more than 5 times of pre-natal visits. The duration of pregnancy mostly fell between 37 to 42 weeks for exclusive breastfeeding mothers from all these three provinces. The mode of delivery and delivery place for the exclusive breast-feeding mothers varies significantly among the different provinces. In Chongqing and Shaanxi, exclusive breastfeeding mothers were more likely to have normal delivery, and in Anhui more breastfeeding mothers chose caesarean section. In Anhui and Chongqing, most the exclusive breast-feeding mothers chose giving birth to the babies in Township hospital and others, whereas in Shaanxi, they were most likely to deliver in county or higher-level hospitals.

**Table 4:** Prevalence of exclusive breastfeeding of mother of different pregnancy related characteristics by provinces

Characteristics	Exclusive breast feeding				p-value
	Total	Anhui	Chongqing	Shaanxi	
<b>First breastfeeding time</b>	N=600	N=267	N=20	N=313	<0.001
Within half an hour after the delivery	33(5.5)	14(5.2)	3(15.0)	16(5.1)	

Within 24 hours after the delivery	133(22.2)	67(25.1)	10(50.0)	56 (17.9)	
More than 24 hours after the delivery	427(71.2)	179(67.0)	7(35.0)	241(77.0)	
never	7(1.2)	7(2.6)	0(0)	0(0)	
<b>First prenatal care</b>	N=589	N=258	N=20	N=311	0.261
1-3 month	413(70.1)	171(66.3)	12(60.0)	230(74.0)	
4-6 months	148(25.1)	72(27.9)	7(35.0)	69(22.2)	
7-10 month	28(4.8)	15(5.8)	1(5.0)	12(3.9)	
<b>Prenatal visits times</b>	N=601	N=267	N=20	N=314	0.632
No visit	4(0.7)	3(1.1)	0(0)	1(0.3)	
1-4 visits	193(32.1)	90(33.7)	5(25.0)	98(31.2)	
5+ visits	404(67.2)	174(65.2)	15(75.0)	215(68.5)	
<b>Frequency of postnatal check up</b>	N=598	N=267	N=20	N=311	<0.001
0	321(53.7)	175(65.5)	5(25.0)	141(45.3)	
1-2 times	141(23.6)	77(28.8)	11(55.0)	53(17.0)	
>=3 times	136(22.7)	15(5.6)	4(20.0)	117(37.6)	
<b>Pregnancy weeks</b>	N=521	N=267	N=16	N=238	0.015

<37 weeks	29(5.6)	23(8.6)	1(6.3)	5(2.1)	
37-42 weeks	487(93.5)	243(91.0)	15(93.8)	229(96.2)	
>42 weeks	5(1.0)	1(0.4)	0(0)	4(1.7)	
<b>Mode of delivery</b>	N=594	N=267	N=19	N=308	<0.001
Normal vaginal birth	324(54.5)	76(28.5)	11(57.9)	237(76.9)	
Caesarean section	270(45.5)	191(71.5)	8(42.1)	71(23.1)	
<b>Birth weight</b>	N=600	N=267	N=20	N=313	0.146
low birthweight	14(2.3)	5(1.9)	1(5.0)	8(2.6)	
normal weight	557(92.8)	244(91.4)	17(85.0)	296(94.6)	
overweight	29(4.8)	18(6.7)	2(10.0)	9(2.9)	
<b>Birth place</b>	N=601	N=267	N=20	N=314	<0.001
County or higher-level hospital	320(53.2)	91(34.1)	7(35.0)	222(70.7)	
Township hospital and others	281(46.8)	176(65.9)	13(65.0)	92(29.3)	
<b>Baby healthy at birth</b>	N=601	N=267	N=20	N=314	0.153
yes	580(96.5)	262(98.1)	19(95.0)	299(95.2)	
no	21(3.5)	5(1.9)	1(5.0)	15(4.8)	

