

**School of Public Health**

**Factors that Influence Breastfeeding Initiation and Duration in  
Urban, Suburban and Rural Areas of Zhejiang Province, Peoples  
Republic of China.**

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# Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief this thesis contains no materials previously published by any other person except where due acknowledgement has been made.

Name: Liqian QIU

Signature:

Date: 1 November 2008



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# Abstract

## **Introduction:**

Breast milk is the best way to feed all infants. It results in better nutrition for the infant and to reduced rates of chronic disease later in childhood and adulthood. Breastfed babies have lower rates of infectious diseases and will not be exposed to contaminated infant formula, such as the recent experience with melamine in China. The WHO Expert Consultation on Infant Feeding recommended exclusive breastfeeding for six months, with the introduction of complementary foods and continued breastfeeding thereafter. It was also recommended by the WHO that breastfeeding continue beyond six months for up to two years and beyond. Breastmilk can provide the majority of nutrients for the first 12 months of life. Complementary foods were given in the second half year gradually.

However with the rapid economic development, the traditional home based obstetric system in China has changed. Following the change in women's living styles, traditional infant feeding perceptions and practices have changed. Women now have high rates of returning to work after delivering a baby, especially in the urban areas, and more infants are being given infant formula and other substitutes for breastfeeding. Zhejiang Province is the one of fastest developing economic regions located in the mid Eastern coast of China. The breastfeeding rate has dropped rapidly since the 1970's. This has significant implications for the child health in this region. A longitudinal study of breastfeeding was needed to provide the data necessary to implement a comprehensive health promotion program. Efforts are needed to promote breastfeeding, which should be one of the highest health promotion priorities.

The aim of this study was to document the prevalence and duration of breastfeeding and exclusive breastfeeding in city, suburban and rural areas in Zhejiang Province; analyze the factors determining the initiation and the duration of breastfeeding; document mothers' knowledge about the benefits of breastfeeding; identify the

prevalence of problems associated with breastfeeding and constraints to exclusive breastfeeding up to six months of life; document the prevalence of prelacteal feeds and finally to describe differences in breastfeeding between city, suburb and rural area.

### **Method:**

In order to achieve these objectives a longitudinal cohort study was undertaken of infant feeding practices in three locations in Zhejiang Province which represent city and suburban and rural areas. Mothers who delivered babies during 2004 and 2005 were randomly selected from the obstetric wards while in hospital and invited to voluntarily participate in the study. The mothers were interviewed in hospital and after discharge, were contacted by telephone three more times at 1, 3 and 6 months. The few mothers who could not be reached by telephone were interviewed during the scheduled routine immunisation clinics at their local MCH clinic. On each of these follow up occasions they were interviewed using a structured questionnaire to obtain details of infant feeding practices. A total of 1520 mothers were recruited in 4 hospitals located in city, suburb and rural areas. Almost all mothers (98%) agreed to participate. All data analyses were carried out using the Statistical Package for Social Science (SPSS), release 14.0 (SPSS Inc., Chicago, IL, USA). Descriptive techniques and survival analysis were used to document breastfeeding rates and duration. Cox regression analysis was undertaken to explore factors affecting breastfeeding.

### **Results:**

Of the total 1520 mothers were recruited into the study, 628 were from the city, 347 from the suburb and 535 from the rural area. Breastfeeding initiation rates were high in all three locations. Initially more than 95% of the mothers began breastfeeding, but only 50.3% babies averagely in three locations were being exclusively breastfed at discharge. The number of infants being exclusively breastfed prior to discharge was relatively low. Exclusive breastfeeding before discharge was positively related to

delivery method, the first feed given to the baby, mother's place of residence, mother's age, mothers' education level and family income.

'Any breastfeeding' rates at discharge and at 1, 3 and 6 months were 96.9%, 96.0%, 89.7% and 76.7% respectively. 'Exclusive breastfeeding' rates at discharge, and at 1, 3, 6 months were 50.3%, 55.1%, 45.8% and 3.9% respectively. The average duration of 'exclusive breastfeeding' was 44.7 days (95% CI, 41.6-47.9).

Overall about half of mothers gave the babies prelacteal feeds before commencing breastfeeding. This situation was more common in city, compared with the suburban and rural mothers. The prelacteal feeding rates were 62.0%, 36.6% and 39.0% in city, suburb and rural area respectively.

The breastfeeding rates differed by location between the city, suburb and rural areas. 'Any breastfeeding' rates in the city, suburb and rural area at discharge were 96.5 %, 96.8 % and 97.4 % respectively, the 'exclusive breastfeeding' rates in city, suburb and rural area at discharge were 38.0%, 63.4 % and 61.0 % respectively. The rates of exclusive breastfeeding at six months were only 0.2%, 0.5 % and 7.2 % respectively, well below the Chinese and WHO targets.

The risk factors related to cessation of 'any breastfeeding' were 'mother's age', 'the time the decision to breastfeed was made', 'whether the infant was admitted to special care nursery', 'mother's return to work within 6 months', 'the early feeding of water and /or other complementary foods, and location of mother's usual residence. Factors negatively associated with 'exclusive breastfeeding' duration were early return to work and to place of residence, with the mothers living in the rural area exclusively breastfeeding for longer.

Delivery method was an important influence on breastfeeding. In this study the highest caesarean section rate was in the city (76%), with a similar rate in the suburbs

(74%) and the lowest in the rural area (53%). Mothers who had a caesarean section were less likely to be exclusively breastfeeding on discharge (35.8% in city, 59.6% in the suburbs) compared to vaginal delivery where the rates were 45% and 74.4% respectively. The adjusted odds ratio for exclusive breastfeeding in caesarean section deliveries in the city and suburban mothers was 0.64 (95% CI 0.46, 0.88).

### **Conclusion:**

The study has described the initiation and duration of breastfeeding (to six months) of babies in the different areas of Zhejiang Province. Separate information is provided on the prevalence of 'any breastfeeding' and 'exclusive breastfeeding'. The factors that are associated with the initiation and duration of breastfeeding in Zhejiang Province are documented. Health promotion programs are needed to change some traditional inappropriate breastfeeding perceptions and to promote 'exclusive breastfeeding' in the first six months of life in Zhejiang. Education should be given and regulations should be introduced restricting hospital staff from recommending prelacteal and supplementary feeds unless warranted for medical reasons. The research also shows that there would be a benefit to breastfeeding if delivery and lactation leave were extended to six months and if the incidence of caesarean section could be reduced to levels more consistent with WHO expected levels.

**Key words:** Breastfeeding, exclusive breastfeeding, breastfeeding duration, breastfeeding initiation, city, suburbs, rural, Zhejiang Province, PR China.

# Abbreviations

BFHI:	Baby-Friendly Health Initiative
BMI:	Body mass index
CI:	Confidence interval
HR:	Hazard ratio
IMR:	Infant mortality rate
IQ:	Intelligence quotient
LBW:	Low birth weight (< 2500g)
MCH:	Maternal and child health
OR:	Odds ratio
SPSS:	Statistical package for social science
UNICEF:	United Nations Children Fund
WHO:	World Health Organisation



# Definitions

The definitions of breastfeeding used in this thesis are from the following sources (Armstrong 1990; CW Binns & Davidson 2003; Labbok & Belsey 1997; Fairbank et al. 2000; M Labbok & Krasovec 1990; WHO, 2003a, b).

Other definitions used in this thesis are from academic documents which are cited in the specific definitions.

**AIDS:** Acquired immune deficiency syndrome, HIV positive persons who have progressed to active disease.

**Almost exclusive breastfeeding:** Besides breastmilk, infant may receive small amounts of culturally valued supplement like water, water based drinks, fruit juice, and ritualistic fluids (Non-nutritive liquids). Same as 'Full Breastfeeding'.

**Any breastfeeding duration:** The total length of time an infant received any breastmilk at all.

**Any breastfeeding:** The child has received breastmilk (direct from the breast or expressed) with or without other drink, formula or other infant food.

**Artificial feeding:** Feeding an infant on a breastmilk substitute.

**Baby Friendly Health Initiative (BFHI):** An approach to transforming maternity practices as recommended in the joint WHO/UNICEF statement on Protecting, Promoting and Supporting Breastfeeding (the special role of maternity services). The BFHI was launched in 1991 by UNICEF and WHO. Baby Friendly Health practice the 'Ten steps to successful breastfeeding' and observe the principles and aim of the International Code of Marketing of Breastmilk Substitutes, including not accepting free or low-cost supplies of breastmilk substitutes, feeding bottles, teats and pacifiers. To acquire the "baby friendly" designation, a hospital must be externally assessed according to an agreed procedure using the Global criteria (Fairbank, O'Meara et al. 2000).

**Bottle feeding:** Feeding an infant from a bottle, whatever is in the bottle, including expressed breastmilk, water, formula, etc.

**Breastfeeding:** The same with any breastfeeding. The child receives some breastmilk but can also receive any food or liquid including non-human milk.

**Breastmilk substitute:** Any milk (other than breastmilk) or food being marketed or otherwise represented as a partial or total replacement for breastmilk, whether or not it is suitable for that purpose (commonly includes infant formula, cow's milk, and other milks)

**Breastmilk:** Human milk and colostrums.

**Cessation of breastfeeding:** completely stopping breastfeeding, including suckling.

**Cohort study:** A longitudinal or prospective study in which subsets of a defined population can be identified to assess their exposure to a factor (eg working) hypothesized to influence the probability of an outcome.

**Commercial infant formula:** A breastmilk substitute formulated industrially in accordance with applicable Codex Alimentarius standards to satisfy the nutritional requirements of infants during the first months of life up to the introduction of complementary foods.

**Complementary feeding:** The practice of giving complementary foods. The process of giving an infant food in addition to breastmilk or infant formula, when either becomes insufficient to satisfy the infant's nutritional requirements. The child receives both breastmilk and solid or semi-solid food or breastmilk substitutes.

**Complementary food:** Any food, whether manufactured or locally prepared, used as a complement to breastmilk or breastmilk substitute. Such food is also commonly called weaning food or breastmilk supplement (Armstrong 1991; Coffin, Labbok & Belsey 1997; M.H. Labbok & Coffin 1997; WHO 2003a, c).

**Confidence interval:** the computed interval with a given probability, e.g. 95%, that the true value of a variable such as a mean, proportion, or rate is contained within the interval.

**Cross-sectional survey:** An investigation in which information is systematically collected, typically to describe the distribution of an attribute (eg breastfeeding) as it exists in a particular population at one point in time.

**Demand feeding:** The unrestricted pattern of breastfeeding characterised by ad libitum feeding (day and night), facilitated by close contact between mother and infant.

**Exclusive breastfeeding:** Breastfeeding while giving no other food or liquid, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines.

**Exclusive breastfeeding duration:** The length of time an infant received breastmilk only.

**Full breastfeeding:** includes exclusive breastfeeding and predominant breastfeeding (or almost exclusive breastfeeding). Breastmilk was the only source of milk given to the infant regardless of supplementation with other fluids such as water and orange juice.

**Human immunodeficiency virus (HIV):** the virus that causes AIDS. In this thesis, the term HIV means HIV-1. Mother-to-child transmission of HIV-2 is rare.

**HIV positive:** refers to people who have taken an HIV test and who know that they tested positive, or to young children who have tested positive and whose parents or guardians know the result.

**Infant or child feeding:** The whole complex of dietary, behavioural, and physiological processes involved in the child's ingestion of food.

**Infant:** All children not more than 12 months of age.

**Initiation:** The infant's first intake of breastmilk.

**Median duration of exclusive breastfeeding:** The age in months when 50% of children are no longer breastfed exclusively.

**Milk expression:** Removing milk from the breasts manually or by using a pump.

**Mixed feeding:** feeding both breastmilk and other foods or liquids.

**Mother to child transmission (MTCT):** Transmission of HIV or other virus or bacteria to a child from an infected mother during pregnancy, delivery or breastfeeding.

**New-method Delivery:** The delivery is assisted by qualified midwife (with Home Delivery Midwife Certificate) and infection guidelines must be implemented, include sterilizing facility, midwife's hands, mother's pudendum and baby's umbilical cord.

**Non-randomized controlled trial (non-RCT):** An experimental study in which participants are allocated to receive either an experimental or a control treatment or intervention, using non-random method. The relative effectiveness of the intervention is assessed by comparing event rates and outcomes in the two groups.

**Odds ratio (OR):** An odds ratio is a measure of the strength of association between disease (or problem) and exposure. For cohort or cross sectional study, it is the ratio of two odds: the odds of exposed individuals getting a particular disease or problem compared to the odds of an unexposed individual getting that particular disease or problem. For example, the odds of an infant who is not breastfed getting respiratory illness during the first year of life, compared to the odds of an infant breastfed to four months getting respiratory disease during the same period.

**Optimal infant and young child feeding:** Exclusive breastfeeding for the first six months of life. Thereafter, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond.

**Partial breastfeeding:** mixed feeding with breastmilk and other sources of energy and nutrients.

**Perceived insufficient milk supply :** The mother's belief that her breastmilk was inadequate in amount or nutritional quality to meet her infant's needs such as appropriate infant weight gain and infant satisfaction.

**Predominant breastfeeding:** An infant's predominant source of nourishment has been breastmilk. However, the infant may also have received water and water-based drinks (sweetened and flavoured water, teas, infusions etc); fruit juice; oral

dehydration solution (ORS); drop and syrup forms of vitamins, minerals and medicines; or ritual fluids (in limited quantities). All other food-based fluids ( eg fruit juice and sugar water ) , in particular breastmilk substitutes, and solids are excluded.

**Randomized controlled trial (RCT):** An epidemiologic experimental study in which participants are randomized to receive either an experimental or a control treatment or intervention. The relative effectiveness of the intervention is assessed by comparing event rates and outcomes in the two groups. Randomized control trials are generally regarded as the most scientifically rigorous method of hypothesis testing available in epidemiology.

**Relative risk (RR):** the ratio of risk of disease or death among the exposed to the risk among the unexposed. The usage is synonymous with risk ratio. Alternatively, the ratio of the cumulative incidence rate in the exposed to the cumulative incidence rate in the unexposed, i.e. the rate ratio.

**Replacement feeding:** feeding infants who are receiving no breastmilk with a diet that provides the nutrients infants need until the age at which they can be fully fed on family foods. During the first six months of life, replacement feeding should be with a suitable breastmilk substitute. After six months the suitable breastmilk substitute should be complemented with other foods.

**Room in:** The practice of having infants remain with their mothers on a 24 hour basis.

**Solid foods :** Any nutrient containing foods (non-drinkable, semi-solid or solid), eg dilute infant cereals. Does not include breastmilk or breastmilk substitutes, fruit and vegetable juices, sugar water, etc.

**Timely complementary feeding rate:** Percentage of infants 6-9 months of age who are fed solid or semi-solid complementary foods in addition to breastmilk.

**Weaned :** The infant or child no longer receives any breastmilk.

**Weaning** : The period during which infants are introduced to breastmilk substitutes and/or solid foods with the intention of replacing some or all of the breastmilk in their diet.

**Wet mother:** a woman feeds other woman's baby with her own breast milk.

**Young child:** A person from the age of more than 12 months up to the age of 3 years (36 months).

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WHO 2003c, 'Glossary of terms', *Infant and Young Child Feeding, a tool for assessing national practices, policies and program*, WHO, Geneva, p.115.



# **CHAPTER 1**

## **INTRODUCTION**



## 1.1 BACKGROUND

The People's Republic of China has a land area about 9.6 million sq km with a population of 1.29 billion in 2004 (National Bureau of Statistics of China 2004). China has one of the longest histories of any country in the world. 5000 years ago China was one of the countries where economic activity first developed. People in Yellow River valley started farming and raising livestock and 3000 years ago learned to use iron tools and produce silk. 2000 years ago social and philosophy scholarship developed and during the Spring and Autumn and Warring States Periods (770-476 B.C.) schools thrived. The discussion of politics and analysis of society became popular during this period. The famous "Silk Road" opened the door to reach the east coast of the Mediterranean Sea and silk products were transported to Europe.

During the Tang Dynasty (618-907) there were some policy developments known as the Zhenguan reign reforms. The marriage of a palace maiden, Wang Zhaojun (Han Chinese) to a chieftain of the Xiongnu (a border country) began multi-cultural acceptance which characterises modern China. The feudal society became more prosperous with increasing trade. During the Song and Yuan dynasties (960-1368) handicraft industry and domestic and foreign trade boomed. At that time land and water transportation was well developed, and economic and cultural relations with Japan, Korea, India, Persia, Arabia and other countries were extensive. Many merchants and travellers came from abroad. Marco Polo was one of the travellers who came from Venice and travelled extensively in China. He described China's prosperity in his "Travels". The "four great inventions" of China in ancient times – paper making, printing, the compass and gunpowder were further developed in the Song and Yuan dynasties.

The last dynasty of Qing (1644 – 1911) was only prosperous for a short period and it was frustrated by rebellion and international alliance invasions. Slavery in China was abolished in 1910, ending over two thousand years of imperial rule in China. Sun Yat-sen worked to create a republic country at that time and China began a long struggle against the warlords, Japanese invasion and civil war.

The socialist people's republic of China was found in 1949. Even though the new country ended war and established socialism, the standard of people's daily life was not immediately improved. Infrastructure, industry, healthcare and education took time to develop. Three decades ago (1978) China started economic reforms and openness. New policies led to the de-collectivization of the countryside and followed with decentralizing government control of industry. The standard of living improved significantly since 1980, which included GDP per capita, consumer spending, life expectancy, literacy rate. In 2003 a major public health event, the SARS epidemic, caused a major health problem across the whole of China. In response, the government gave more attention to health care. Health care became more and more important issue in recent years.

In China the average population density is 135 people per sq km and the per capita GDP is about \$1505 (National Bureau of Statistics of China 2004). There is a difference in incomes between the city and rural areas and the ratio of average incomes of city dwellers to rural residents is about 3.2:1. The Engel coefficient (the proportion of food expenses in the total consumption expenditure) of urban residents is 37.1% and for rural residents is 45.6% (National Bureau of Statistics of China 2004).

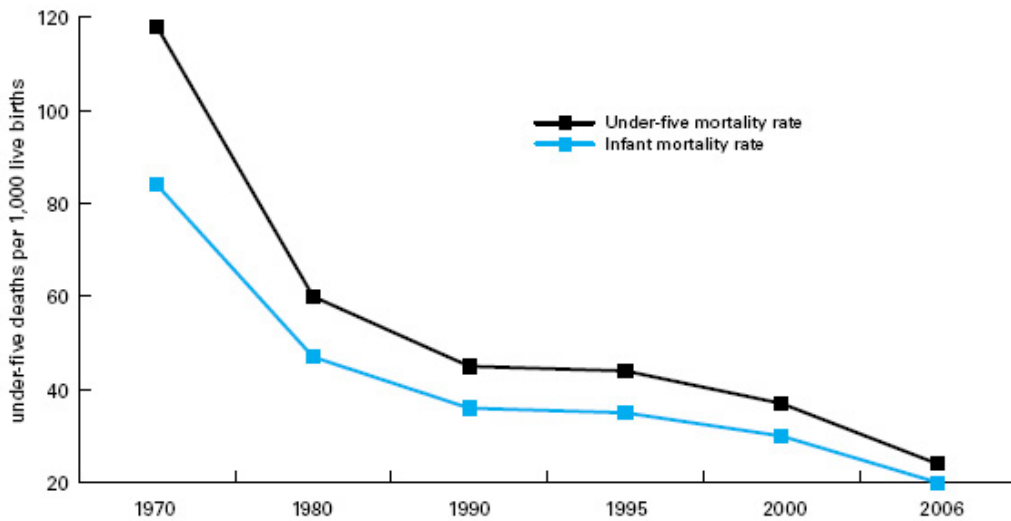
The changes in life expectancy and mortality rates in China have been widely studied because of the dramatic changes that have occurred (Banister and Hill 2004; Li, Luo et al. 2008). The average life expectancy was 71.8 years in 2002, an improvement of 4 years over the past two decades (Zhu 2003). The birth rate in 2003 was 12.41 per thousand, the death rate 6.40 per thousand, and the natural growth rate 6.40 per thousand (National Bureau of Statistics of China 2004). The three leading causes of death in 2003 were malignant tumours, cerebrovascular diseases and respiratory diseases in both urban and rural areas (Ministry of Health 2003).

The maternal mortality in 2002 was 28.7 per one hundred thousand in urban areas and 61 per one hundred thousand in rural areas. Mortality of children under 5 years is 13.8 per

thousand in urban areas and 23.1 per thousand in rural areas. In the city 89.4% of deliveries are in hospitals, compared to 71.6% in the countryside(Bureau of MCH and Center of MCH Beijing University 2003).

The recent report by UNICEF on Children in the Asia Pacific region illustrates the progress that has been made in China in improving child health and mortality.

### Child mortality rates in China dropped sharply in 1970–1990, but reductions have since slowed



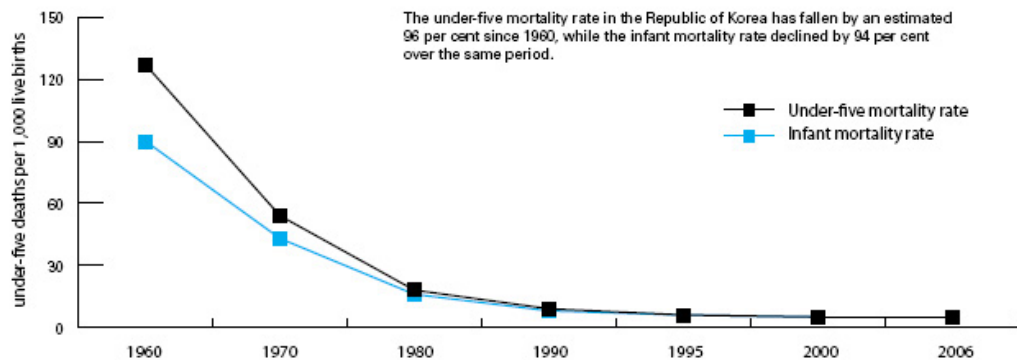
Source: UNICEF global databases, 2007.

Source: (UNICEF 2008)

Since 1970 infant mortality in China has dropped from 84 per 1000 live births to its present level of 21. (World Health Organization 2006) In urban areas it is lower than this and is reported as being as low as 5 per 1000 live births in cities such as Shanghai.(2001)

This is almost as great an improvement as made in the Republic of Korea over the same period of time.

## The Republic of Korea has achieved remarkable reductions in its under-five and infant mortality rates



Source: UNICEF global databases, 2007.

(UNICEF 2008)

The review by UNICEF classifies China as a moderately performing country and to improve child survival recommends the WHO-UNICEF joint regional child survival strategy essential package of services which includes the promotion of breastfeeding.

(UNICEF 2008)

The promotion of breastfeeding became a priority of maternal and child health programs in the 1990s, and by 2000 there were about 7000 baby-friendly hospitals (Guo, Wang et al. 2001). The majority of hospitals of county level or above are now accredited as baby-friendly hospitals.

The Zhejiang Province is a rapidly industrialising area located in the southeast of China, to the south of Shanghai. It is divided administratively into 11 regions, an area of 101800 sq km and includes off shore 2000 islands. The population is 49 million, and the population density of 442 per sq km is the highest in China. In 2006 there were 378,906 live births. Almost all residents (99 per cent) are from the Han ethnic group. In the past two decades private industry has grown rapidly because of the reformed economic policy and for the past three decades has had one of the fastest growing economies in the country. The shortage of farmland has seen many workers move to the cities or even turn their farms into small businesses. The province has become the home of many high technology industries and this has led to the growth of a large, well educated middle class

in the capital city Hangzhou and surrounds. The provincial average GDP per capita was \$A3288 in 2003 (Zhejiang Provincial Bureau of Statistics 2004) much higher than the national level. By 2007 the per capita GDP was 4883 USD and it was ranked the fourth province of China. Overall the economic development was not equal. The rural areas of the province have not progressed as rapidly and people from the rural west and other provinces continue to move to the cities in search of more lucrative employment. Maternal and child health care has improved in response to economic reform. The provincial maternal mortality rate was the lowest in China in 2007, at 8.6 per one hundred thousand. Almost all Zhejiang residents' babies were delivered in hospital.

Table 1.1 shows the progress that has been made in maternal health care in Zhejiang.

Table 1.1 Maternal mortality rate 1988– 2007, Zhejiang Province (1/100000)

Year	1988	1990	1992	1994	1996	1998	2000	2002	2003	2004	2005	2006	2007
Case	253	217	167	151	102	98	76	46	53	56	55	39	33
Maternal mortality rate (1/100000)	48.50	42.20	36.77	33.34	23.15	25.44	19.59	12.74	14.91	14.44	13.40	10.29	8.60

Source: The annual report of Maternal and Child Health Statistics, Zhejiang Health Bureau

There has also been a substantial improvement in child health statistics as shown in Table 1.2.

Table 1.2. Neonatal, infant and under 5 years child mortality rates in Zhejiang Province 1992-2007 (‰)

	1992	1994	1996	1998	2000	2001	2002	2003	2004	2005	2006	2007
Neonatal Death	11.5	14.19	12.09	7.54	7.77	5.9	5.49	6.88	7.46	4.86	4.9	3.48
Infant Death	17.52	19.67	16.51	12.13	10.48	9.44	7.46	10.14	10.46	7.04	6.94	5.34
<5 Child Death	21.75	23.93	20.06	17.93	15	12.98	9.58	13.46	12.77	9.3	9.34	7.56

Source: The annual report of Maternal and Child Health Statistics, Zhejiang Health Bureau

While health care has much improved for Zhejiang local residents, health care for migrant populations is not as satisfactory. People migrating from other less developed provinces usually have lower salary and undertake hard physical work. Most of them do not have health insurance. Their health problems are often serious since they do not have routine health checks and are more likely to have malnutrition and lower standards of personal hygiene. Their maternal and child health care is also worse than Zhejiang residents. The Table 1.3 shows the child death and maternal death differences between Zhejiang residents and migrant population.

Table 1.3. Comparison of child death rates and maternal death rate between Zhejiang local residents and migrant population 2005-2007

	Neonatal Death		Infant Death		<5 Child Death		Maternal deaths	
	Rate (/1000)		Rate (/1000)		Rate (/1000)		Rate (/100000)	
	resident	migrant	resident	migrant	resident	migrant	resident	Migrant
2005	4.86	7.22	7.04	5.71	9.30	11.71	13.4	48.0
2006	4.90	8.17	6.94	10.41	9.34	13.57	10.29	35.17
2007	3.48	6.94	5.34	9.42	7.56	12.35	8.60	28.37

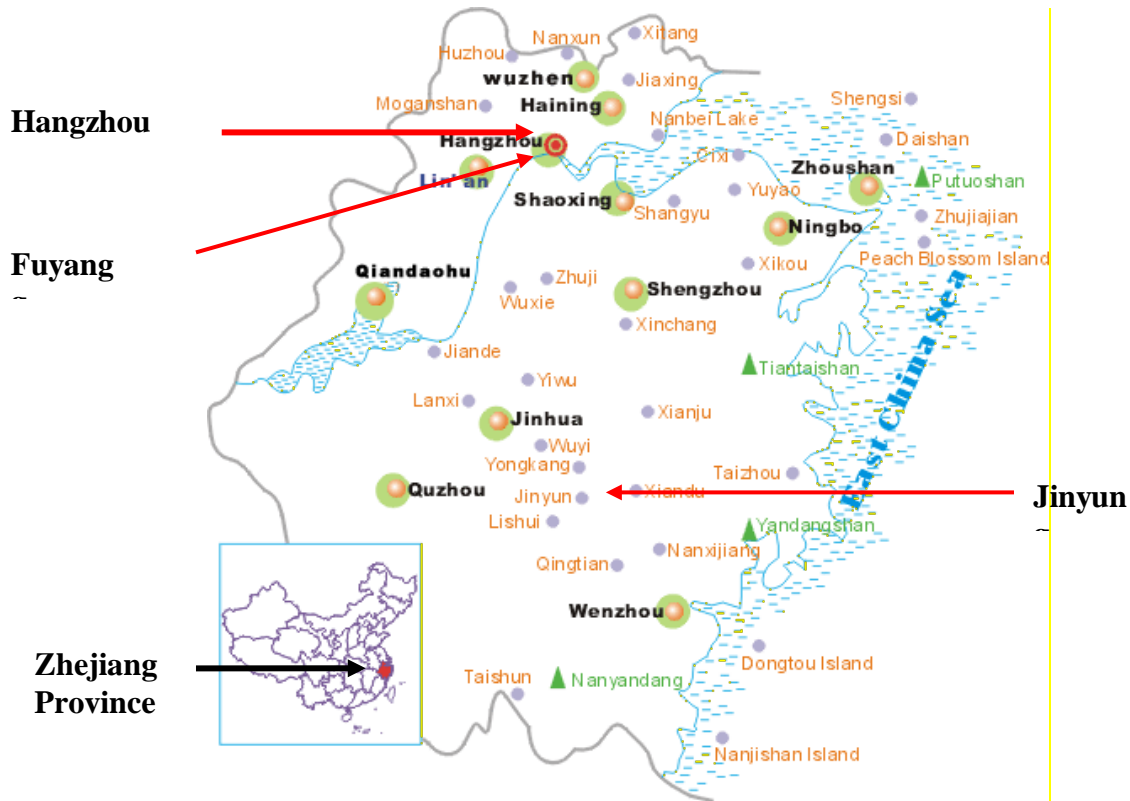
Note: Neonatal, infant death and <5year death rates are expressed per 1000 live births. Maternal death rates are per 100000 births.

Source: The annual report of Maternal and Child Health Statistics, Zhejiang Health Bureau

The capital city, Hangzhou, is situated in the northeast of Zhejiang Province. It has a recorded history of at least 4700 years and has twice been the national capital, during the Wuyue (year 907) and Nan Song dynasties (year 1129). The city has a population of 6 million and an area of 16596 sq km area (Hangzhou Statistic Bureau 2003). It lies on the shores of the picturesque West Lake and is a favourite location of holidays for people within China and from overseas. The city population is generally well educated. Zhejiang

University is located in Hangzhou. It is one of the top ten educational institutions in China.

The following map is the location of Zhejiang Province in China (small map of China) and study location of Hangzhou, Fuyang and Jinyun (big map of Zhejiang Province)



Fuyang, a city of 620000 people is located 50 km southwest of Hangzhou and is divided into 26 communes or communities for geographical and administrative purposes. The main economy is based on the agriculture, papermaking and telecommunication devices. There were 5172 births in 2003 (Dept. of MCH 2004).

Jinyun County has 436000 people and is located in a mountainous area in the south of Zhejiang Province. The train transportation has been available since 1998 and since last year a highway has linked Jinyun to neighbouring cities. Travel from Hangzhou to Jinyun

takes 5 hours by train or 3 hours by express bus. 3918 babies were born in 2003 in Jinyun (Dept. of MCH 2004).

## **1.2 STUDY DESIGN**

A longitudinal cohort study of infant feeding was undertaken in the Zhejiang Province of PR China. Mothers who delivered babies from October 2004 until 2005 were eligible to participate in the study. The study centres were located in the capital city (Hangzhou), in a suburban location (Fuyang) which is located 50 km from the southwest of Hangzhou, and in Jinyun a mountainous rural area a further 300 km to the south-west.

For residents of this province health care is generally of high standard and all deliveries are done in a hospital.

While China has a large number of ethnic groups, Zhejiang province is almost entirely of Han group. In the remote areas there are small minority groups but it is estimated that they constitute no more than 2% of the population. For the purposes of this study migrant populations were not included in the sample.

This study aimed to document the prevalence and duration of breastfeeding, and exclusive breastfeeding in Zhejiang Province, including urban, suburban and rural areas. The study analysed the factors determining the initiation and the duration of breastfeeding; document mothers' knowledge about the benefits of breastfeeding; identify the prevalence of problems with breastfeeding and constraints to exclusive breastfeeding up to six months of life.

## **1.3 AIMS**

1. Document the prevalence and duration of breastfeeding and exclusive breastfeeding in Zhejiang Province, in city, in suburban and in rural areas.



2. To analyse the factors determining the initiation and the duration of breastfeeding in Zhejiang.
3. Document the use of prelacteal feeds in infants in Zhejiang.
4. To determine the factors influencing the use of prelacteal feeds and the introduction of complementary feeding.
5. Identify the prevalence of problems with breastfeeding and constraints to exclusive breastfeeding in Zhejiang.
6. Document mothers' knowledge about the benefits of breastfeeding.
7. Describe differences in breastfeeding in the geographic areas in the Zhejiang Province.

#### **1.4 HYPOTHESES**

1. Socio-cultural factors influence breastfeeding rates by the women of Zhejiang.
2. There will be a low prevalence of breastfeeding and shorter duration among employed women.
3. Information, encouragement, rooming-in and early mother and baby skin to skin contact promote exclusive breastfeeding.
4. There will be a high prevalence of prelacteal feeds among less educated women.
5. The mothers in rural are more likely to breastfeed their babies than the mothers in city.
6. Medical professional knowledge and support are related to mother's breastfeeding practice.

#### **1.5 LIMITATIONS OF THE STUDY**

This study is the largest cohort study of breastfeeding that has been reported. However there are several limitations that need to be considered when reading the results presented in this thesis. The study sample was 1500 mother out of a provincial population of about 50 million. Three locations were selected to represent the city, suburban and rural locations in the province. While these locations are considered to be representative of the province, the results cannot be extrapolated to all locations in Zhejiang Province. The

results will need to be repeated at regular intervals as the development in the province is causing rapid changes in Zhejiang society.

## **1.6 OUTLINE OF THE THESIS**

This thesis is presented in the form of four published papers, one paper under review and a descriptive chapter which contains the results of the study, together with introductory, literature review and concluding chapters. Chapter one introduces the major issues relating to infant feeding and the background to maternal and child health in China and Zhejiang Province. The significance, objectives and limitations of the study are also described. Chapter Two contains literature reviews about the history of breastfeeding in China, importance of breastfeeding, factors associated with breastfeeding and breastfeeding in China. Chapter Three summarizes the methodology. Chapter Four includes the papers that contain the results of the study. The major findings of the study and recommendations from the study are described in Chapter Five. The Appendices include the questionnaires, and the ethics application. For convenience the references are included after each chapter or paper.

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## CHAPTER 2

# LITERATURE REVIEW

## **SECTION 1 Breastfeeding in China in Historical and Modern Times**

In this literature review comments will first be made on the place of breastfeeding in Chinese history and literature.

### **Part 1 Breastfeeding History in Ancient China**

If people ask the history of Chinese women breastfeeding, the Chinese mother may tell them Chinese women always feed their babies with breast milk. From the ancient time till now, generation to generation children absorbed nutrition from their mother's milk and grow up. In the human long history China provides us with one of the longest written histories on earth. The care of children is often mentioned in historical documents and universally mothers used breastmilk to feed their baby. As well as nutrition, it was believed that children inherited their mother's spirit from breastfeeding behaviour. When children grew up, they consequently regarded their mothers as their best friends throughout life and paid them great respect. When they showed that they were proud of their mothers, the first reason given was 'my mother fed me with her milk'. In more than 5000 years of recorded history. There are many mentions of breastfeeding, in novels, autobiographies, medical textbooks, Chinese opera, and more recently in movies. Breastfeeding is even mentioned in epitaphs on tombs. Today, when these records are read it is like reviewing human development history throughout China. Reviewing the literature is a constant reminder of the benefits of breastmilk and its place in human development.

#### **2.1.1.1 Breast-feeding in the earliest Chinese literature**

When reviewing the Chinese literature, there are many keywords used to describe breastfeeding. In the paper called *Nv Xue Pian. Zi Ru Zhi De Yi* (女学篇. 自乳之得宜) and *Wan Shi Jia Zang Yu Ying Jia Mi. Ju Yang Yi Shen Qi Ji Si* (万氏家藏育婴家秘. 鞠养以慎其疾四) in Qing dynasty (1644-1911) described that a baby was stronger if he

was fed mother's milk, and only mother's milk was adequate for child growth at a young age. The reason was that the baby gained nutrition from "mother's blood before birth and mother's milk developed from the blood". In the Ming dynasty, the physician Gong Ting Xian(龚廷贤 1522 ~ 1619) wrote the book "S hou Shi Bao Yuan"(寿世保元). He said exclusive breastfeeding 4-5 months was the best for baby. If mother did not have enough milk, she should adjust her self. The more the infant was breastfed, the more breastmilk was produced. In the book "Bei Ji Qian Jin Yao Fang"(备急千金要方) from the Tang dynasty(AD 652) the author Sun Si Miao (孙思邈) said a baby should be fed on demand for the first 1-2 months, 7-8 times a day. After then feeding could be once every 3-4 hours. If the mother did not have enough milk, another mother could breastfeed her infant. The selection criteria of a supplement mother were very strict, including the mother's physical health, kindness, and having enough milk. With the growth of the child supplementary food should be added at about 4-6 months. Breastfeeding could cease when the baby's age reached 10-12 months.

The variation in descriptions found in the literature was due to the many different cultures and lifestyles that existed in ancient China. Agriculture has dominated Chinese development for as long as can be remembered. Generally, there were no breast milk substitutes available for infant feeding. Only mothers breast milk provided unique safe food for new babies in old China. In poor and middle-class families the infant usually died if the mother was not available to breast-feed for some reason. However for the emperor and aristocratic families, infants were usually fed by wet nurses. This was because aristocratic women did not wish to feed the baby by themselves or could not produce enough breastmilk. A further reason for the lack of interest in breastfeeding in aristocratic families was the contraceptive effect of breast-feeding. The larger an aristocratic family became, the more likely it was to retain its power and influence. Hence, the main function of society women or concubines was to produce as many children as possible, and breastfeeding was known to interfere with this activity even in ancient times.(Hsiung 1995; Segawa 2008) For women from poor families, it was an honour to be asked to be a wet nurse in an aristocratic family.

It is difficult to place a date on the development of the system of using wet nurses for aristocratic families in old China. Literature that can be found more than 2000 years ago in Zhou Dynasty ( 5-6C BC) describes the selection of wet nurses. In the book called “ Li Ji, Nei Ze” ( 礼记·内则 ) the regulation of the aristocratic families baby care was documented. (Confucius 1979) This book described how a wet nurse should be selected. Since a wet nurse was to take care of the baby from his/her birth it was a most important choice. The wet nurses’ personality could influence the emperor's family and the behaviour of the younger generation. The quality of a wet nurse thus became very important. The wet nurse continued to be respected by those that they had brought up, even when they had become adults. The women's family would frequently receive gifts or honours from the emperor's family. For this reason, women (including their husband and other family members) would readily accept the situation if a woman was selected as wet nurse candidates, it was a source of pride for a lower level family when a woman was selected to be a wet nurse in the Empress’ family, even though that meant that the wet nurses would miss her own children. In fact, there are stories in the classic Chinese literature of the wet nurses’ own children developing severe malnutrition or even dying.

As the old Chinese feudalistic and imperialistic system evolved, hiring a wet nurse by a mother became more and more popular. It was a sign of wealth in the better off families when a wet nurse was hired to care for the children. It developed into a cultural form of its own, and during the Min and Qing dynasties, 1400 to 1900, the selection of wet nurses became more complicated. Not only the aristocratic families but also middle-class families became able to afford to have wet nurses. But the terminology of wet nurses was different in different classes. Different names were given to wet nurses from different classes of society. For example wet mother in emperor or aristocratic family was called “Ru Mu” (乳母) , “Nai Po” (奶婆), “Nai Kou”( 奶口 ), “Ru Ao”( 乳媪 ). The wet mother in public was called “Nai Zi” ( 奶子 ), “Mo Mo” ( 嬷嬷 ), “Nai Niang”( 奶娘 ).