Table 5 presented the odds ratio (OR) and their 95% confidence intervals (CIs) for exclusive breastfeeding due to various maternal demographic characteristics in different provinces. The maternal age was not significantly associated with exclusive breastfeeding in total sample, but in Anhui province the oldest age group of mothers was significantly associated to exclusive breastfeeding compared to the youngest age group of mothers (OR=1.64,95% CI= 1.08-2.48). Mother’s educational level with university level of education was found to be significantly associated with exclusive breastfeeding with lower odds (OR=0.47, 95%CI =0.25-0.90) in total population, but in Anhui province mothers with middle/higher education had significantly lower odds of exclusive breastfeeding compared to the mother with no education-primary education. According to the result, mother’s occupation was significantly associated with exclusive breastfeeding, for example, the group with “other” occupations had significantly lower odds compared to the group “farmer” occupations, in Anhui (0.70 ,95%CI 0.52-0.94), Chongqing (0.31, 95%CI 0.13-0.77) and total populations (0.64-0.92). However, father’s occupation was not significantly associated with exclusive breastfeeding in total, but in Anhui and Chongqing province the group with “other” occupations had significantly lower odds.

**Table 5:** Odd ratio (OR) and 95% confidence interval (CI) for exclusive breastfeeding due to maternal demographic characteristics in different provinces

<b>Characteristics</b>	<b>Total</b>	<b>Anhui</b>	<b>Chongqing</b>	<b>Shaanxi</b>
<b>Mother age</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>
<25	1	1	1	1
25-34	1.16(0.96-1.40)	1.28(0.96-1.72)	1.28(0.48-3.37)	0.98(0.75-1.27)
>=35	1.21(0.89-1.65)	1.64(1.08-2.48)	1.48(0.38-5.76)	0.93(0.55-1.58)
<b>Mother education level</b>				

illiteracy or semi-illiteracy/primary school	1	1	1	1
middle/high school	0.85(0.69-1.04)	0.74(0.55-0.98)	0.90(0.32-2.53)	0.91(0.65-1.28)
university	0.47(0.25-0.90)	0.35(0.11-1.17)	NA	0.59(0.26-1.32)

**Father education level**

illiteracy or semi-illiteracy/primary school	1	1	1	1
middle/high school	1.13(0.86-1.48)	0.94(0.65-1.35)	1.04(0.30-3.64)	1.29(0.82-2.03)
university	0.84(0.51-1.40)	0.83(0.39-1.77)	NA	0.83(0.40-1.73)

**Mother occupation**

farmers	1	1	1	1
others	0.77(0.64-0.92)	0.70(0.52-0.94)	0.31(0.13-0.77)	0.98(0.76-1.27)

**Father occupation**

farmers	1	1	1	1
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others	0.80(0.64- 1.01)	0.61(0.43- 0.84)	0.29(0.12- 0.72)	1.08(0.77-1.53)
<b>Family total</b>				
<b>income</b>				
<15000 CYN	1	1	1	1
15000-30000 CYN	0.90(0.65- 1.24)	0.46(0.16- 1.34)	0.85(0.64- 1.13)	0.81(0.67-0.99)
>30000 CYN	0.71(0.48- 1.05)	0.38(0.05- 2.96)	0.76(0.41- 1.43)	0.67(0.50-0.91)
<b>Baby gender</b>				
male	1	1	1	1
female	1.14(0.95- 1.36)	1.24(0.94- 1.62)	1.52(0.62- 3.74)	0.96(0.75-1.24)

Table 6 showed OR and 95% CIs for exclusive breastfeeding due to maternal pregnancy related characteristics in different provinces. The first breastfeeding time was not significantly associated with exclusive breastfeeding in total sample, but in Shaanxi province the groups of mothers not providing breastmilk to the babies within 24 hours (OR=0.47, 95% CI= 0.24-0.92) and more than 24 hours (OR=0.50, 95% CI= 0.27-0.94) was significantly associated to exclusive breastfeeding compared to the group of mothers giving breastmilk to the babies within half an hour. Women who started late prenatal care visit were found to be significantly associated with exclusive breastfeeding with higher odds in total population (OR=1.95, 95%CI =1.23-2.07) and in Anhui (OR=2.27, 95%CI =1.20-4.30) compared to those who started within first 3 months of pregnancy. The frequency of postnatal checkup was significantly related to the exclusive breastfeeding, as the group with more than 3 times has significantly higher odds compare to the group of none checkup in Shaanxi and in total population.