The relationship between host family and wet nurse became quite complicated. On the one hand, the wet nurse was usually from a very low social class, and the host family treated her like a “milking cow”, with the status of a slave. But at the same time, she developed a very close relationship with a boy that she was nursing. When the boy became a new emperor, the woman and her family would receive acknowledgement from the emperor.

During the “Three Kingdoms” Dynasty (220 BC to 265 AC) three Emperors promised their wet nurses high posts or other favours. Similarly, the Tang dynasty emperor, Tang Zhongzong (about 618 AC) and the Ming dynasty emperor Cheng Zu (about 1400 AC), gave honor and respect to their wet nurses. Some of the wet nurses’ husbands received promotion or the family was given property. While the primary purpose of a wet nurse was to provide nutrition and care for the infants, they sometimes developed far more influence within the court. The following is a story about the relationship between an emperor and his wet nurse.

The last Chinese emperor, Pu Yi, wrote about his wet nurse in his autobiography, ‘From Emperor to Citizen’. In the second chapter, “my childhood”, he described his wet nurse in great detail. Pu Yi, (February 7, 1906 to October 17, 1967) was the last Emperor of China and ruled between 1908 and 1911, ruling as the Xuantong emperor, the 12th emperor of the Qing dynasty to rule over China. When he became emperor he was only two years old. He was cried continuously during the ceremony to inaugurate him as emperor. No one could control his crying, except his wet nurse, Mrs Wang Jiao. For this reason, the administration team in the Forbidden City, allowed Mrs Wang Jiao to stay in the palace with Pu Yi. In his book wrote that he was often called a bad boy since he would sometimes hurtle into other people, and did not behave while he lived in the palace. At the same time no one could criticise him because he was the emperor. Only his wet nurse could advise him about his behaviour.

It is said that Mrs Wang Jiao breastfed Pu Yi, until he was nine years of age. She was illiterate and had been sold to a family in Beijing to marry their son. Three years later,



she gave birth to a daughter, and because she was in good health, and took good care of her body, she had on adequate supply of breastmilk and was chosen to become a wet nurse. After being chosen for the imperial household she was not able to return home to care for her daughter and her daughter died at three years of age. She was not told this news in case it caused her sadness. The administrators in the Forbidden City thought if a wet nurse was given sad news it would influence the quality of her breastmilk. Mrs Wang Jiao was removed from the palace when PuYi was nine years old and at that time no one told PuYi where Mrs Wang Jiao went. He was very sad and missed her and after that became even more rude and unkind to others. (Pu Yi 2007)

### **2.1.1.2 The benefits of breastfeeding as described in Chinese literature**

Breastfeeding was frequently mentioned in general historical literature of China and more specifically in the writing of ancient Chinese physicians prescription, which recorded detail information about the benefits of breastfeeding. In ancient China most Chinese physicians encouraged women to breastfeed immediately after the birth. During the Tang dynasty (AD 618-907) a famous physician Sun Simiao (AD 581-682), described human milk as “the pride of vital energies and understood it's important for infant survival growth and development” (Cultural China 2007). Mr Sun began to study Chinese medicine at the age of 18 and he lived until more than a hundred. During his long period of practice, he recorded thousands of prescriptions. He had one special prescription collection book that documented children’s feeding problems. This book became the pioneer traditional Chinese medicine and textbook. Sun Simiao is respectfully called “King of Medicine” by later generations.

Sun Simiao is remembered for the two medical works which summarized medical achievements made before the Tang Dynasty, namely *the Essential Recipes worth a Thousand Gold* (Qianjin Yaofang 千金要方) and *A Supplement to Recipes worth a Thousand Gold* (Qianjin Yifang 千金翼方). The former work, which is the earliest medical cyclopedia in China, recorded more than 5300 recipes, while the latter recorded

more than 2000 recipes. Both works have exerted a great influence on later generations, and were quoted by many traditional Chinese medical books after the Tang Dynasty. Sun Simiao was the forerunner of the foundation of gynecology. (Cultural China 2007)

Sun Simiao also produced another book called “Feminie Study”, during the Tang dynasty, which described that infants had a natural capacity for suckling mother's milk. He recorded that breastmilk was the best food for new babies, and that nothing else could be better than breastmilk. The breastmilk nutritional elements were the same as in a mother's blood, so the infant would receive suitable nutrition from his mother's milk. In his book, he also described that if an infant was breastfed for a longer period of time, his personality would be influenced by his mother. The baby would inherit the mother's nature, emotion, humour, mood, spirit and virtue. If the mother had very good health and personality, her baby would also be healthy and have good behaviours when he grew up.

Child diseases were described in formal traditional Chinese medicine starting in the Song dynasty (960-1126 AD). Classifications included infection, nutrition problems, birth defects, trauma, infant problems, mental problems etc. During the thousands of year there were very few articles describing breastfeeding problems. One exception was the notable physician Zhang Jing Yue (张景岳)(1563-1640). He wrote the book Jing Yue Quan Shu (景岳全书) and in the chapter on paediatrics he wrote that the health status of the baby depended on mother's health. If the baby was sick, the physician should treat both baby and mother.

In the book You Ke Fa Hui (幼科发挥) the author, Wan Quan (万全) (1495-1585) explained that the mother's “blood nutrition” was similar to breastmilk. He looked forward to modern biochemistry where it is understood that the nutrients in breastmilk reflect blood levels. A breastfeeding mother should balance her food intake and control her emotions. If the mother was healthy, the baby was safe. He established the theory that both physical and mental health of mother influenced the baby's health.

Over thousands of years of history, Chinese physicians created theories of infant feeding. The theories included that the baby should be fed in regularly, but not too frequently; the baby should not always be held when he/she cried; baby should feed breastmilk for 4-5 months exclusively; breastfeeding should continue until 12-18 months of age; mother's food during breastfeeding should not include too much fat, but should be nutritious; and meat or fish should be given to the child after one year old.

China has a long culture of eating different foods and cuisines in the different regions of China. It also provided guidance on different food choices for different populations, such as what kind food was good for postpartum women and how lactating mothers should eat. There are many recipes for foods to assist mothers to produce more milk. In general mothers should eat less solid food and more liquids in the days after delivery. The theory was that the mother's digestive function was not good and the mother needed appropriate foods to assist in recovery from the weakness of labour. The food also should not be so salty, but could be sweet. In traditional Chinese breastfeeding theory people believed salty food makes the milk diluted. Detailed descriptions of these theories were included in the famous novel "A Dream of Red Mansions" (红楼梦) and the autobiography "From Emperor to Citizen" (我的前半生).

The ancient Chinese physicians thought, feeding breastmilk at the beginning of life was always perfect for infants, even if the mother was less than adequately nourished and was suffering from disease. This was recorded as early as the 12th century writings (Gartner and Stone 1994). The ancient Chinese physicians had a series of rules, to assist in mothers in breast-feeding. These are not unlike the modern 10 steps to promote successful breast-feeding.

## **Part 2 Breastfeeding History in Modern China**

### **2.1.2.1 Breastfeeding in the past four decades in China**

Since liberation, the Chinese government has made the health of its people a high priority. China received great international recognition for establishing health services in every small village throughout the country. As part of its health program, immunisation and child nutrition was a high priority. In the early 1990's the Chinese government, established the National Program of Action for Child Development in China. Included in this development programme was a target to reach 80% breast-feeding at 4 months in each province by the end of the decade. The goals included promoting 'exclusive breastfeeding' to four or six months (<http://www.few.gov.cn/fzgh/et/zget90.htm>). In the academic literature the target is explained as reaching 80% exclusive breast-feeding at four months by the year 2000 (Zheng 1993; Yuan 1994; Wang, Zhou et al. 2006). Before the new millennium a new target was established in the National Program of Action for Child Development in China for the decade from 2001 to 2010 is to achieve a breastfeeding rate of 85% at 6 months together with the timely introduce complementary food. (<http://www.few.gov.cn/fzgh/et/et.htm>)

#### **2.1.2.2 Definitions of breastfeeding (Labbok and Krasovec 1990; Binns 2003)**

The following definitions are used in this study:

***Exclusive Breastfeeding:*** Breastfeeding while giving no other food or liquid, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine.

***Full Breastfeeding:*** Infant is breastfed and may also receive small amounts of culturally valued supplements – water, water-based drinks, fruit juice or ritualistic fluids.

***Partial Breastfeeding:*** mixed feeding with breastmilk and any other sources of energy and nutrients.

***Any breastfeeding:*** The child is receiving some breastmilk with or without other drinks, formula or infant foods.

The 'exclusive breast-feeding' definition given above is consistent with current WHO and UNICEF definitions. However in practice exclusive breastfeeding is often

measured over a 24 hour period and may be presented as period prevalence. (Binns, Fraser et al. 2008)

When reviewing the literature published in China, in many papers, particularly those published before the year 2000 breastfeeding has not been adequately defined in their method sections.

### **2.1.2.3 Changes in breastfeeding rates in China**

Historical attitudes to breast-feeding have been described above and there have been considerable changes in breastfeeding practices in China over the past forty years. The 'ever breastfed' rates in both urban and rural areas were over 80% in the 1950's and 1960's (Chen and Ji 1993). During the 1970's, the rates started to decline, especially in larger cities, when the use of breastmilk substitutes became more widespread (Wang, Zhu et al. 1991). For the first time, middle-class Chinese were able to afford to spend more money on food purchases, including infant formula. The breast-feeding rate continued to decline in the 1980s, and in Beijing, as late as 1990, the breastfeeding rate remained at a low level.

A cross sectional study in Beijing (n=439) showed that the 'any breastfeeding' rates at four months were 62.8%, 56.9%, 61.3% and 55.9% in 1989, 1990, 1991 and 1992 respectively. The 'full breastfeeding' rates at four months were 35.3%, 29.3, 29.0%, and 31.5% respectively (Wang, Liang et al. 1995). In 1983 a breast-feeding education program was commenced in Beijing to counter the effects of low breast-feeding rates, but despite this breastfeeding rates remained at a low level for another 10 years.

A larger cross-sectional survey undertaken in 20 provinces in China in 1984 found that breastfeeding rates at four and six months were 42.5% and 34.4% in urban areas and 69.95% and 60.35 in rural areas (Liu 1993). No further details of methods or definitions used are given in this paper, but in accordance with practice at the time this would have referred to 'any breastfeeding'. In a rural area near Shanghai the breastfeeding rate was 80% in the early 1980's and fell to 44% in early 1990's and again no details are given of

the methodology used (Pang 1993). The trends towards declining breastfeeding rates were similar in urban and rural areas, but the rates in urban areas were lower. This was a similar trend to that experienced in many parts of the world including Australia. (Binns 2003)

To achieve a national 'exclusive breastfeeding' rate at four months of 80% by 2000 as detailed in the National Program of Action for Child Development in China in the 1990's the Ministry of Health moved to introduce Baby Friendly Hospital accreditation to China (Niu, Zhao et al. 1993). The movement became established in China and between 1992 and 1998, the Baby Friendly Hospital program was initiated in 6745 large or medium-sized hospitals and 3475 small hospitals (Song 1999). Another report stated that there were 5550 small hospitals initiated as Baby Friendly Hospitals by the end of 1998 (Song 1999). The discrepancy may be due to differences in the classification of hospital size or simply the difficulty of reporting in a country as large as China.

During the 1980s and 1990s number of programs were commenced to promote breastfeeding, including the Baby Friendly Hospital Initiative, Women and Child Health Protection Legislation, society support programs and breastfeeding education programs (Song 1999). Following these initiatives, and in parallel with the concern expressed about breast-feeding in the rest of the world, the breastfeeding rate in China started to increase in the 1990's (Zheng 1993). In Beijing, after the Baby Friendly Hospital initiative became established in 1992, the breastfeeding rates improved. In Longfu Hospital, Beijing with the initiation of the Baby Friendly hospital program, the 'any breastfeeding rate' at four months increased from 56% to 63% between 1989 and 1992 and further increased to 83% in 1994. The 'full breastfeeding' rate increased from 28% before the commencement of these programs 40%, although all of this data was only based on a cross sectional study of a sample of 439 mothers (Wang, Liang et al. 1995). Another survey in Beijing (a retrospective study, n=817) found that the breastfeeding rate at four months was 16.4% in 1989-1991, increasing to 56.7% in 1995-1997 (Liu, Lin et al. 1999). A further retrospective study at the Beijing Railway Hospital (n=824)

showed the same trend, with the breastfeeding rate at four months of 16.8% in 1991-1994 increasing to 58.8% in 1995-1998(Liao 2000).

Other parts of China followed the breastfeeding trends being set in Beijing (Pang 1993). In Tianjin, one of the larger coastal cities in Eastern China, a major breastfeeding promotion program started in 1987. The breastfeeding initiation rates in Maternal and Child Health Care Institute of Tanggui District in Tianjin increased from 55% in 1985 to 85% in 1991 and 95% in 1992 (n=1897 in 1992)(Zheng 1993). A cohort study (n=289) undertaken in the Xiangzhou People's Hospital in Zhuhai, Guangdong Province found that the 'full breastfeeding' rates at four and six months were 45.4% and 9.9% respectively in 1993(Huang 1995). After the Baby Friendly Hospital program was initiated at that hospital the 'full breastfeeding' rate at four and six months increased to 70.9% and 56.8% respectively by 1994(Huang 1995).

A national cross sectional survey in 1992 with a large sample size of 177163 found that the 'full breastfeeding' rates at the first month were 21.1% in urban areas and 37.6% in rural areas. However by three months the rates had fallen to 14.3% and 24.3% respectively (Chang, Fu et al. 2000). Another slightly smaller national cross sectional survey in 1998 (n=13721) found a further increase of the 'full breastfeeding' rate at one month to 64.3% in urban areas and 60.0% in rural areas and at three months the rates were 37.5% and 53.7% respectively(Ahluwalia, Tessaro et al. 2000). This study was interesting because the full breast-feeding rate is reported to be higher in urban areas than in the rural areas. This may reflect the cultural practice of giving additional feeds of drinks such as tea in some rural areas.

In 2002, a cross-sectional study (n=2001) undertaken in Beijing and four provinces (Shandong, Hubei, Zhejiang, Guangdong) found that the 'ever breastfed' rates were 90.1% and the 'full breastfeeding' rates at four and six months were 45.3% and 21.6% respectively. From the results of the survey it was estimated that the average duration of breastfeeding was  $8.73 \pm 4.21$  months (mean  $\pm$  SD) (Wenkun, Buo et al. 2004). A retrospective survey (n=3414) in five large cities from different regions of China

(Guangzhou, Shanghai, Congqing, Xi'an and Changchun) in 2002 found that average breastfeeding duration was eight months and the 'any breastfeeding' rates at 0, 4, 6, 12, 24 months were 94.6%, 61.0%, 50.1%, 5.3% and 0.4% respectively (Hu, Zhang et al. 2004).

A further survey in 105 counties (rural areas, sample size 21036) from 1996 to 2000 showed that the 'ever breastfed' rate was 98.2% and 'Full Breastfeeding rate' at four month was 24.4% in rural China(Wang, Wang et al. 2005). A comparison of breastfeeding rates made in Shihezi, a remote area in far west of China, showed that there as no significant increase in 'any breastfeeding' rates at six months between 1994-1996 (77.5%) and 2003-2004 (76.2%). However during this time period the 'full breastfeeding' rate at one month increased from 38.0% to 57.3% (Xu, Liu et al. 2006). Data from the Chinese Food and Nutrition Surveillance System (CFNSS) in 1998 (a cross sectional study, n=403) showed that the 'exclusive breastfeeding' rates under 4 months were 67.1% (53.7% in urban areas, 76.6% in general rural areas, and 64.6% in the poor rural areas)(Fu, Chang et al. 2000). However the interpretation of this data is difficult as it appears that in this report breastfeeding is expressed as period prevalence and it is difficult to compare these rates with other reports

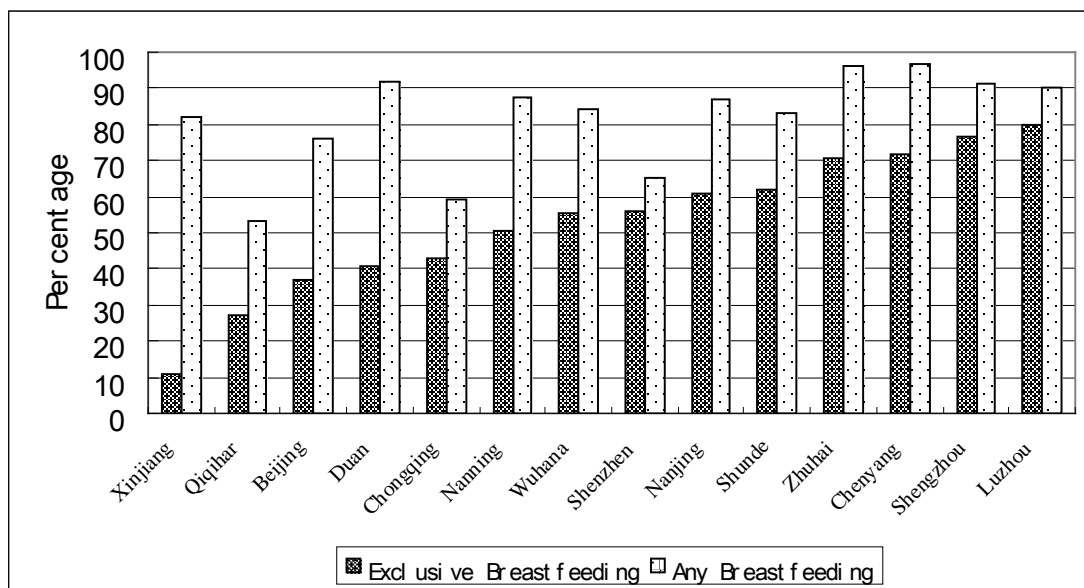
These studies show that the breastfeeding rates in China fell during the 1970's, to reach their lowest point in the 1980's and began to rise in the early 1990's. However China is a huge country geographically, with great variation in population density and ethnic diversity. For these reasons the breastfeeding rates and infant feeding practices in different parts of China can vary considerably (Yun, Kang et al. 1989; Fang, Haiqing et al. 2000).

Breastfeeding in China has significantly improved since the introduction of the Baby Friendly Hospitals Initiative in 1992. Before the implementation of the breastfeeding promotion program, few studies of breastfeeding were published which makes it difficult to describe with accuracy the trends in rates. However since 1993, there has been a notable increase in the number of published studies on breastfeeding.



#### **2.1.2.4 Breastfeeding rates in China from cohort studies**

Figure 2.1 summarizes the ‘exclusive breastfeeding’ and ‘any breastfeeding’ rates from cities and regions in China. The results are summarised from 14 papers published in Chinese and English of cohort studies of breastfeeding that were done between 1994 and 2004.



**Figure 2.1 Breastfeeding Rates (%) at Four Months by Cohort Studies, P.R. China (Year 1994-2004)**

The studies included in Figure 2.1 are all cohort studies with follow up to at least four months. The variables included in the studies were 'exclusive breastfeeding', 'partial breastfeeding' and 'non-breastfeeding'. In this table 'any breastfeeding' rates were generated from 'exclusive breastfeeding' plus 'partial breastfeeding'.

Usually the methods of these studies were similar even though they were conducted by different researchers. All other cases included were recruited randomly in hospitals after delivery. The follow up data were consecutive and collected by medical professionals at their postpartum hospital visit or during the infants regular physical examinations. Most of the studies (93%) completed at least four months follow up.

The 'any breastfeeding' rates at four months in the six large cities were relatively high, 93% in Zhuhai, Chongyang, 84%-88% in Nanning, Nanjing and Wuhan, 76% in Beijing, and 59% in Chongqing. The rates in the four medium-sized cities ranged from 53% to 90%. The rates were all above 90% in the three small cities and 82% in Xinjiang. The 'exclusive breastfeeding' rates in all cities studied, except Luzhou, were below 80% at four months of life and ranged as low as 27%. In the six large cities, 'exclusive breastfeeding' rates at four months were from 37% to 61%; in the four medium-sized cities, from 27% to 80%; in the three small cities from 41% to 77% and in Xinjiang 10.9%. Both 'any breastfeeding' and 'exclusive breastfeeding' rates in Chongqing and Qiqihar were lower in most other cities. The 'exclusive breastfeeding' rates in Beijing and Duan were also lower and the lowest rates were found in the Xinjiang Uygur Autonomous Region where minority groups often feed other fluids, such as tea to their infants.

A number of cohort studies were found that did not meet the criteria for inclusion into Figure 2.1. A cohort study in Shanghai suburb showed that 'any breastfeeding' rates (Zhang 1998) at four months were above 90% from 1994 to 1996 (Zhang 1998). In this study 'exclusive breastfeeding' rates at one month were 48%, 60% and 80% in 1994, 1995 and 1996 respectively and at four months 20%, 36% and 70% respectively (Zhang 1998). Probably as a result of breastfeeding promotion programs, 'exclusive

breastfeeding' rates have increased in recent years, but the rates have not yet reached the 80% target. A cohort study (n=1085) in Daqing, a medium-sized city in Heilongjiang Province, found that 'full breastfeeding' rates at one, two, three and four months were 86.5%, 82.6%, 75.8% and 71.2% respectively (Zhao, Yang et al. 2004). A cohort study in Nanchang, the capital city of Jiangxi province showed that the 'exclusive breastfeeding' rate was 67.7% at one month and 45.8% at four months (Shen 1997). In Nantong, a medium-sized city in Jiangsu province, 'exclusive breastfeeding' rates at discharge and four months were 81.63% and 58.16% respectively (Chen and Yao 1998). Another cohort study in Chongqing undertaken in 2003 and found that the 'exclusive breastfeeding' rates at one, two, three and four months were 98%, 69%, 66% and 64% respectively (Liao, Xiao et al. 2003). The more recently reported 'exclusive breastfeeding' rates for China were higher than in 1999 (Zhang and Wang 2000).

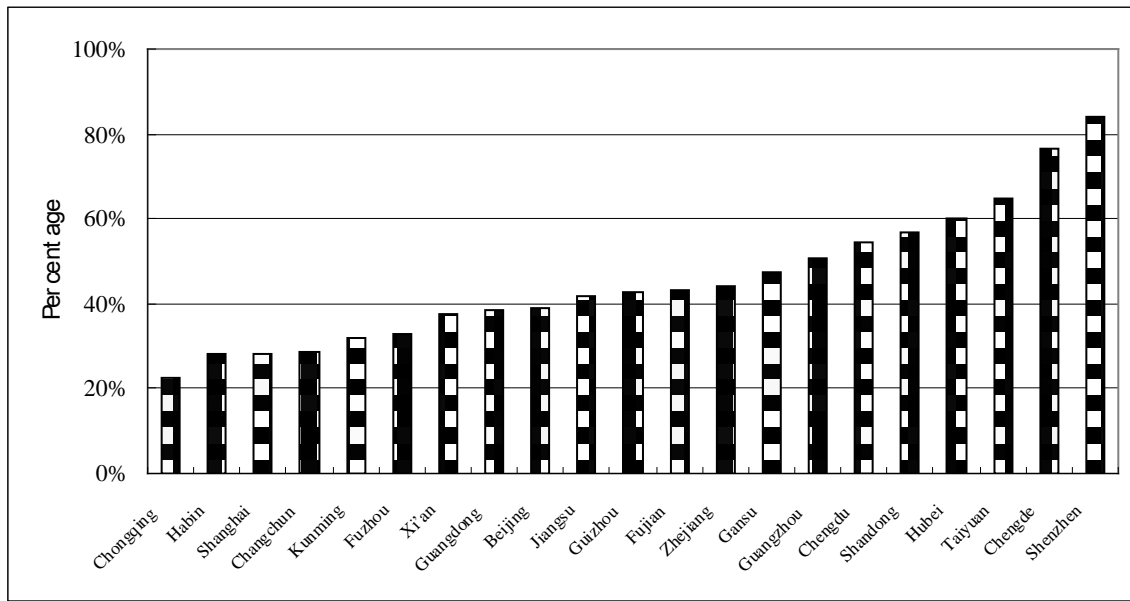
To summarise the situation in China, the 'any breastfeeding' rates in the majority of cities were above 80% at four months in these cohort studies. However very few of the cities of China were able to reach the national target of 'exclusive breastfeeding' of 80%.

#### **2.1.2.5 Breastfeeding rates in China in other studies**

Figure 2.2 summarizes the 'exclusive breastfeeding' rates. These studies used a variety of research methods including cross-sectional, retrospective and some cohort studies which did not satisfy the criteria for inclusion into the Figure 2.2.

The national surveys (cross-sectional) that included rural areas found that 'exclusive breastfeeding' at three months were 46.3% in urban areas and 69.6% in rural areas (Fu, Chang et al. 2000), at four months 24.4% (Wang, Kang et al. 2000). The Chinese National Nutrition and Health Survey polled 2002 (cross-sectional study, n=6858) found that the 'full breastfeeding' rate under four month was 71.6% (65.5% in urban areas and 74.4% in rural areas) and 'any breastfeeding' rate was 94.6% (92.5% in urban areas and 95.6% in rural areas) (Lai, Yin et al. 2005). In the survey, 'any breastfeeding' rate at four month was 91.2%, at six months 84.3%, at one year 42.6% and at two years 19.2%. The mean duration of breastfeeding was 10.1 months (8.6 months in urban areas and 10.8% in

rural areas). In this study the rate of introduction of complementary food before four months was 30.4% (Lai, Yin et al. 2005). A cross-sectional survey in Hefei found that ‘exclusive breastfeeding’ rate at 4-6 months was 51.4% (Li and Qu 1997). However it is difficult to know how to interpret this figure as it appears to be a survey conducted over the 4 to 6 months age range, a time when the rate of exclusive breast-feeding is likely to be declining rapidly.



**Figure 2.2 Exclusive Breastfeeding Rates (%) at Four Months by cross-sectional or retrospective studies in P.R. China**

In nine large cities out of the 12 shown in Figure Two, the ‘exclusive breastfeeding’ rates at four months were below 40%. In the seven provinces shown in Figure Two, the ‘exclusive breastfeeding’ rates at four months were between 40-60%. The only report in which ‘exclusive breastfeeding’ at four months reached to 80% in Figure Two was from Guanlan Hospital in Shenzhen, a medium-sized city in Guangdong province. In this hospital ‘exclusive breastfeeding’ increased significantly after the introduction of the Baby Friendly Hospital Initiative in 1995. The ‘exclusive breastfeeding’ rates were 63.4% in 1995, 56.6% in 1996, 63.8% in 1997, 73.3% in 1998, 78.6% in 1999 and finally reached 84.2% in 2000 (Zhang and Huang 2003).

The results from this group of studies were similar to the cohort studies, and ‘any breastfeeding’ rates in the majority of cities or provinces were above 80% at four months. Few cities or provinces reached the national target of ‘exclusive breastfeeding’ of 80%. The duration of ‘any breastfeeding’ in the majority of cities or provinces was usually between seven and nine months.

#### **2.1.2.6 Reasons for Discontinuing Breastfeeding or Exclusive Breastfeeding before Four Months in China**

The most common reasons for ceasing breastfeeding or ‘exclusive breastfeeding’ before four months were ‘perceived breastmilk insufficiency’, ‘mother’s return to work’, ‘maternal or child illness’ and ‘breast problems’, ‘some traditional perceptions’ etc.

#### **2.1.2.7 Perceived breastmilk insufficiency**

Perceived breastmilk insufficiency was the most common reason for discontinuing ‘exclusive breastfeeding’ or ‘any breastfeeding’ in China (Xiao, Wu et al. 1998; Xiang, Hao et al. 2001; Tian and Xie 2003). In Xi’an, ‘insufficient milk’ was the first reason (81%) for terminating breastfeeding (Xiang, Hao et al. 2001). A survey in Hubei province showed that in mothers who gave their babies complementary food before four months, 51.7% of them did so because they thought their breastmilk supply was insufficient (Fang, Haiqing et al. 2000).

This result is consistent with findings of studies from other countries where breastmilk insufficiency is perceived as a socially acceptable reason for not breastfeeding (Binns and Scott 2002). A study of Japanese women living in Perth, Australia, also showed that the most common reason for the decision to cease breastfeeding was 'insufficient breastmilk' (Utaka, Li et al. 2005). Perceived 'insufficiency of breastmilk supply' may not reflect the true reasons for cessation of breastfeeding but may give mothers as a socially acceptable reason when she wanted to stop breastfeeding (Binns and Scott 2002). The study in Beijing showed that before Baby Friendly Hospital initiatives (before 1995), one third mothers (32%-35%) claimed that they terminated breastfeeding because of disliking or feeling uncomfortable with breastfeeding. Only 8%-9% mothers ceased breastfeeding because of perceived insufficient milk. But after the Baby Friendly Hospital Initiative was introduced, the mothers were educated to know that they should breastfeed their babies and less than 14% mothers gave the reason for stopping breastfeeding as 'dislike or feel uncomfortable with breastfeeding'. However the reason 'insufficient milk' increased to more than 35% while the proportion of other reasons changed little (Liu, Lin et al. 1999; Liao 2000). It seems that mothers may have changed their reason for not breastfeeding from 'dislike of breastfeeding' to 'insufficient milk' for not breastfeeding their babies. In a study (of 214 mothers) in Kunming, 68 mothers introduced complementary food before four months and 66% of them claimed the reasons as 'insufficient milk' or 'no milk'. Among the mothers who claimed 'breastmilk insufficiency', 28 mothers thought they had temporary 'insufficient milk' and fed their babies formula, but once the formula was introduced, their breastmilk continued to decline. Thirteen babies who did not suck the breast in time because of mother's pain of operation or early birth. Nine mothers suspected that their breastmilk quality was not good enough and seven mothers had insufficient sleep and bad appetite. Only 11 mothers (5%) claimed the breastmilk insufficiency as the only reason (Chen and Hu 1998).

### **2.1.2.8 Mothers return to paid work after birth**

In metropolitan cities or developed areas, the mother returning to paid employment was an important reason for breastfeeding cessation and the early introduction of complementary food (Fang, Haiqing et al. 2000; Xiang, Hao et al. 2001; Tian and Xie 2003). Maternity leave in China is generally not very long and currently the Government recommends three-month delivery leave and one month lactation leave for working mothers (Wang, Zhu et al. 1991). The total four months leave available to mothers is clearly not enough for 'exclusive breastfeeding' for six months (Gu 2003) (Yu and Song 2000; Gu 2003). In many private companies maternity leave provisions do not even reach four months. In Zhongshan City of Guangdong province, the average delivery leave from work was only 67 days and only 2.6% work places have breastfeeding rooms (Gu 2003). Competition for good work positions in China is intense and mothers are reluctant to surrender their positions.

### **2.1.2.9 Illness in the Mother or Child: effect on breastfeeding**

Mother or child's health problems is one of main reasons for stopping breastfeeding or introducing complementary food (Xiang, Hao et al. 2001; Tian and Xie 2003). In Beijing, mother or baby's illness accounted for 14%-20% reasons (ranking third) for terminating breastfeeding (Liu, Lin et al. 1999; Liao 2000). This reason ranked in the second place for ceasing breastfeeding and the third place for early complementary food introduction in Shanghai (Wu, Zhou et al. 2001; Zhou 2001). It ranked in the third place in Jiangsu (Chen 1999), the second most common reason in Kunming (Chen and Hu 1998) and in Zhejiang Province (Han and Li 1999). The occurrence of illness was given as the most common reason for not breastfeeding in Sichuan province (Gui 2002).

Mother's illnesses such as acute infections or being HBsAg (hepatitis) positive often led to separation from their babies and cessation of breastfeeding (Gui 2002). This is despite the fact that modern paediatric practice recommends vaccination and then the mother can continue with breastfeeding. In this group the most common infant illnesses that were



examined were respiratory diseases and diarrhoea (Wu, Zhou et al. 2001; Xiang, Hao et al. 2001). In actual fact the continuation of breastfeeding is helpful for the recovery from these illnesses and the prevention of later problems. What was previously called “breastfeeding jaundice” was given as a common reason for cessation of breastfeeding (Wu, Zhou et al. 2001). Premature infants often stayed in Neonatal Intensive Care Units for a period of time and were less likely to be breastfed (Gui 2002). It would seem that few of the maternal or infant health problems mentioned in the literature should actually be genuine medical reasons for stopping breastfeeding.

#### **2.1.2.10 Breast problems:**

Breast problems such as sore and inverted nipples, mastitis were reported to be very common in breastfeeding mothers especially in the first month (Shen 2001; Wu, Zhou et al. 2001; Gui 2002). This is also the case in developed countries, but can often be managed by correct advice on attachment.(Binns and Scott 2002)

#### **2.1.2.11 Traditional perceptions that influence breastfeeding outcomes:**

The tradition of early introduction of complementary foods to infant can be traced to as early as the Sui Dynasty (581-618AD) of China (Ping-Chen 1995). An academic report from this period said: ‘thirty days after a child is born, he should be given some foods, in the amount of two dates or so; after fifty days, of a cherry or so; after a hundred days, of a large date or so’. Tang (618-907AD) medical authorities were quoted as recommending: ‘an infant may be given a rice drink after the seven days of birth’. A scholar named Sheng Chi Ching (960-1276AD) in the Song Dynasty, also advised that foods should be provided to an infant thirty days after birth (Ping-Chen 1995).

These traditional beliefs still have a strong adverse influence on ‘exclusive breastfeeding’ in China, especially in the less developed and minority areas (Chen and Hu 1998; Han and Li 1999). The Chinese National Nutrition and Health Survey of 2002 (n=6858)

showed that the use of prelacteal feeds is still very common. The first feed for 48.8% babies (38.8% in urban areas and 53.1% in rural areas) was sugar water (Koletzko 2006).

Following traditional feeding methods was an important reason for discontinuing 'exclusive breastfeeding' in Kunming (accounted for 34.3% reason) (Chen and Hu 1998) and Zhejiang rural areas (account for 25.6% reasons) (Han and Li 1999).

In Hubei province, 50% of the mothers stated that the reason for the introduction of complementary food before four months was that the mother wanted to follow traditional feeding patterns (Fang, Haiqing et al. 2000). Generally, mothers thought that their breastmilk was too thin to satisfy baby's requirements and there was a need to add cereal to complement breastmilk (Lin, Li et al. 1997). Traditional practices still have a strong influence, even on medical staff. There was a report of one medical doctor who misunderstood the meaning of 'exclusive breastfeeding' as 'do not give baby formula or cow milk before five months', but thought it was acceptable to give some starchy foods' (Tian 1995). Many mothers thought that their baby should be weaned before 12 months (Dang, Yan et al. 2005).

Another traditional perception that needs to be corrected is that 'breastfeeding is not good for mothers'. A survey undertaken in the Beijing Women Hospital from 1983 to 1985 showed that almost half mothers and relatives thought breastfeeding was not acceptable because it increased mother's burden, impacted mother's health or changed mother's shape (Chen and Ji 1993).

#### **2.1.2.12 Other reasons**

Caesarean section rates have been increased significantly in China since mid 1990s (Wang, Zhou et al. 2006). Caesarean sections have been become an important reason for discontinuing breastfeeding in Sichuan (accounted for 16.2% reasons) (Gui 2002) and Beijing (accounted for 5.0-5.2% reasons) (Liu, Lin et al. 1999; Liao 2000). A cohort study from Shanghai showed that breastfeeding rates at one, six and twelve month in

caesarean section group were significantly lower than vaginal delivery group. The HR was 1.21 (95% CI: 1.10-1.33) (Wang, Zhou et al. 2006).

### **2.2.13 Conclusions**

Breastfeeding rates in China fell during the 1970's when the use of breastmilk substitutes became widespread. The rates of breastfeeding reached their lowest point in the 1980's. As a result many efforts were introduced to promote breastfeeding, and since the early 1990's the breastfeeding rate in China has started to increase again. Since the mid 1990's the 'any breastfeeding' rates in the majority of cities and provinces, including minority areas have again climbed above 80% at four months. But almost all cities and provinces did not reach the national target of 'exclusive breastfeeding' of 80%. The duration of 'any breastfeeding' in the majority of cities or provinces was between seven to nine months.

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## **Section 2 The Importance of Breastfeeding**

In the previous section the literature reviewed was specific to China. The following section will focus on the general literature on breastfeeding.

Breastfeeding is the basis of good nutrition for all infants, and is the most important part of the WHO and UNICEF infant feeding strategies (WHO 2002). It is an important priority for all mothers, babies and society (Galtry 2000; Victora, Adair et al. 2008). The benefits of breastfeeding for the infant are experienced in the immediate short-term and long-term.

The immediate benefits include improved cognitive development, and more appropriate growth rates. There is now considerable evidence that infants who are breastfed are less prone to become obese in childhood, adolescence and late in life.(Oddy, Li et al. 2006; Oddy, Scott et al. 2006)

Breastfeeding has immediate benefits in reducing infant morbidity and/or mortality from diarrhoeal disease, and acute respiratory infections. In developing countries, the benefits are particularly noteworthy and are greater in infants who are exclusively breastfed (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000). But as well as reducing infections in developing countries, breastfeeding also has an important effect in the developed world as shown in the recent major review from the USA (Ip, Chung et al. 2007). There is also some evidence that other infections, including otitis media and urinary tract infections are reduced in infants who are breastfed. In neonatal intensive care units necrotising enterocolitis remains a problem that can be reduced by the use of breast milk (Binns and Davidson 2003).

Benefits of breastfeeding for the mother include: a reduction in the rates of premenopausal breast cancer and ovarian cancer; prolonging the duration of lactational amenorrhoea and improving postpartum weight loss. Breastfeeding also decreases the cost

of caring for infants through reduced usage of the health care system. Education costs may also be reduced because of the health benefits reduces absenteeism and improves the infant's brain development (Galtry 1997).

### **2.2.1 The composition of breastmilk**

Breastmilk provides the best balanced food for infants including all of the nutritional requirements, up until six months of age and this includes providing nutrients for ill and preterm infants (Ahluwalia, Tessaro et al. 2000; Spatz 2004). Natural selection over millions of years has made human breastmilk far more suitable for babies than any artificial formula (Newman 1990; Hartmann, Sherriff et al. 1995). Breastmilk contains living cells as well as nutrients, growth factors, hormones, enzymes, and immune-protective factors (Hamosh 1996). During the second six months of life, breastmilk can provide substantial amounts of nutritional requirements, and approximately 60% of energy requirements. If breastfeeding is continued beyond 12 months, which is the current recommendation of the WHO and UNICEF it provides a very useful addition to child nutrition. Human milk in the second year of life provides approximately 31% energy, 38% protein, 45% vitamin A and 95% vitamin C needed by children of this age (World Health Organization 2000).

Breastmilk is the easiest form of milk for preterm infants, whose digestive systems are immature, to digest and absorb (World Health Organization 2000). The components of breastmilk compensate for immature function, including the neonate's inability to produce certain immunoglobulin A (IgA), taurine, nucleotides, and long-chain polyunsaturated fatty acids (Hamosh 1996; Heird 2001).

Lactogenesis I it is the first stage of preparation of the breast for milk production, which occurs during pregnancy. Within four days of birth, Lactogenesis II occurs with the copious production of milk (Neville and Morton 2001). The stages of lactation correspond roughly to the following times postpartum: colostrum (0–4 days), followed by



transitional milk and several weeks later by more mature milk (15–30 days) (Butte, Lopez-Alarcon et al. 2002). Colostrum is usually clear watery, and can also be yellow, but it contains antibodies, white cells and vitamin A. It also contains growth factors which help intestine to mature and possibly prevent allergy. The promotion of colostrum feeding within the first two hours of birth or even earlier is a priority for UNICEF and is an important subgoal of the Millenium Development Goals (UNICEF 2006). Human breastmilk is quite variable in its composition, and to a certain extent is related to maternal nutrition, but it is generally acknowledged that even malnourished mothers can produce milk, which is adequate for infant survival (Christian 2002; Stephenson and Symonds 2002; Dewey and Cohen 2007). The changes in human milk composition that occur in the first 12 months of life are shown in Table 2.1 (Butte, Lopez-Alarcon et al. 2002). There may be considerable individual variation in the composition.