**Table 6:** Odd ratio (OR) and 95% confidence interval (CI) for exclusive breastfeeding due to maternal pregnancy related characteristics in different provinces

<b>Characteristics</b>	<b>Total</b>	<b>Anhui</b>	<b>Chongqing</b>	<b>Shaanxi</b>
<b>First breastfeeding time</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>	<b>OR (95%CI)</b>
Within half an hour after the delivery	1	1	1	1
Within 24 hours after the delivery	1.04(0.69-1.57)	1.36(0.73-2.53)	1.16(0.31-4.35)	0.47(0.24-0.92)
More than 24 hours after the delivery	1.34(0.91-1.97)	1.64(0.91-2.94)	0.69(0.17-2.75)	0.50(0.27-0.94)
never	0.34(0.15-0.80)	0.73(0.28-1.90)	NA	NA
<b>First prenatal care</b>				
1-3 month	1	1	1	1
4-6 months	1.03(0.84-1.26)	0.86(0.64-1.17)	2.05(0.79-5.34)	1.22(0.90-1.66)
7-10 month	1.95(1.24-3.07)	2.27(1.20-4.30)	2.49(0.30-20.70)	1.65(0.82-3.31)
<b>Prenatal visits times</b>				
5+ visits	1	1	1	1
1-4 visits	1.12(0.93-1.36)	1.29(0.97-1.72)	0.86(0.31-2.42)	0.96(0.73-1.26)
No visit	0.54(0.19-1.53)	1.17(0.33-4.15)	NA	0.25(0.03-1.90)

<b>Frequency of postnatal check up</b>				
0	1	1	1	1
1-2 times	0.98(0.79-1.22)	1.30(0.96-1.75)	1.99(0.68-5.84)	0.90(0.63-1.27)
>=3 times	1.35(1.08-1.69)	0.89(0.50-1.57)	1.01(0.27-3.84)	1.64(1.24-2.18)
<b>Pregnancy weeks</b>				
37-42 weeks	1	1	1	1
<37 weeks	0.82(0.54-1.23)	0.97(0.60-1.54)	0.90(0.11-7.03)	0.65(0.24-1.70)
>42 weeks	1.05(0.40-2.78)	0.93(0.11-8.01)	NA	0.76(0.25-2.28)
<b>Mode of delivery</b>				
Normal vaginal birth	1	1	1	1
Caesarean section	0.93(0.78-1.11)	1.02(0.76-1.37)	0.95(0.38-2.40)	1.06(0.79-1.43)
<b>Birth weight</b>				
normal weight	1	1	1	1
low birthweight	0.78(0.44-1.39)	0.68(0.26-1.76)	1.38(0.17-10.90)	0.90(0.41-1.98)
overweight	1.02(0.68-1.54)	1.03(0.61-1.75)	2.91(0.62-13.55)	0.93(0.44-1.95)
<b>Birth place</b>				

County or higher level hospital	1	1	1	1
Township hospital and others	1.00(0.84-1.19)	1.21(0.92-1.60)	1.27(0.50-3.25)	1.26(0.95-1.66)
<b>Baby healthy at birth</b>				
yes	1	1	1	1
no	1.18(0.72-1.91)	0.70(0.27-1.82)	2.80(0.34-23.20)	1.25(0.68-2.27)

## 6 DISCUSSION

The results from this survey among rural women from three Chinese provinces indicated that the rate for exclusive breastfeeding over 6 months is relatively low, and the pattern largely varied by province. For example, in Chongqing, only 3.9% of the babies received exclusive breastfeeding for more than 6 months, the percentages are 17.6% and 22.0% for Anhui and Shaanxi, respectively. The key demographic determinants of exclusive breastfeeding include maternal age, education, occupation, as well as paternal occupation and family income. These determinants vary significantly among provinces.