**Table 2.1 Human milk composition in the first year (Butte, Lopez-Alarcon et al. 2002)**

Age (months)	Protein (g/L)	Calcium (mg/L)	Iron (mg/L)	Zinc (mg/L)
1	11	266	0.5	2.1
2	9	259	0.4	2
3	9	253	0.4	1.5
4	8	247	0.35	1.2
5	8	241	0.35	1
6	8	234	0.3	1
7	8	228	0.3	0.75
8	8	222	0.3	0.75
9	8	215	0.3	0.75
10	8	209	0.3	0.5
11	8	203	0.3	0.5
12	8	197	0.3	0.5

In the first year, the amounts of energy, vitamin A, vitamin D and vitamin B6 in breastmilk are relatively stable at about 0.67Kcal/g, 1.7 $\mu$ mol/L, 645 ng/L and 0.13mg/L respectively (Butte, Lopez-Alarcon et al. 2002).

Breastmilk provides enough water for babies and even in hot climates provides enough fluids for infants. Indeed giving additional fluids may reduce the stimulation to the mother's breast and can introduce infection into the infant's gastrointestinal tract.

The fat content of breastmilk increases the energy contained in a breastfeed and provides the polyunsaturated fatty acids essential for development, particularly development of the central nervous system (Marangoni, Agostoni et al. 2000; Butte, Lopez-Alarcon et al. 2002). Because of the changing composition of breastmilk during the feed infants should continue feeding until completely satisfied, rather than being removed from the breast too quickly (Butte, Lopez-Alarcon et al. 2002).

The iron content of breastmilk is low at about 2 mg per litre, but its bioavailability is much higher than other foods (up to 50%) (Calvo, Galindo et al. 1992). Comparable bioavailability for artificial infant formula would be five to 10%. The reason for the high rate of iron absorption is the lower phosphate and protein content of human milk compared to cow's milk and the transport of iron, bound to the protein lactoferrin. Because of the high bioavailability of iron from breastmilk, if the infant has been born with sufficient iron stores, which is usually the case in term infants, exclusively breastfed infants usually maintain a satisfactory iron status until about six months of age (Griffin and Abrams 2001).

The differences between the breastmilk, cow's milk and infant formula are contained in the following table which was prepared by UNICEF.

**Table 2.2 Differences between milks (World Health Organization 1998)**

	Breastmilk	Animal milk	Formula
Bacteria contaminants	None	Likely	Likely when mixed
Anti-infective factors	Present	Not present	Not present
Growth factors	Present	Not present	Not present
Protein	Correct amount and	Too much and	Partly corrected

	easy to digest		difficult to digest	
	Enough	essential	Lacks essential fatty	Lacks essential fatty
Fat	fatty acids		acids	acids
	lipase to digest		No lipase	No lipase
Iron	Small amount		Small amount	Extra amount
	Well absorbed		Not well absorbed	Not well absorbed
Vitamins	Enough		Not enough A and C	Vitamin added
Water	Enough		Extra needed	May need extra

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### 2.2.2 Reduced morbidity and mortality

The millennium goals of the United Nations have set the reduction in childhood mortality as being one of their prime aims. Breastfeeding, particularly exclusive breastfeeding until six months of age, is one of the key strategies in achieving these goals.(UNICEF 2007)

Breastfeeding is the most effective public health intervention available for reducing the morbidity and mortality of children under five (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000; León-Cava, Lutter et al. 2002; Chen and Rogan 2004; Labbok, Clark et al. 2004). Infants who are exclusively breastfed for six months experience lower rates of morbidity and mortality than those who were only partially breastfed or fed entirely on infant formula (Kramer and Kakuma 2002; León-Cava, Lutter et al. 2002; Chen and Rogan 2004). The WHO estimates that approximately 15% of under 5 deaths could be prevented if infants were exclusively breastfed for 6 months (World Health Organization 2002). Currently in the Western Pacific region of WHO an estimated 3200 children under the age of five die every day. A substantial proportion of these deaths could be prevented if exclusive breastfeeding until six months of age was implemented across the region.

A case control study based on the 1988 National Maternal and Infant Health Survey (NMIHS) data of United States was conducted in 8944 babies (cases=1204 postneonatal

deaths (between 28 days and one year), controls= 7740 children who were still alive at one year). The results showed that children who were ever breastfed had lower postneonatal death rate (OR=0.79, 95% CI, 0.67-0.93) and fewer occurrences of Sudden Infant Death Syndrome (SIDS) (OR=0.84, 95% CI, 0.67-1.05) than never breastfed ones (Chen and Rogan 2004).

The WHO collaborative study brought together a number of cohort studies from developing countries. A meta-analysis of these studies that included 522 deaths of children under one years of age showed that the protection against mortality provided by breastmilk was more significant in early infancy, with a pooled odds ratios(OR), of 5.8 (95% CI 3.4, 9.8) for infants <2 months of age, OR= 4.1 (95% CI 2.7, 6.4) for 2-3 month old, OR= 2.5 (95%CI 1.6, 3.9) for 4-5 month old and 1.8 (95%CI 1.2, 2.8) for 6-8 month old. (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000). After eight months of age, the lower bound of the 95% CI of the odds ratios was no longer greater than one. This suggests that in this age group, further studies are required with a larger sample sizes (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000). The survival benefits of breastfeeding certainly extend beyond infancy (León-Cava, Lutter et al. 2002). Breastfeeding appears to be dose related and the longer an infant is breastfed the lower is the risk of neonatal death (Nath, Land et al. 1994; Chen and Rogan 2004).

Infectious diseases had a lower incidence in breastfed infants than in artificially fed infants, including gastrointestinal infection such as diarrhoea, respiratory tract infections and otitis media,(Kramer, Guo et al. 2002; León-Cava, Lutter et al. 2002; Escuder, Venancio et al. 2003). Accordingly, the deaths due to these diseases were lower in breastfed than in artificially fed infants. The mortality rates of measles, diarrhoeal diseases, and acute lower respiratory infection (ALRI) among weaned children under two years old or non breastfeeding babies were significantly higher than those who were still being breastfed (Yoon et al. 1996).

On the other hand, delaying initiation of breastfeeding and ceasing to breastfeed in the first six months of life increased the risk of neonatal mortality (Hill, Andersen et al. 1995; Fairbank, O'Meara et al. 2000; Renfrew, Lang et al. 2000). Stopping breastfeeding after 12 months of age or before 15 months due to a new pregnancy or mother's death, increased infant mortality in developing countries (Cattaneo and Quintero-Romero 2006; Ip, Chung et al. 2007). In countries with a high prevalence of infection, breastfeeding into the second year of life significantly improved infant's survival compared to ceasing breastfeeding (Cattaneo and Quintero-Romero 2006).

The National Health and Medical Research Council of Australia summarised infant conditions that are reduced in infants by breastfeeding (Binns and Davidson 2003)

- respiratory illness, particularly in households where both parents smoke
- asthma
- gastrointestinal tract disease
- inflammatory bowel disease
- otitis media,
- urinary tract infections
- bacteraemia-meningitis,
- SIDS—sudden infant death syndrome
- necrotising enterocolitis in premature infants—reduced incidence.

A detailed review of the scientific and epidemiological evidence in support of the World Health Organization's and UNICEF's Global Strategy for Infant and Young Child Feeding provides detailed summaries and assessments of the most relevant studies. (León-Cava, Lutter et al. 2002)

Breastfeeding was more strongly associated with preterm or low birth weight infant survival, especially in low socioeconomic status such as maternal education and poor hygienic areas (Butz, Habicht et al. 1984; Yoon, Black et al. 1996; León-Cava, Lutter et al. 2002).

The protective effect of breastfeeding against infections was particularly important in young (under six months), low birthweight and preterm infants (Yoon, Black et al. 1996). The protection was also especially important in developing areas, when baby's mothers had little formal education and in emergency conditions such as war (Yoon, Black et al. 1996; Jakobsen, Sodemann et al. 2003; Walker, Turnbull et al. 2004). In most developing countries, the benefits of breastfeeding for child's survival outweighed the risk of transmitting HIV by the mother's milk.

Besides diarrhoea and respiratory infections, the protective effects of breastfeeding were significant in many other infections of infants. Breastfeeding reduces the occurrence and recurrence of otitis media and tonsillitis (Manning, Avery et al. 1974; Duncan, Ey et al. 1993; Stenstrom and Ingvarsson 1997; Heinig 2001; Ip, Chung et al. 2007). Infants who were fully breastfed for less than six months were at greater risk for recurrent otitis media than those who were fully breastfed for more than six months. Exclusive breastfeeding also reduces risk of first-time febrile urinary tract infection (UTI) (Marild, Hansson et al. 2004).

Necrotizing enterocolitis is a common gastrointestinal disease in neonatal intensive care units in developed countries. The risk of the disease is greater in formula-fed infants than in breastfed infants (Ip, Chung et al. 2007) (Hanson 1998).

As an overall summary of its benefits, breastfeeding has an important effect in reducing admissions of infants to hospitals, and again, this is dose related. For each additional month of full or exclusive breastfeeding rates for admission to hospital are reduced.

### **2.2.3 Protection against chronic disease**

In recent years there has been considerable interest in the developmental origin of adult disease hypothesis (DOAD). While variations of the theory have been around for some time it has been popularised by the work of Professor Barker (Barker 2006; Barker 2006; Barker 2007). Many chronic adult diseases have their origins in the rate of early growth

and development. Breast-feeding provides the most appropriate rate of growth that appears to minimise the development of diseases such as:

obesity,

diabetes (type 2),

hypercholesterolaemia,

heart disease,

chronic renal disease.

It appears that breastfeeding may have long-term health effects in preventing the development of some chronic diseases in adults that could be in addition to the rate of infant growth and development (Oddy 2001; Binns 2003; Schack-Nielsen and Michaelsen 2007). The role of breast-feeding in the development of adult disease has recently been reviewed by several international authorities:

WHO/ UNICEF (Horta, Bahl et al. 2007)

USA (Ip, Chung et al. 2007)

World Cancer Research Foundation(World Cancer Research Fund / American Institute for Cancer Research 2007)

These reports list the many significant advantages breast-fed infants have over those who have been given artificial formula.

Compared to artificial feeding, breastfed babies are also less likely to have allergies, obesity, ulcerative colitis, inflammatory bowel diseases and Crohn's disease in their later life. (Baker, Michaelsen et al. 2004; Klement, Cohen et al. 2004; Kane and Lemieux 2005), (León-Cava, Lutter et al. 2002);(Hanson and Korotkova 2002); (Schack-Nielsen, Larnkjaer et al. 2005).

Prolonged breastfeeding protects infants against elevated weight gain which might be the first step on obesity development (Baker, Michaelsen et al. 2004; Oddy, Scott et al. 2006; Oddy, Scott et al. 2006). There was a dose response association between the duration of breastfeeding and the risk of obesity. 'The longer an infant was breastfed, the lower the risk of obesity' (Binns 2001).

Recently, the WHO has published detailed methodology that was used to develop the new international growth reference. Infants who are exclusively breast-fed for the first few months of life grow at a different rate and have different body shape by the end of the first year of life (de Onis, Garza et al. 2006; de Onis, Garza et al. 2007). Infants who are bottle fed can be given large quantities of food in an uncontrolled way, while infants who are breastfed have their intake limited by the ability of the breast to produce milk. Self-regulation of energy intake appears to be established earlier, and in a more accurate way.

Exclusive breastfeeding for the first months of life (> 5 months) and total (longer than seven or nine months) breastfeeding independently protects children against the development type 1 diabetes (Sadauskaite-Kuehne, Ludvigsson et al. 2004). On the other hand, early introduction of breastmilk substitutes or cow's milk (before three months) increased the risk of the disease later in life (Sadauskaite-Kuehne, Ludvigsson et al. 2004)

The WHO review of the long-term effects of breast-feeding, summarise the benefits in the following table (Horta, Bahl et al. 2007):



**Table 2.3 The Review of Breastfeeding Protecting against Chronic Disease**

Outcome	Breastfeeding (current review)	
	Pooled effect size (95% confidence interval)	conclusion
Blood pressure (mean difference in mmHg, 95% CI) Systolic Diastolic	-1.21(-1.72 to -0.70) -0.49 (-0.87 to -0.11)	The effect of breastfeeding is significant, but smaller than the effect of other interventions.
Total serum cholesterol (mean difference in mmol/L, 95% CI)	-0.18 (-0.30 to -0.06)	The effect of breastfeeding is significant and larger than the effect of other interventions.
Overweight or obesity	Odds ratio 0.78 (0.72 to 0.84)	The effect of breastfeeding is significant(22% reduction), while other interventions showed no effect.
Type II diabetes	Odds ratio 0.63 (0.45 to 0.89)	The effect of breastfeeding is significant(22% reduction) and of similar magnitude to the effect of other interventions.
Intelligence test scores	Mean difference 4.9 points (2.97 to 6.92)	The effect of breastfeeding is significant, with a substantial effect size.

#### 2.2.4 Promotion of maternal-infant bonding

The Development of infant bonding is an important benefit of breastfeeding. Modern obstetric practice encourages the baby to be placed in contact with the mother immediately after birth. The immediate close contact followed by rooming in helps the relationship between the mother and infant to develop (Rapley 2002). Continuing close

contact between mother and infant provides reassurance for the infant and the babies seem to cry less. The mothers respond in a more affectionate and less stressful way. For infants who are artificially fed the contact may be slightly less intimate. The attention and stimulation associated with breast-feeding may assist with the infant's language and psychosocial development (León-Cava, Lutter et al. 2002).

### **2.2.5 Infant development and breastfeeding**

Breastfeeding is thought to provide benefits for the cognitive development of the child in terms of intelligence quotient (IQ), cognitive, physical, behavioural and temperament development (Wang and Wu 1996; León-Cava, Lutter et al. 2002; Liu, Ma et al. 2006; Schack-Nielsen and Michaelsen 2007). Children who were exclusively breastfed for six months had a significant IQ advantage over those breastfed for three months (Rao, Hediger et al. 2002). Low birth-weight babies fed breastmilk in the first weeks of life performed better on intelligence tests in later childhood than children who were artificially fed (León-Cava, Lutter et al. 2002). In children born small for gestational age, the benefit of exclusive breastfeeding on cognitive development was greater than those born appropriate for gestational age (Rao, Hediger et al. 2002). Higher IQ scores might be the result of factors present in breastmilk such as the long chain polyunsaturated fatty acids or to greater stimulation from mother when breastfeeding.

It is difficult to isolate the benefits of breastfeeding from other social and economic influences, because of the impact of many factors on cognitive development. When studying breastfeeding it is hard to be sure that residual confounding influences have been eliminated. However, in a very well controlled study Martin and colleagues have shown that infants who were breastfed were more upwardly socially mobile (Martin, Goodall et al. 2007).

The benefits of breastfeeding on neurodevelopment of children included motor skills, early language development and cognitive development (Vestergaard, Obel et al. 1999; León-Cava, Lutter et al. 2002). Breastfed infants score higher on visual acuity evoked

potential testing compared to those who are not breastfed (León-Cava, Lutter et al. 2002; Smith, Durkin et al. 2003; Schack-Nielsen and Michaelsen 2007). Prolonging breastfeeding increased general cognitive capacity, promoted the attainment of gross motor milestones and results of the visuomotor integration test. Infants breastfed for six months or longer had an advantage at the Bayley psychomotor developmental index compared to those breastfed for a shorter time (Agostoni, Marangoni et al. 1998; Agostoni, Marangoni et al. 2001). While evidence for the benefits of breastfeeding on cognitive development is accumulating, studies are required in a number of different cultural settings to confirm the extent of the benefits.

Two birth cohort studies were conducted in a sample of 973 young adult men and women and a sample of 2280 men born between October 1959 and December 1961 in Copenhagen, Denmark. The long term cohort study showed that duration of breastfeeding was positively associated with higher scores on the Verbal, Performance, and Full Scale WAIS IQs of the adults (Mortensen, Michaelsen et al. 2002). The potential confounders that were adjusted for in the study included parental social status and education; single mother status; mother's height, age, and weight gain during pregnancy and cigarette consumption during the third trimester; number of pregnancies; estimated gestational age; birth weight; birth length; and indexes of pregnancy and delivery complications (Mortensen, Michaelsen et al. 2002).

The mechanisms of breastfeeding benefiting intellectual development might attribute to some component(s) of breastmilk or feature of breastfeeding. Breastmilk contains long-chain polyunsaturated fatty acids which are required for brain development (Agostoni, Marangoni et al. 1998; Marangoni, Agostoni et al. 2000). The physical contact between mother and infant during breastfeeding provided psychosocial stimulation and bonding which benefited children's developmental (León-Cava, Lutter et al. 2002).

### 2.2.6 Infant growth patterns

Infants who are breastfed grow at more appropriate rates than those who are artificially fed. Infants who were breastfed for more than 12 months grew more rapidly in the first two months and less rapidly from three to 12 months (Dewey, Heinig et al. 1995). Previously, infant growth references in use around the world were developed from either artificially fed infants or a combination of artificially fed with some breastfed infants. This led to the situation where the growth references were higher than could be achieved by exclusively breastfed infants as described in the following paragraph

*“the NCHS curves are inappropriate for healthy, breastfed infants. Recent research shows that infants fed according to recommendations by the WHO and who live under conditions that favour the achievement of genetic growth potentials grow less rapidly than, and deviate significantly from, the NCHS reference. The negative deviations are large enough to lead health workers to make faulty decisions regarding the adequate growth of breastfed infants, and thus to mistakenly advise mothers to supplement unnecessarily or to stop breastfeeding altogether. Given the health and nutritional benefits of breastfeeding, this potential misinterpretation of the growth pattern of healthy breastfed infants has great public health significance. The premature introduction of complementary foods can have life-threatening consequences for young infants in many settings, especially where breastfeeding's role in preventing severe infectious morbidity is crucial to child survival”.*(de Onis , Garza & Habicht 1997)

This has led to the development of a new growth reference by the World Health Organisation (de Onis, Garza et al. 2004). However, because of the way in which the sample was selected, it appears that the reference may in fact be too high for the first six months of life (Binns and Lee 2006; Binns and Lee 2007). After six months of age the new reference appears to more accurately reflect the growth pattern of breastfed infants.

Decreasing duration of breastfeeding or earlier complementary food introduction increased infant weight gain (Dewey, Heinig et al. 1995; Baker, Michaelsen et al. 2004).

Formula-fed infants were heavier and longer by 52 weeks of age (Oddy, Scott et al. 2006). Cattaneo reviewed studies on breastfeeding for the European Union. He described four systematic reviews that included 48 observational studies, with a total of 340000 subjects (Cattaneo 2006). The combined preventive effect on breastfeeding against the development of obesity was an Odds Ratio of 0.82 (0.68-0.93). This Odds Ratio may be small, but the preventable fraction is huge because of the high proportion of the population who could be breastfed. Cattaneo concluded that the extent of the protection of breastfeeding against obesity depended on exclusivity, prevalence and duration of breastfeeding and their changes over time

Breastfeeding is now considered to be one of the most important interventions available for the prevention of childhood obesity (Dietz 2001). This is very important in China, where there has been considerable concern expressed about the rapid development of obesity in cities such as Shanghai.(1991; Yao, Chen et al. 2004; Chang, He et al. 2007)

### **2.2.7 Benefits to the mother of breastfeeding**

Breastfeeding offers some protection against premenopausal breast cancer, ovarian cancer and osteoporosis (Labbok 2001; Zhang, Lee et al. 2004; World Cancer Research Fund / American Institute for Cancer Research 2007). A case control study in China (Cases were 275 patients with histologically confirmed epithelial ovarian cancer and controls were 623 women without neoplasm) showed that breastfeeding for more than 12 months lowered the risk of ovarian cancer compared to breastfeeding for no more than four months (the adjusted odds ratios (AOR) were 0.51, 95% CI, 0.3-0.9)(Zhang, Lee et al. 2004). Mothers who breastfed at least three children were less likely to have ovarian cancer compared with those who breastfed only one child (AOR= 0.44, 95% CI, 0.2-0.9) (Binns, Gilchrist et al. 2004). Breastfeeding was included in the latest review by the World Cancer Research Foundation as a health promotion strategy for mothers for the prevention of cancer.

The Collaborative Group on Hormonal Factors in Breast Cancer has brought together worldwide data from epidemiological studies in 30 countries that included information on breastfeeding patterns and other aspects of childbearing (2002). Their meta-analysis showed a relative risk of breast cancer reduction of 4.3% (95% CI 2.9–5.8;  $p < 0.0001$ ) for every 12 months of breastfeeding in addition to a decrease of 7.0% (5.0–9.0;  $p < 0.0001$ ) for each birth.

Additional benefits to the health of mothers from breastfeeding have been summarised by the NHMRC (Binns and Davidson 2003). Breastfeeding is of benefit to mothers because of the reduction in postpartum blood loss, weight loss, risk of postmenopausal hip fracture, risk of breast and ovarian cancer in later life.

Breastfeeding hastens uterine involution after birth. Early initiation of breastfeeding after delivery promoted maternal recovery from childbirth by accelerating uterine involution and reduces the risk of haemorrhaging. Breastfeeding stimulated the release of oxytocin which helped to contract the uterus, expel the placenta and reduce postpartum bleeding (León-Cava, Lutter et al. 2002). Thereby breastfeeding preserved maternal haemoglobin stores and improved iron status (Dewey 2004).

Breastfeeding helps the mother regain her pre-pregnancy body weight (providing that breastfeeding continues for more than seven months). This may be an important factor in the reduction in the prevalence of obesity later in life. There is a positive association between maternal weight loss and the duration of lactation (Kac, Benicio et al. 2004).

### **2.2.8 Post pregnancy and amenorrhea**

Although breastfeeding is not regarded as a reliable method of contraception for individual women it does provide useful benefits on a population wide basis, particularly in developing countries.

Breastfeeding increases the demand for calcium from the mother for the production of breast milk. However, during this time calcium absorption is increased, and after

breastfeeding has ceased bone mineralisation improves and subsequently there is a decreased risk of postmenopausal hip fractures (Jones, Riley et al. 2000; O'Brien, Nathanson et al. 2003; Weaver 2006). There is a dose-response relationship between average duration of breastfeeding per child and risk of hip fracture (Cumming and Klineberg 1993; Huo, Lauderdale et al. 2003).

### **2.2.9 Economic benefits of breastfeeding**

The economic benefits of breastfeeding have been extensively studied in Australia by Smith (Smith 1999; Smith 2001). Production of breastmilk by mothers is an unrecognised contribution to gross domestic product. Breastfeeding is by far the least expensive method of feeding infants (León-Cava, Lutter et al. 2002). Formula and other breastmilk substitutes require substantial amounts of money for their purchase, particularly in developing countries. In China there is a difference in the pricing between infant formula manufactured by domestic companies and international companies. However, the cost of both is still substantial, and can be a severe economic strain on Chinese couples living on the average wage. During 2008 because of the general increase in food prices, the cost of purchasing formula in China has increased by approximately 30% (Qiu personal observation.)

Bottles and teats need to be kept sterile. This requires time and the use of electricity or other forms of energy to heat the water. Bottle fed infants were more likely to have health problems (including infant diarrhea, respiratory infection, insulin-dependent diabetes melitus and otitis media) than breastfed infants (Cattaneo, Ronfani et al. 2006). The increased use of health facilities, leads to higher costs of health care (Riordan 1997; Cattaneo, Ronfani et al. 2006). Although no economic studies have been published from China, the benefits to this country from breastfeeding are quite considerable. Each year there are 18 to 20 million births, and the production of breastmilk to feed these infants is of considerable economic benefit, even when they are considering the additional gains

from improved health and development. In Zhejiang province, there were 600,000 births during 2007.

Riordan's commentary estimated that additional annual national (US) health care costs of infantile diarrhoeal disease in nonbreastfed infants was \$291.3 million; respiratory syncytial virus, \$225 million; insulin-dependent diabetes melitus, from \$9.6 to \$124.8 million; and otitis media, \$660 million(Riordan 1997). These four medical diagnoses alone created over \$1 billion of extra health care costs each year. This study is now a decade old and costs are likely to be considerable higher. The potential benefits to society of more intelligent children of breastfeeding were important though it could not be directly measured in terms of dollars (Riordan 1997).

#### **2.2.10 Allergic disease**

Allergic disease appears to be increasing in prevalence in Western countries. In China, the prevalence of asthma appears to be increasing, although it is difficult to isolate the effects of environment in this disease. Breastfeeding may reduce the risks of atopy, asthma and protect babies from cow's milk allergy in exclusive breastfeeding period (Vandenplas 1997; van Odijk, Kull et al. 2003; Oddy 2004). Exclusive breastfeeding for at least six months could decrease the incidence of atopic allergies. Exclusive breastfeeding for less than four months was associated with an increased risk for current asthma (OR 1.36, 95% CI, 1.00-1.85)(Oddy, de Klerk et al. 2002). With each additional month of exclusive breastfeeding, the risk of asthma at six years was reduced by 4% (OR=0.96; 95% CI, 0.92, 1.00) (Oddy 2004). Exclusive breastfeeding might also reduce the incidence of lower respiratory illness (Oddy 2004).

However more recent research has shown that while exclusive breastfeeding is beneficial in preventing atopic disease, it is important to introduce other foods to the infant at six months in order to reduce the subsequent development allergies (Greer, Sicherer et al. 2008) .



### **2.2.11 Risks of artificial feeding**

In contrast to the benefits of breastfeeding are the risks of using artificial formula to feed infants. In an analysis of US data for found that for every thousand infants who were not breastfed, there were an extra 2030 doctors visits, more than 200 inpatient days and an additional 600 prescriptions. But when the study was done in the mid-1990s the excess cost was estimated at \$331,000. The control group were infants who were exclusively breastfed for more than three months (Ball and Wright 1999; Ball and Bennett 2001).

The benefits of breastfeeding have been summarized in the previous paragraphs. On the other hand, artificial feeding has a number of disadvantages. Artificial feeding increases the risk of many health problems: infections (included diarrhoea and respiratory infections, septicaemia, meningitis and otitis media), persistent diarrhoea; malnutrition (include vitamin A deficiency and anemia); more allergy and milk intolerance; dental disease and oral dynamic problem; some chronic diseases; overweight; lower score on intelligence test and mortality (Wang and Wu 1996; Oddy 2001; León-Cava, Lutter et al. 2002; Liu, Ma et al. 2006; Schack-Nielsen and Michaelsen 2007).

### **2.2.12 Current international policy recommendations**

Human milk is the best food for babies and breastfeeding remains the best way to feed babies. WHO recommends that breastfeeding should be started within one hour of birth exclusive breastfeeding be practiced from birth to six months of age, and complementary foods be introduced at six months of age while continuing to breastfeed (WHO and Organization. 1994; WHO European Region 1999; WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000). Infants should be given no other liquids or solids than breastmilk, not even water, during the exclusive breastfeeding period (World Health Organization - Working Group on Infant Growth 1995). WHO recommends that breastfeeding should continue beyond the first year of life.

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### **Section 3 Factors Positively and Negatively Associated with Initiation and Duration of Breastfeeding**

Research that has been conducted in China about the reasons for discontinuing breastfeeding is detailed in section 1. The literature search has failed to find any randomised controlled trials of interventions to promote breastfeeding in China, although there are many local examples of health promotion interventions.

Much research work has been conducted worldwide to explore the factors associated with breastfeeding and some of this experience will be relevant to China. The most important factors are included in the following table (Binns and Davidson 2003)



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**Factors associated with the initiation and duration of breastfeeding in a rural population compared with an urban population**

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Factors associated with the decision to breastfeed

In a Rural area, breastfeeding was more likely if:

- Fathers preferred breastfeeding ;
- Mothers were younger ;
- Mothers decided to breastfeed pre-pregnancy ;
- Mothers were primiparous.

Factors associated with risk of ceasing breastfeeding

In a Rural area risk of early cessation of breastfeeding was higher:

- In younger mothers ;
  - In mothers who planned to breastfeed for less than two months ;
  - Where fathers did not prefer breastfeeding ;
  - In mothers who did not decide to breastfeed before becoming pregnant ;
  - In mothers whose infants received complementary formula foods in hospital.
- 

In a Rural area, breastfeeding was more likely if

- Fathers preferred breastfeeding ;
- Maternal grandmothers breastfeed ;
- Mothers decided to breastfeed pre-pregnancy ;
- Mothers were primiparous ;
- Mothers were born in Australia, the United Kingdom, Asia, the Middle East or North Africa.
- Husbands were professional or administrators.

In a Rural area, risk of early cessation of breastfeeding was higher:

- In younger mothers;
- In less educated mothers;
- In mothers born in Australia, the United Kingdom compared with mothers born in the Middle East or Africa;
- In mothers who planned to breastfeed for less than four months
- When maternal grandmothers were ambivalent or preferred formula feeding;
- When mothers received conflicting advice on infant feeding while in hospital.

Note: See reference 46 for details of odds ratios and their confidence intervals

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These factors appear to be important in many studies in different cultures around the world.

Knowledge of these factors is important for policy making and breastfeeding promotion. The following paragraphs discussed in more detail a number of factors associated with the initiation and duration of breastfeeding from cross-sectional, retrospective and prospective studies. While the factors which impact breastfeeding in different places are not entirely consistent, the following factors are commonly recognized to be significant ones concerned with breastfeeding.

### **2.3.1 Factors positively and negatively associated with initiation and duration of breastfeeding**

#### **2.3.1.1 Maternal confidence and intention to breastfeed**

Intentions are an immediate antecedent of behaviour (Saunders-Goldson and Edwards 2004). The first step to successful breastfeeding is to establish the intention to breastfeed (Hill 2000; Leung, Tam et al. 2003; James, 2004).

Mothers who had positive breastfeeding attitudes, sentiment, confidence, and intention to breastfeed their babies were more likely to initiate and maintain breastfeeding (Ryser 2004; Scott, Binns et al. 2006). On the other hand, few women who intended to bottle feed were less like to breastfeed their babies. Lack of confidence in their ability to breastfeed during the first two days was associated with breastfeeding discontinuation at two weeks (odds ratio (OR) =: 2.8; 95% CI, 1.02-7.6) (Taveras, Capra et al. 2003), A cohort study in UK showed that only 3.4% initiated breastfeeding if they did not intend to breastfeed (Donath and Amir 2003). The longer the period of time that the mother intended to breastfeed, the longer the mother breastfed her infant (Donath and Amir

2003). The intended length of breastfeeding accounted for 18% of the variance in duration of breastfeeding (Quarles, Williams et al. 1994).

In Australian studies in urban and rural areas, and in the aboriginal population at the time when the decision to breastfeed was made was also highly significant (James, 2004). The earlier in the pregnancy, or before the pregnancy, the decision was made, the stronger was the influence. (Scott and Binns 1998; Scott and Binns 1999; Binns and Graham 2005; Binns, Gilchrist et al. 2006; Scott, Binns et al. 2006)

Breastfeeding intention was positively associated with older maternal age, higher levels of education and breastfeeding knowledge, more breastfeeding experience, better income, a smaller family size, fewer children, perceived social support, living with a partner and no smoking (Leung, Tam et al. 2003; Mitra, Khoury et al. 2004). Mothers who intended to breastfeed reported fewer barriers to breastfeeding than non intenders (Mitra, Khoury et al. 2004).

### **2.3.1.2 Support from father, family and society**

Support and encouragement are important for initiation and continuation of breastfeeding and in Australian society fathers are particularly important (Scott, Binns et al. 1997; Scott, Landers et al. 2001; Binns, Gilchrist et al. 2004). Support from family and relatives is important when any problems are encountered (Kruske, Schmied et al. 2007; Moore, Anderson et al. 2007). The encouragement from a supportive partner, family members, friends, health professionals and society was positively associated with the continuation of exclusive and any breastfeeding (Ingram, Johnson et al. 2002; Sikorski, Renfrew et al. 2003). Mother's confidence at 6 and 12 months was correlated with the experience of overall breastfeeding support (Ekstrom, Widstrom et al. 2003). Father's presence during labour and while in hospital was correlated with the duration of exclusive and total breastfeeding in primiparas (Ekstrom, Widstrom et al. 2003). Stronger parental bonds were associated with initiation of breastfeeding.

The positive breastfeeding perception and experience of mother's mother benefited her daughter's breastfeeding (Ekstrom, Widstrom et al. 2003). Mothers, who knew how long they had been breastfed as a child, exclusively breast fed her baby longer (Ekstrom, Widstrom et al. 2003). In a cohort study in Pelotas, Brazilian, 420 babies in the Live Birth Information System in 1982 were followed up until they gave birth as adults from 1995 to 2001. The study showed that mothers who had not been breastfed had a relative risk (RR) of 1.34 (95% CI, 0.35-5.18) of not breastfeeding their children, compared to mothers who were ever breastfed (Horta, Bahl et al. 2007). In China new mothers traditionally received substantial support and encouragement from other female family members (Leung, Au et al. 2006; Xu, Binns et al. 2006; Shi, Zhang et al. 2008).

For mothers in paid employment, appropriate breastfeeding policy and support such as flexible employment arrangements could help sustain breastfeeding (Arthur, Saenz et al. 2003). Effective strategies included delayed return to work, working part time, improved conditions at work for breastfeeding, breastfeeding breaks during work hours, milk expression and storage, and access to breastfeeding counselling (Rea and Morrow 2004).

A prospective randomised controlled trial of 450 women with uncomplicated pregnancies in Singapore showed that postnatal breastfeeding support increased exclusive breastfeeding. Women who received postnatal support were more likely to breastfeed exclusively at two weeks (relative risk (RR) =1.82, 95% CI, 1.14 - 2.90), six weeks (RR=1.85, 95%CI, 1.11 - 3.09), three months (RR=1.87, 95%CI, 1.03 - 3.41), and six months (RR=2.12, 95%CI, 1.03 - 4.37) compared with women who received routine care. The rate of any breastfeeding at six weeks after delivery was also higher in the postnatal support group compared with women who received routine care (RR=1.16, 95%CI, 1.02 - 1.31) (Su, Zhao et al. 2007).

### **2.3.1.3 Support from medical and hospital staff**

UNICEF and WHO officially launched the Baby-Friendly Hospital Initiative (BFHI) in the 1980s with the goal of translating the international breastfeeding policy recommendations into a best practices model. The policy included a list of 10 steps to encourage and support breastfeeding which have become the centre point of the BFHI.(WHO and Organization 1998; Spiby, McCormick et al. 2007)

“Every facility providing maternity services and care for newborn infants should:

- (1) Have a written breastfeeding policy that is routinely communicated to all health care staff.
- (2) Train all health care staff in skills necessary to implement this policy.
- (3) Inform all pregnant women about the benefits and management of breastfeeding.
- (4) Help mothers initiate breastfeeding within a half hour of birth.
- (5) Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.
- (6) Give newborn infants no food and drink other than breastmilk, unless medically indicated.
- (7) Practise rooming in , allow mothers and infants to remain together 24 hours a day.
- (8) Encourage breastfeeding on demand.
- (9) Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.
- (10) Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic (WHO and Organization 1998)..

Hospitals' implementation levels of the Ten Steps to Successful Breastfeeding were affected by some factors such as breastfeeding education of health care professionals and mothers, prenatal and post discharge outreach to mothers, the restriction of infant supplementation, formula availability, and overall implementation with acceptance of free formula (Kovach 1997; Kovach 2002; Cattaneo, Yngve et al. 2005).

The Baby-Friendly Hospital Initiative (BFHI) has had a global impact on breastfeeding outcomes and was highly cost-effective (Fairbank, O'Meara et al. 2000; Cattaneo and Buzzetti 2001).

#### **2.3.1.4 Breastfeeding education**

Education was an effective method to promote breastfeeding in initiation and duration (Ever-Hadani, Seidman et al. 1994; Ryan 1997; Kmietowicz 2000; Ludvigsson 2003). The benefit was more significant in mothers who were less likely to breastfeed and required special attention, such as primipara, disadvantaged groups and ethnic minorities (Perez-Escamilla 1994; Ryan 1997; Kmietowicz 2000; Kronborg, Vaeth et al. 2007). In studies in China the benefits of breastfeeding education have been demonstrated as a positive factor. (Tarrant and Dodgson 2007; Xu, Binns et al. 2007; Gong, Ji et al. 2008)

A prospective randomized controlled trial of 450 mothers in Singapore showed that antenatal education and postnatal breastfeeding support increased exclusive breastfeeding (Su, Zhao et al. 2007). Women receiving antenatal education were more likely to exclusively breastfeed babies at six weeks (relative risk (RR) =1.73, 95%CI, 1.04-2.90), three months (RR=1.92, 95%CI,1.07-3.48), and six months (RR=2.16, 95%CI,1.05-4.43) compared with women who received routine care (Su, Zhao et al. 2007). In the immediate postnatal period, if mothers were taught good breastfeeding technique by midwives in a 'hands-off' style, which enables mothers to position and attach their babies for themselves, breastfeeding rates were increased and the incidence of perceived milk insufficiency decreases (Ingram, Johnson et al. 2002).

There were various types of education such as antenatal and postnatal courses, coaching, guideline, conferences, web-based learning and interactional education, telephone counselling (Renfrew, Dyson et al. 2005; Shaikh and Scott 2005; Spatz and Sternberg 2005; Poon, Ho et al. 2007; Dodgson, Tarrant et al. 2008) (Kmietowicz 2000). A systematic review of 59 randomized controlled trials (RCTs), non-RCTs with concurrent

controls and before-after studies (cohort or cross sectional) showed that small informal group health education classes appeared to increase the initiation and duration of breastfeeding in developed countries (Fairbank, O'Meara et al. 2000). This form of intervention was effective when implemented among women of all income groups and from minority ethnic groups. However, breastfeeding literature alone, or combined with a more formal, non-interactive method of delivering health education, appeared to have limited effectiveness in terms of initiation rates when implemented in women of different income and ethnic groups in the UK, the Republic of Ireland and USA (Fairbank, O'Meara et al. 2000). Kmietowicz's review showed that simply giving women leaflets on the benefits of breastfeeding was of little value (Kmietowicz 2000). Inviting women to participate in small discussion groups and one to one advice sessions achieved very good results (in some cases tripling the rate of breastfeeding) (Kmietowicz 2000). Women from disadvantaged groups and ethnic minorities could benefit most from involvement in small, informal discussions on the merits and practicalities of breastfeeding (Kmietowicz 2000).

Peer support programmes offered by trained and experienced peers were also effective (Kmietowicz 2000). Embodied knowledge such as seeing successful breastfeeding and hearing about successful experiences was more effective in helping the mother commit to breastfeeding than theoretical knowledge (Hoddinott and Pill 1999).

Medical professionals have a key role to play in providing breastfeeding education to women (World Health Organization 2000). Midwives, postnatal nurses, paediatrician, obstetricians, general practitioners and all relevant staff should be trained and understand the principles and practice of breastfeeding support including informing all pregnant women about the benefits, correct positioning and attachment, preventing and managing breastfeeding problems, mothers' needs and safe use of breast pumps (World Health Organization 2000). Health professionals should also educate all key family members, whenever an opportunity arises both during pregnancy and postpartum, in the benefits of breastmilk for babies and how to encourage and support a mother in the early weeks of breastfeeding (Ingram, Johnson et al. 2002). It has been well established that skilled

support offered to mothers could increase the initiation and duration of breastfeeding (Mitra, Khoury et al. 2003; Taveras, Capra et al. 2003; Bosnjak, Batinica et al. 2004).