- Maternal age

In the results, maternal age was positively associated with the practice of exclusive breastfeeding longer than 6 months. In Anhui, the number of mothers aged over 35 who provide exclusive breastfeeding longer than 6 months are significantly higher than those of mothers aged below 24. This result agreed with what is observed in the reviewed literature (Doran, Schellenberg, 1998).

- Education

Education level was found negatively associated with the practice of exclusive breastfeeding. Mothers who had middle/high school education level were less likely to give exclusive breastfeeding to their babies more than 6 months than those mothers who were less educated. The odds for exclusive breastfeeding practice of mothers who had university level is even lower against those of less educated mothers. The finding in the literature review stated that children with more educated parents were more likely to receive exclusive breastfeeding, and the duration of the exclusive breastfeeding were longer (Banu B, 2012) (Scott & Binns, 1999; Susin et al., 1999) (Aggarwal, 2008) (Ajibade, 2013). These findings are different from the results in this study indicating that the education material in these regions may lack of enough accurate information about breastfeeding

practice.

- Occupation

In Anhui and Chongqing, babies with non-farmer parents are less likely to receive exclusive breastfeeding more than 6 months. This result agrees with the reviewed literatures (Sittlington, 2016). The short-period of maternal leave can be the most important negative factor affecting the practice of exclusive breastfeeding.

- Family income

In Shaanxi, none of the above factors are observed, however babies in families with higher income are less likely to receive exclusive breastfeeding for more than 6 months. It is different from what is observed in the literature review. The findings in the literature review stated that lower income family have decreased incidence and duration of breastfeeding (Sittlington, 2016) (Coulibaly, Segguin, Zunzunegui, & Gauvin, 2006). The reason can be that wealthier families might use infant formula earlier and lower income families were more likely to acknowledge the benefits from breast feeding.

- Others

Albeit not statistically significant, babies who are delivered in Township hospitals received higher rate of Exclusive BF than the county-level hospitals, may due to different KPI. Compare to the study from other developing countries, we can observe that high initial BF rate accompanied with low exclusive BF rate (Batal, Boulghourjian, , & Afifi, 2006). The factors which related to exclusive BF rate varies largely among the areas, may due to the local policy and culture.

## **6.1 Strength and Limitation**

A structured, piloted and modified questionnaire with random sampling was applied in this survey, with a reasonable sample size and response rate. Most non-respondents were women not able to be reached. Only very few candidates refused to attend the survey. If the women were not available to answer the questions, relatives were included as proxy respondents. The interviews were selected from university staffs and students, and trained with relative skills. The answers from proxies were validated by an early study, indicating similar associations between exposures and outcomes between the proxies and index respondents, and no significant impact of missing data from proxies.

- Strength

The strength of the work lays on the high quality of the data collected using survey conducted by well-trained interviewers. The samples are well stratified and distributed, which reflect certain common patterns of the population. The statistical method applied in the study is able to discover the correlations between the interested variables and breastfeeding patterns.

- Limitation

The data was collected on 2008, and the demographic structure may have been changed during the past a few years. Study on certain groups are not available due to the limited number of samples. The logistic regression method is focused on correlations, and further investigations are required for revealing potential causality

## 7 ACKNOWLEDGEMENTS

I am grateful to all those blessings and contributions in my endeavor that has made this work possible.

First of all, I would like to express my most special appreciation to my supervisor Dr. Subas Neupane, who has been a tremendous mentor for me. I would like to thank you for your instructions and encourages which help me finally complete this thesis. Your advices and guidance are priceless. I wish to thank Ms. Catarina Ståhle-Nieminen for the kind help in coordinating the Master's programme in Public Health and the support for me being able to finish the thesis remotely.

I wish to express my gratitude to Silvia, Paula, Wendi and all my friends in Finland for making my life colorful and spending time with me in the cold and dark.

Special thanks to my parents for your love and all the support you have provided. Finally, I would like to thank my beloved husband Jie who always stay with me and support me to complete this work.



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