### **2.3.1.5 Influence of social status**

The social rank of the family has a significant effect on both the prevalence of breastfeeding and the length of lactation in some cultures, but particularly modern western countries (Hitchcock and Coy 1988; Donath and Amir 2000). Mothers who had a higher socioeconomic status, were well educated, white race, married (or had strong parental bonds), older, non-smoker were more likely to breastfeed (Kmietowicz 2000; Dennis 2002) (Vogel, Hutchison et al. 1999; Donath and Amir 2000; Noble and Team 2001).

The Australian National Health Survey in 1995 (cross sectional, n=3252 children for this study) indicated that breastfeeding rates varied according to the socio-economic status of the area in which the child lives. Higher socioeconomic status was associated with higher rates and longer duration of exclusive and any breastfeeding (Donath and Amir 2000). Promoting maternal education could increase breastfeeding initiation rate and breastfeeding rate at six months (Cernadas, Noceda et al. 2003; Li, Li et al. 2003).

In most developed countries, higher socioeconomic status and education are positively associated with breastfeeding initiation and duration (Dennis 2002). However, in some developing countries, higher income and more educated women were less likely to breastfeed than low income and less educated mothers (Pasternak and Wang 1985; Dennis 2002). A retrospective study of 584 women in Tianjing, China from October 1981 to March 1982 showed that among women of aged 40 to 49 years, when they had been breastfeeding in the 1960's, breastfeeding duration (mean) was 17.8 months in illiterate group, 17.3 months in primary education group, 14.2 months in middle school education group, and 14.5 months in high school education group (Pasternak and Wang 1985). Among women of 50 to 59 years old, breastfeeding duration (mean) was 20.5 months in illiterate group, 17.3 months in primary education group, 14.6 months in middle school education group, and 13.0 months in high school education group



(Pasternak and Wang 1985). It was important to highlight the necessity for incorporating breastfeeding knowledge into the school curriculum to improve the level of breastfeeding.

Increased parity, having a healthy full-term infant and successful previous breastfeeding experience was positively associated with breastfeeding duration (Barber, Abernathy et al. 1997; Humenick, Hill et al. 1998; Dennis 2002).

To summarise, factors positively associated with breastfeeding were maternal confidence and intention to breastfeed, support from partner, family, society and hospital, breastfeeding education, advantaged maternal socioeconomic status and demographic factors such as an older age, high income, high level of education, white race, non-smoker and strong parental bonds.

### **2.3.2 Factors negatively associated with breastfeeding initiation and duration**

Generally there are several negative factors influencing breastfeeding rates and duration. These could be breastfeeding difficulties, maternal smoking, introduction of the pacifier, prelacteal feeds, early return to work, caesarean section, drugs/illness of the mother or baby and disadvantage socioeconomic status included lower levels of education, the unmarried, living in disadvantaged accommodation, younger maternal age and low income (Vogel, Hutchison et al. 1999; Scott, Binns et al. 2006; Bakoula, Veltsista et al. 2007; Qiu, Xie et al. 2007). Some factors are common or universal.

#### **2.3.2.1 Maternal employment and location of workplace**

Mother's involvement in work and location of workplace accounted for a significant part of the decline of breastfeeding (Lakati, Binns et al. 2002; Biagioli 2003; Cardalda, Miranda et al. 2003) (Yimyam, Morrow et al. 1999; Chan and Asirvatham 2001). Employment was a persistent barrier to continued breastfeeding. Mothers who returned work within the first six weeks were much less likely to initiate breastfeeding (RR = 0.85; 95% CI, 0.77-0.94) (Noble and Team 2001; Hawkins, Cole et al. 2007).

A population based cohort study of new mothers (n = 228,000) in US showed that mothers who worked part time had a significantly higher rate of breastfeeding initiation rate (68.8%) than those who were employed full time (65.5%), or who were not employed (64.8%)(p <0.05). Expecting to work part time did not impact the breastfeeding initiation significantly (Fein and Roe 1998).

Mothers returning to work for financial reasons were also less likely to start breastfeeding (RR = 0.96, 95% CI, 0.93-0.99) than those who returned for other reasons (Hawkins, Cole et al. 2007). Women who were the main source of income for the family were less likely to exclusively breastfeed their infants compared with the fathers as main source of income (Chatman, Salihu et al. 2004).

a) Maternal employment and breastfeeding duration:

Return to work was the main or important reason for working mothers to stop breastfeeding (Arthur, Saenz et al. 2003; Li, Li et al. 2003). The population based cohort study in US showed working full time had a negative effect on breastfeeding duration. By six months after delivery, breastfeeding rate of mothers employed full time (26.1%) was lower than those who worked part time (36.6%) and nonworking mothers (35.0%). Mothers who were not employed were more than twice as likely to breastfeed at six months than mothers who worked full time (OR=2.08, 95% CI, 2.03-2.13) (Ryan 2007). Another cohort study 9087 US women showed that among breastfeeding mothers, returning to work within a year of delivery was associated with a shorter duration of breastfeeding. Among employed mothers, the duration of maternity leave was positively associated with the duration of breastfeeding (Visness and Kennedy 1997). Fein's study showed that working full-time at three months postpartum decreased breastfeeding duration by an average of 8.6 weeks (P <0.01) compared to not working. Mothers working more than 34 hours per week, breastfed for shorter durations than did those not employed or those employed part time (p<0.05), but still for an average of 16.5 weeks. Part-time work of more than four hours per day decreased duration but less than full time work (not reached to significant differences). Non-employed mothers breastfed an

average of 25.1 weeks, those employed 1–19 h per week breastfed for 24.4 weeks, and those working 20–34 h breastfed for 22.5 weeks ( $p>0.05$ ) (Fein and Roe 1998).

A cohort study of 3734 Greek mothers showed that working mothers were more likely to breastfeed their babies than housewives (Bakoula, Veltsista et al. 2007). Interestingly, working mothers with a longer maternity leave (six months and more) were more likely to intend to breastfeed for a longer duration than non-working mothers (OR=1.58, 95% CI, 1.07-2.33). Mothers who had received maternity leave for less than two months were not significantly different from non-working mothers in intention to breastfeeding (OR=0.61, 95% CI, 0.32-1.14). Most mothers tended to return to their work at two months as the maternity entitlement was usually eight weeks in Greece (Bakoula, Veltsista et al. 2007). Adjusted factors for the study included type of hospital, mode of delivery, region of mother's upbringing, maternal age, maternal level of education, paternal level of education, maternal grandmother education, paternal grandmother education, maternal grandfather education, paternal grandfather education, home population density, previous experience of breastfeeding, support from family members and season of delivery (Bakoula, Veltsista et al. 2007). A cross-sectional study of 2162 children aged 0-23 months in Sri Lanka showed the similar result: the continuation of breastfeeding at the end of the first year was significantly lower in non-working mothers compared to working mothers (Agampodi, Agampodi et al. 2007).

b) Location of workplace:

A retrospective survey in Tianjin, China, showed a decline in the rate and duration of breastfeeding since the mid-1930's until the 1980's (Pasternak and Wang 1985). One of the main reasons for the decline was that mother worked in cities or places which were beyond the distance to breastfeed children. In China, traditionally children were looked after by their grandparents. Because many mothers worked in a place far from their parent's home where their children stayed, it was a common phenomenon that mothers gave up breastfeeding to go back to work (Pasternak and Wang 1985). Besides, many conditions of the work environment, employer policy, related to the separation of the

world of work and home, were barriers to working mother's ongoing breastfeeding (Barber-Madden, Petschek et al. 1987).

c) Employment policy and breastfeeding

Most mothers wished and needed to continue breastfeeding after returning to work. But there were some barriers in employment policy for mothers to breastfeed (Barber-Madden, Petschek et al. 1987). The obstacles included lacking of paid maternity leave, flexible work arrangement, child care at or near the work place, place to express and store breastmilk, information regarding the benefits breastfeeding, psychological support and other benefits offered by the employer (e.g. health insurance and pregnancy disability)(Barber-Madden, Petschek et al. 1987).

Appropriate breastfeeding policy and support programs can help keep mothers at work continuing to breastfeeding. Effective strategies included providing pregnant staff with information about breastfeeding support, long and paid maternity leave, working part time, flexible work hours , improved conditions at work for breastfeeding, breast-pumping or breastfeeding breaks during work hours, facilities to express and to store breastmilk, on-site day care, the introduction of telecommuting and access to breastfeeding counseling (Visness and Kennedy 1997; Fein and Roe 1998; Frank 1998; Yimyam and Morrow 1999; McIntyre, Pisaniello et al. 2002; Arthur, Saenz et al. 2003; Rea and Morrow 2004; Hawkins, Cole et al. 2007).

Flexible employment arrangements might increase duration among working mothers and provide an atmosphere of greater acceptance (Arthur, Saenz et al. 2003). Working no more than 20 hours per week appeared to be protective for continued breastfeeding. A cross-sectional survey of 313 employed women in Chiang Mai, Thailand showed that mothers with flexible work hours were more likely to breastfeed their babies than those with inflexible hours(Yimyam and Morrow 1999). At six months postpartum, women who worked inside the home breastfed more than those working in the formal sector with inflexible hours. Women who were working outside the home for a long period or had strict schedule jobs encountered many obstacles to maintaining breastfeeding and most

stop breastfeeding within one month after resuming employment (Yimyam and Morrow 1999).

Support for breastfeeding not only benefited mother and babies, but also benefited employers. A program which enables women to pump and store breastmilk in the workplace, was rewarded with increased employee loyalty, improved productivity, better recruitment, and an enhanced public image for the employers (Galtry 1997). The absenteeism rate and health care cost were lower among breastfeeding mothers than formula fed mothers (Galtry 1997). Besides, the benefit to employers of providing support for lactation was that mothers were more likely to return to the work place which provided support for lactation following leave, thereby preserving valuable skills and experience (Galtry 1997).

d) Breastmilk expression and non daytime breastfeeding

The expression of breastmilk was a useful skill for emptying breast and continuing breastfeeding (Chamberlain, Merewood et al. 2005; Binns, Gilchrist et al. 2006).

The expression of breastmilk allowed a mother to be away intermittently from her infant and continue to breastfeed when they returned to work (Valdes, Pugin et al. 2000). The practice was more important when the work environment was less than ideal for the breastfeeding mothers (Chamberlain, Merewood et al. 2005). A cohort study of 12 months duration among 587 mothers in Perth, Australia showed that mothers who expressed breastmilk (at one or more time periods) were more likely to breastfeed to six months (any breastfeeding). (relative risk (RR) = 0.71, 95% CI, 0.52-0.98) than those who had never expressed milk (Win, Binns et al. 2006).

International Labour Organization (ILO) Maternity Protection Convention 183 and Recommendation 191:

The international labour standards on maternity protection were adopted by the International Labour Conference in June 2000. The Convention, which applies to all employed women, provides the right to maternity leave of not less than 14 weeks, cash

and medical benefits, job security, workplace health protection and breastfeeding breaks. Mothers who continued breastfeeding after their return to work have the right to nursing breaks or a reduction in hours of work in order to breastfeed or to express breastmilk. The recommendation includes additional provisions regarding the adaptation of nursing breaks to particular needs and the establishment of facilities for breastfeeding at or near the workplace. ILO Conventions were international treaties, subject to ratification by ILO Member States. Recommendations were non-binding instruments, which set out guidelines for national policy and action. Both forms were intended to have a concrete impact on working conditions and practices in every country of the world.

### **2. 3.2.2 Maternal milk insufficiency**

This is a common reason for mothers to give when ceasing breastfeeding in China (see discussion above). Insufficient milk supply (including perceived milk insufficiency) were a main immediate reason for stopping breastfeeding or for providing supplements to babies (Chan, Nelson et al. 2000; Chatman, Salihu et al. 2004).

Perceived milk insufficiency was the mother's belief that her breastmilk was inadequate in amount or nutritional quality to meet her infant's needs such as appropriate infant weight gain and infant satisfaction. It was defined as the maternal report of delayed "milk arrival", 'not have enough milk', "low milk supply", "infant not full after feeding" and "milk dried up." (Ingram, Johnson et al. 2002). Perceived milk insufficiency was particularly common among mothers of infants younger than six months of age. However physiologic studies have suggested that only 1% to 5% of women have genuine problems with milk production and supply and that most milk insufficiency may be perception rather than real (Binns 2003) and in some cases may also related to poor early breastfeeding management.

### **2.3.2.3 Maternal and environmental smoking**

There were about a quarter to one third of women in pregnancy or during lactation who smoked in several Australian studies (Amir and Donath 2002; Giglia, Binns et al. 2006;

Giglia, Binns et al. 2007). In a cohort study of 587 mothers in Perth, Australia, 39% mothers smoked prior to pregnancy (Giglia, Binns et al. 2007). A similar cohorts consisted of 455 Aboriginal and 556 Non-Aboriginal mothers in the same place showed that 67% of the Aboriginal and 18.3% of Non-Aboriginal mothers smoked regularly prior to and during pregnancy (Giglia, Gilchrist et al. 2004). China is a country with a high male smoking rate and a considerably lower rate of female smoking and smoking by fathers has an effect on breastfeeding duration. (Xu, Binns et al. 2007). A national survey in 1996 showed that smoking rates were 63% in the males and 4% in females in China (Xu, Binns et al. 2007).

A population based birth cohort study (follow up to nine months) of 6747 Hong Kong Chinese mother–infant pairs found that both maternal and paternal smoking were negatively associated with initiating breastfeeding (odds ratio (OR) for ever maternal smoking = 2.51, 95% CI, 1.63-3.86; OR for ever paternal smoking = 1.22, 95% CI, 1.08-1.39). Exposure to environmental tobacco smoke (ETS) (from the father and other smokers) was also a risk factor against breastfeeding (OR = 1.21, 95% CI, 1.08-1.36). Compared to no smoker at home, the risk of not initiating breastfeeding was 1.21 (95% CI, 1.06-1.37), when there was one smoker at home and 1.35 (95% CI, 1.10-1.65), when there were two or more smokers at home (Leung, Ho et al. 2002). However, the association between smoking and breastfeeding duration was not statistically significant in this study (Leung, Ho et al. 2002). All odds ratios (OR) in the study were adjusted for maternal education level, maternal full-time employment, maternal age, birth order, method of delivery and birthweight (Leung, Lam et al. 2002).

The common explanation for an adverse effect of maternal smoking on breastfeeding is that nicotine has a negative effect on breastmilk supply by suppressing prolactin levels (Amir 2001; Amir and Donath 2002). However, the long-term levels of prolactin do not correlate with milk production (Amir 2001). Aboriginal women who smoked were still breastfeeding successfully (Giglia, Gilchrist et al. 2004). The relationship between smoking and duration of breastfeeding was not only a physiological one. Minchin's review in 1991 mentioned that smoking mothers questioned the quality and quantity of

their milk when their baby had health problems and feared that their contaminated milk was a risk to baby's health (Minchin 1991).

#### **2.3.2.4 Artificial teats, pacifiers**

Pacifiers (also called dummies or soothers) were commonly used for calming infants (Victoria, Tomasi et al. 1993; Binns and Scott 2002). The Baby Friendly Hospital Initiative (BFHI) developed by WHO and UNICEF required hospitals to follow 10 steps to achieve "Baby-Friendly" status. Step nine advised that hospitals should "give no artificial teats or pacifiers to breastfeeding infants." This recommendation was subsequently supported by evidence that the use of artificial teats and pacifiers was associated with early cessation of breastfeeding as well as other problems (World Health Organization 1994; Howard, Howard et al. 2003).

A cohort study in 556 mothers in Western Australia showed that the use of a pacifier at two weeks was associated with reduced likelihood of breastfeeding to six months (OR = 0.40; 95% CI 0.25-0.63) after adjusting for the presence of breastfeeding problems (Binns and Scott 2002). A one-year cohort study of 350 mother-infant pairs in New Zealand showed that daily pacifier use was associated with early cessation of breastfeeding (risk ratio (RR) = 1.71; 95% CI, 1.29- 2.28) and a reduced duration of full breastfeeding (adjusted RR = 1.35; 95% CI, 1.05, 1.74) (Vogel, Hutchison et al. 2001). A prospective study of 506 mother-infant pairs in Sweden showed that pacifier use was associated with fewer feeds and shorter suckling duration per 24 hours, shorter duration of exclusive breastfeeding, and shorter any breastfeeding duration compared with no pacifier use (Aarts, Hornell et al. 1999). A random controlled trial in 700 breastfed newborns in US showed that pacifier use in the neonatal period was detrimental to exclusive and overall breastfeeding (Howard, Howard et al. 2003).



### **2.3.2.5 Breast nipple trauma and mastitis**

Lactation mastitis, a common acute inflammation of the interlobular connective tissue within the mammary gland, can affect the ability of women to breastfeed. In Barbosa-Cesnik 's review in 2003, the incidence of mastitis range from 2% to 33% in different places (Barbosa-Cesnik, K et al. 2003). The incidence was highest in the first few weeks postpartum, decrease gradually thereafter; however, cases might occur as long as the woman was breastfeeding (Fetherston 1997; Foxman, D'Arcy et al. 2002; Barbosa-Cesnik, K et al. 2003).

Mastitis caused considerable pain and increased the risk of early weaning (Barbosa-Cesnik, K et al. 2003).

### **2.3.2.6 Caesarean section and anaesthesia**

Caesarean section rates have increased significantly in many countries in the past decade (Weaver, Helen Statham et al. 2007). The Bulletin of the World Health Organization in 2001 reported that the caesarean section rate was about 22% in the UK and similar in sub-Saharan Africa, 40% in Chile and even up to 80% in some Brazilian hospitals (Santo, de Oliveira et al. 2007). The caesarean delivery rate in the United States was 30.2% in 2005, but is lower in the Scandinavian countries (Wiklund, Edman et al. 2007). In Australia the national caesarean section rate rose from 18.0% in 1991 to 30.3% in 2005 (Rowe-Murray and Fisher 2002; Evans, Evans et al. 2003; Walker, Turnbull et al. 2004). And the unprecedented high caesarean delivery rate was still upward. The Australian Aboriginal population had the high rate of caesarean sections at 50.4 % (Binns, Gilchrist et al. 2004). A longitudinal study of 638 mothers in Hangzhou, China showed a very high caesarean section rate at 77% (Qiu, Xie et al. 2007).

Some studies showed that caesarean delivery impacted breastfeeding initiation and duration (Leung, Lam et al. 2002) (Wang, Zhou et al. 2006). A prospective study in 602 mother and baby pairs in China showed that the median time of breastfeeding initiation in caesarean section group was 12 hours after delivery, ten hours later than vaginal delivery

group (2 hours). Babies born by caesarean section had shorter breastfeeding duration compared to the vaginal delivery group (RR= 1.21; 95% CI, 1.10, 1.33) (Wang, Zhou et al. 2006). A prospective, population-based birth cohort study (n=7825 mother-infant pairs) in 1997 in Hong Kong, China showed that caesarean delivery was a risk factor for not initiating breastfeeding, for breastfeeding less than one month, and remained a significant hazard against breastfeeding duration (Leung and Sauve 2002). Another prospective study of 2,064 mother and baby dyads in Taiwan, China also showed the negative impact on breastfeeding of caesarean delivery. Mothers with caesarean section in Taiwan were less likely to breastfeed their babies at one and three months after delivery compared to vaginal delivery (Chien and Tai 2005).

A prospective study of 500 health mother-infant pairs in Niger showed that no mother with caesarean section had early initiation of breastfeeding (within 30 minutes of recovery of post-operative consciousness) (Awi and Alikor 2006). The mean time of breastfeeding initiation was 3.35 hours in vaginal delivery group, 6.50 hours and 5.9 hours in Caesarean section with general and spinal anaesthesia groups respectively (Awi and Alikor 2006). A cohort study of 1247 mothers in New Zealand showed that caesarean section was negatively associated with exclusive breastfeeding initiation (Butler, Williams et al. 2004).

A cross-sectional survey of 865 mothers in South Korea revealed that caesarean delivery decreased the initiation of partial breastfeeding and exclusive breastfeeding rates (Chung, Kim et al. 2007). Another cross-sectional study was carried out in 344 women with children aged between six months and three years from five villages in the north of Jordan. Women who had caesarean delivery were less likely to practice full breastfeeding compared to those who had vaginal delivery (OR= 2.36, 95% CI, 1.17, 4.78). A retrospective study of 8486 mothers in the Jerusalem district showed that caesarean delivery was associated with the failure of breastfeeding initiation (Ever-Hadani, Seidman et al. 1994).

On the other hand, some studies did not show statistical significance about the relationship (Kearney, Cronenwett et al. 1990; Xu, Binns et al. 2007; Xu, Binns et al. 2007). A randomized controlled trial conducted in 1596 women from 110 centers worldwide who had a singleton fetus in breech presentation at term showed no association between caesarean delivery and breastfeeding rate at three months postpartum (Hannah, Hannah et al. 2002).

The different conclusion about the relationship between caesarean section and normal delivery questioned here that the delivery method was not the fixing negative factor. It could influence by other factors like the time of first breastfeeding, the separation of mother and baby.

### **2.3.2.7 Formula advertising**

Formula as a breastmilk substitute was for non breastfed infants (which accounted for very small proportion of infants) and those who need supplementary food (generally after six months of life). It has been found in cohort and experimental studies in developed and developing countries that the distribution of formula samples was negatively associated with breastfeeding (Howard, Howard et al. 1994; Perez-Escamilla 1994; WHO and Organization 1998). Mothers who received free formula samples at discharge had significantly lower rates of full and any breastfeeding than mothers who did not receive samples. Perez-Escamilla's meta-analysis in 1994 indicated that commercial discharge packs had an adverse effect on lactation performance, especially among groups at risk such as primiparae and low-income women in developing countries (Perez-Escamilla 1994).

Distribution of discharge commercial (formula) packs was detrimental to successful breastfeeding (Howard, Howard et al. 1994; Perez-Escamilla 1994; Bliss 1997). The discharge packs contained formula company-produced educational materials (with pictures of formula and company logos). Such commercial packs, when compared to

noncommercial breastfeeding discharge packs decreased the duration of exclusive breastfeeding (Donnelly, Snowden et al. 2000).

To regulate inappropriate sales promotion of breastmilk substitutes including infant formula; other milk products, foods and beverages and bottlefed complementary foods, WHO published the International Code of Marketing of Breastmilk Substitutes (WHO 2002). The aim of this Code was to contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breastfeeding, and by ensuring the proper use of breastmilk substitutes, when these were necessary, on the basis of adequate information and through appropriate marketing and distribution (WHO 2002). Following the Code, Innocenti Declaration by WHO and UNICEF set 'implementation of the International Code of Marketing of Breastmilk Substitutes' as one of four targets to support, protect and promote breastfeeding for each country (Michaelsen, Weaver et al. 2000).

#### **2.3.2.8 Prelacteal feeds**

Prelacteal feeds were common but also detrimental (Engle 2002; Kramer and Kakuma 2002; Ruel and Menon 2002; Dewey and Brown 2003). In China, more than a quarter babies are given prelacteal feeds rather than colostrums (Zhao, Niu et al. 2003) (Qiu, Xie et al. 2007; Xu, Binns et al. 2007). If a baby had prelacteal feeds, his mother was more likely to have difficulties and stop breastfeeding early than those who were exclusively breastfeed from birth (Ludvigsson 2003; Qiu, Xie et al. 2007). On the other hand, if a baby's hunger was satisfied from a bottle feeding, he wanted to breastfeed less. Without sufficient breast emptying breastmilk took longer to 'come in' and it was more difficult to establish breastfeeding (Kwa 1993; Hossain, Reves et al. 1995). Moreover, prelacteal feeds replaced colostrum as the baby's earliest feeds. The baby was more likely to have infections and more likely to develop intolerance to the proteins in the artificial feed, and allergies, such as eczema.

### **2.3.2.9 Culture, traditional perceptions and breastfeeding**

Cultural forces played an important role in women's decisions on breastfeeding and the support for breastfeeding from partner, family and society (Ever-Hadani, Seidman et al. 1994; Homer, Sheehan et al. 2002; Xu, Binns et al. 2007). A prospective survey among 668 Black and 511 White women who delivered their first child in Washington, DC showed that white mothers had a higher initiation rate and longer duration of breastfeeding. A cohort of 1219 mothers in Xinjiang, PR China showed that Uygur (a minority in China) mothers were less likely to exclusively breastfed their babies because the traditional perception was breastmilk was too thin to satisfy baby's nutritional requirements (Xu, Binns et al. 2007). A prospective study of 986 women from English, Chinese and Arabic-speaking backgrounds in Sydney during 1997 and 1998 showed the differences in the infant feeding decisions and breastfeeding duration between English, Arabic and Chinese-speaking women (Homer, Sheehan et al. 2002). Chinese-speaking women were less likely to intend to breastfeed and fewer initiated breastfeeding compared with English-speaking and Arabic-speaking women. Arabic-speaking women had significantly longer duration rates compared with English-speaking and Chinese-speaking women (Homer, Sheehan et al. 2002).

Some studies in Singapore, Malaysia and Thailand showed that mothers of Chinese descent were less likely to breastfeed their babies than other ethnic groups (Chye, Zain et al. 1997; Fok 1997; Chye and Lim 1998; Chan and Asirvatham 2001). Breastfeeding rates of migrant Chinese mothers in Sydney were lower than the average level of Australia (Diong, Johnson et al. 2000). One reason for this might be attributed to an incorrect traditional perception: breastfeeding was good for infant but not good for mother's recovery after delivery (DaVanzo, Sine et al. 1994; Leung, Tam et al. 2003; Leung, Au et al. 2006).

A very old Chinese traditional breastfeeding instruction in Sung dynasty (960-1276 AD) mentioned that the overnight milk (in the breasts) must be discarded by expression in the morning before letting the child suckle (Hsiung 1995). This knowledge needs to be

updated. A widely circulated text of the Ming dynasty, Advice for Safe Birth, Infant Rearing and Maintaining Health, quoted past exhortations "not to make children overly full" in breastfeeding (Hsiung 1995). This was inconsistent with the hind milk values.

### **2.3.2.10 Maternal body mass index**

Women who were overweight or obese before pregnancy breastfed for a shorter time than those with normal weight (Donath and Amir 2000; Baker, Michaelsen et al. 2004). A retrospective analysis of 287213 completed singleton births from London showed that obese pregnant women ( $BMI \geq 25 \text{ kg/m}^2$ ) were less likely to initiate breastfeeding than women with normal BMI (20-24.9  $\text{kg/m}^2$ ) (odds ratio (OR) =0.86, 99% CI, 0.84, 0.88 in BMI 25-29.9  $\text{kg/m}^2$  group; OR=0.58, 99% CI, 0.56, 0.60 in BMI  $\geq 30 \text{ kg/m}^2$  group) (Karaolis-Danckert, Gu'nther et al. 2007).

### **Conclusion**

In conclusion, factors negatively associated with breastfeeding were perceived milk insufficiency, early return to work, maternal smoking, introduction of a pacifier, maternal obese, use of prelacteal feeds, not feeding the infant colostrums, maternal and child ill, primiparas, urbanization and disadvantaged socioeconomic status, such as mothers were younger, less educated, belonged to an ethnic minority, living in disadvantaged areas, had a low income and were unsupported.

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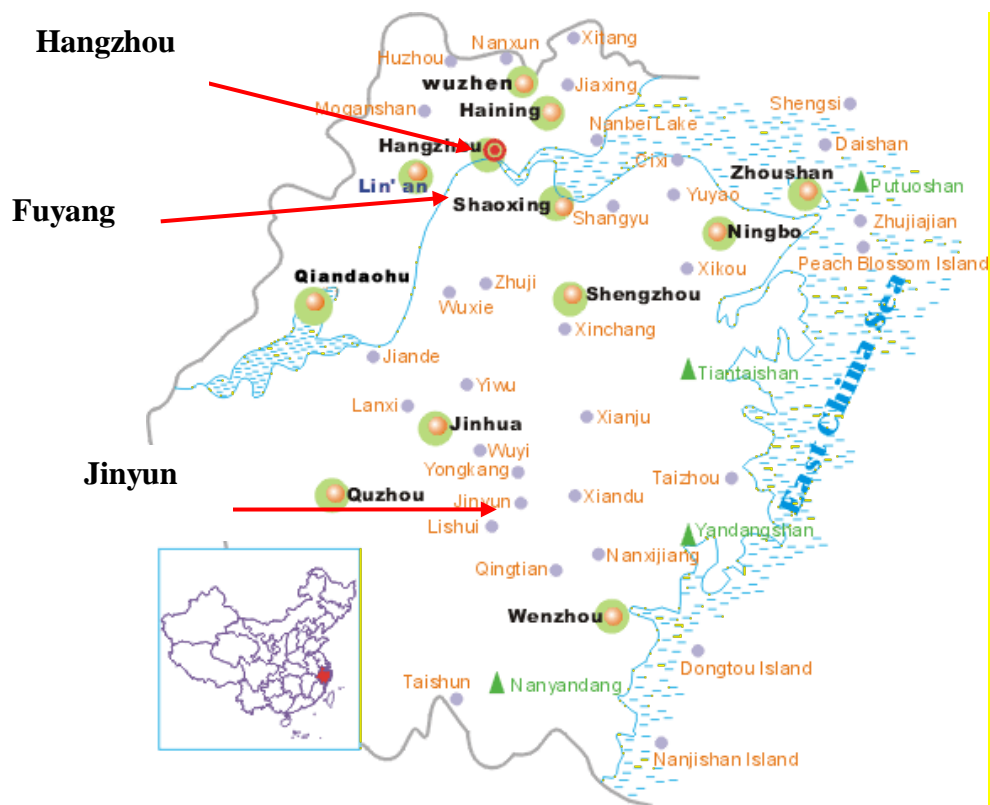
# **CHAPTER 3**

## **METHODOLOGY**

### 3.1 Study location

A longitudinal cohort study of infant feeding practices was undertaken in Zhejiang Province, China. Zhejiang Province is a rapidly industrialising area located in the southeast of China. Three locations are selected as study sites which are located in the capital city (Hangzhou), in suburban (Fuyang), 50 km to the southwest of Hangzhou, and in a mountainous rural area a further 300 km to the south-west. These areas were selected as being representative of the different economic and social environments in Zhejiang Province (See the map of three locations).

Zhejiang Province Map and its location in China Map



Hangzhou, the largest city, has a population of 6 million and lies on the shores of the picturesque West Lake and is situated in the northeast of Zhejiang Province. The city is the capital of the province, the centre of political, economic, education, technology, medical and health care. It has an area of 16596 sq km area (Hangzhou Statistic Bureau 2003).



Fuyang, a city of 620000 people is located 50 km southeast of Hangzhou and is divided into 26 communes or communities for geographical and administrative purposes. The main economy is based on the agriculture, papermaking and telecommunication devices. There were 5172 births in 2003(Dept. of MCH, ZHB 2004).

Jinyun County has 436000 people and is located in a mountainous area in the southwest of Zhejiang Province. Since the transportation is not so good in mountain area, Jinyun's economic resource is mainly dependent on agricultural products. The GDP per capita is lower than Zhejiang average level. (2004 Zhejiang Province GDP per capita 3780 USD, Jinyun County 1164 USD). The train transportation has been available since 1998 and since 2003 a highway has linked Jinyun to neighbouring cities. Travel from Hangzhou to Jinyun takes 5 hours by train and 3 hours by express bus. A total of 3918 babies were born during 2003 in Jinyun( Dept. of MCH, ZHB 2004).

All the mothers in the study were recruited while in hospital during the period October 2004 to December 2005. The first interview was undertaken by a nurse or women's health worker before discharge from hospital and follow up interviews were held at one month, three months and six months post partum. The first interview was always undertaken in person, and most (92%) of the follow-up interviews were undertaken by telephone. In the few instances where mothers could not be reached by telephone, the follow-up interviews were completed at the routine examinations in the community child care clinics. A total of 1520 mothers were recruited from four hospitals, the Women's Hospital, School of Medicine, Zhejiang University in the city and Fu-yang Maternal and Child Hospital in the suburban location. In the rural area of Jinyun two locations were used for the study, the Jin-Yun People's Hospital and the Li-Shui Maternal and Child Health Hospital. Each of these hospitals is typical of the health care facilities in the area they are located.

### **3.2 Inclusion and Exclusion criteria**

While China has a large number of ethnic groups, Zhejiang province is almost entirely of majority Han group. In the remote areas there are small minority groups but it is estimated that they constitute no more than 2% of the population. For the purposes of this study a migrant populations were not included in the sample.

The selection criteria for the study were:

Mothers who had infants born in one of the above institutions and resident within the geographic area served by one of these hospitals.

Mother and neonate did not have serious diseases.

Mothers stayed in service area and had their prenatal health care during pregnancy.

Mothers had to confirm that they intended to be resident within the location for six months following the birth of the infant and give agreement to participate in the study.

The following exclusion criteria were used in the study

The presence of any a serious disease that would result in prolonged admission to hospital.

The presence of major congenital abnormalities.

Very early premature births, less than 32 weeks.

Being a member of a migrant group who was not regarded as permanent residents of Zhejiang province

In Hangzhou almost one half of the deliveries are not by local residents and were excluded from the study. However in the suburban and rural areas almost all mothers were local residents and were eligible to participate. The hospital in Hangzhou has more than 8000 deliveries each year that are accommodated in five obstetric wards. All of the wards are equivalent in terms of patient catchment, but because of the limitation of staff numbers in this project, only two of the wards were included in the study.

The sample was planned to be consecutive and unselected. However on some days there were too many deliveries in the hospital for the staff to interview them all. On these occasions selection of the mothers to be interviewed was made using random numbers. Mothers were contacted while in hospital and were invited to participate in the study. The response rate was high and 98% of mothers (1520 out of 1551) agreed to participate in the study.

The mothers were followed up at approximately monthly intervals when they attend maternal and child health clinics or by telephone. China has a very high rate of telephone or cellphone penetration, and all of the mothers in the study were able to give some contact number. On a few occasions it was necessary to make personal visits. The follow-up continued until the infants in the study reached six months of age. Those mothers who ceased to breastfeed their child were also followed up to document their infant feeding practices.

Interviews in the study were conducted at the following time intervals:

- In hospital
- One month
- Three months
- Six months

All interviews were undertaken by trained nursing personnel.

### **3.3 Study instrument**

The initial and follow-up questionnaires used in this study were based on questionnaires previously used in similar studies undertaken by Binns, Scott, Duong and Xu. Many have been extensively used in breastfeeding cohort studies in Australia, China (Xinjiang) Vietnam and Kenya (Duong, Binns & Lee 2004; Scott et al. 1999; Xu et al. 2007). The questionnaires included a modified version of the Iowa breastfeeding perception scale which has previously been used in Australia and China. They are attached in Appendix One

- a. Infant Feeding Practices (baseline)
- b. Follow up Questionnaire.

The baseline questionnaire has 7 sections which include mother and the family general information, baby's information, pregnant information, delivering information, breastfeeding information, hospital procedure for breastfeeding, health education and mother's attitude. The follow up questionnaire has 6 sections.

The questionnaires were designed to identify the feeding method and to collect information on factors associated with breastfeeding. These questionnaires have been extensively used in breastfeeding studies in cultures similar to Hangzhou. Nevertheless it was still important to ensure that all of the questions were relevant, understandable and culturally acceptable in Hangzhou. While Mandarin is universally spoken in Zhejiang Province, Hangzhou has its own distinct dialect and many local words were used in translation. The questionnaires were first translated into Chinese and the questionnaires were reviewed by medical staff who were expert in maternal and child health care who further assessed language and content. The questionnaires were tested for comprehension and relevance on a sample of 30 mothers in each of the study areas. After translation, the questionnaires were modified according to their comments. Following the pilot study a number of focus group discussions were held. On this basis the language used in the questionnaires was modified to ensure that it was culturally acceptable in the Zhejiang province.

The questionnaires were designed to identify the feeding method and to collect information on factors associated with breastfeeding. The information included current feeding practices, the types of problems experienced by women in lactation, the time of weaning and reasons for the cessation of breastfeeding before six months postpartum, and perceptions of mothers, fathers, relatives and others on breastfeeding. Further questions covered socio-demographic factors (e.g. maternal age, education, occupation, ethnicity, marital status, family income, partner's occupation), psychosocial factors (e.g. maternal attitudes and beliefs, influence of significant others, social support), bio-medical factors (e.g. method of delivery) and hospital practices (e.g. early mother-infant contact, demand feeding, rooming-in, antenatal and post-natal education). The initial questionnaire also includes information on prenatal education that the mother and father had received. The questionnaires contained both closed- and open-ended items.

The final version of the baseline questionnaire included 150 questions and the follow-up questionnaire included 117 questions. The questionnaires took approximately 30 minutes to complete.

### **3.4 Ethical considerations**

The project was approved by the Research Administration Section of the Women's Hospital, School of Medicine, Zhejiang University and the Human Research Ethics Committee of Curtin University, Australia. The purpose of the study was explained to the mothers and assurance was given that all information would be kept confidential. Any mother had the right to withdraw from the study at anytime. All of the mothers were reassured that participation or nonparticipation, in the study would not influence their care in any way. After the purpose of the study had been explained to the mothers were then given a consent letter to sign. The questionnaire and the interviewing nurses used standard terminology and the local dialect to ensure mothers' understanding. An information sheet was given to each mother and the purpose of the study was explained and informed consent was requested. Copies of the information sheet and consent form are provided in the Appendix.

The data was kept confidential after collection at the Department of Women Health, Women's Hospital. This department is responsible to investigating maternal deaths in Zhejiang Province and has facilities to store a large amount of confidential questionnaires. After the questionnaires had been coded the data was kept in a de-identified data file.

The research followed the ethical principles of the Helsinki Declaration (WMA & Association, 1996) and the National Health and Medical Research Council of Australia (NHMRC, 1999).

### **3.5 Definitions**

The definitions of breastfeeding used in this paper are based on standard definitions and were the same as those used in Xu's study in Xinjiang Province, in the west of China[Xu et al. 2007].

- *Any breastfeeding*: The infant receives breastmilk (direct from the breast or expressed) with or without other drink, formula or other infant food.

- *Exclusive breastfeeding*: Breastfeeding while giving no other food or liquid, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine.
- Prelacteal feeds are defined as any feeds given before the onset of lactogenesis II, which is the onset of copious lactation that occurs within four days of birth (Neville & Morton 2001).

### 3.6 Sample size

The study was planned to include 600 mothers who delivered babies in the Zhejiang Women's Hospital, 600 in Fuyang MCH hospital and 600 in Jinyun People's Hospital.

It was assumed that the lowest exclusive breastfeeding rate on discharge in the city, in suburban and rural hospital in Zhejiang Province is 60%. For the Sample size calculation the proportion breast-feeding was assumed to be 0.6, alpha 0.05, and power 0.8. The sample size required using the following formula:

$$(n = (\mu_{\alpha}/\delta)^2 \rho (1 - p). \quad \mu_{0.05} = 1.96, \quad \delta = 0.05, \rho = 0.6).$$

So the calculation is

$$N = (1.96 / 0.05)^2 * 0.6 * (1-0.6) = 369.$$

According the formula each site should have 369 mothers enrolling our study for detecting the differences in prevalence of breastfeeding between the city, suburb and rural area. Three locations sample requires

$$369 * 3 = 1107 \text{ mothers}$$

Finally 1551 mothers were recruited, but 31 of them later withdrew or dropped out of our study, leaving 1520 participants (638 from city, 347 from suburb and 535 from rural area) taking part in the study. This number size exceeded the initial recruitment target and enough to allow for some dropouts and difficulties with follow-up.

### **3.7 Recruitment of sample**

The principal researcher is on the staff of the Hangzhou Women's hospital and recruited the part of sample personally by daily visits to the hospital. There are about 6000 mothers delivering in Women's Hospital in City during 2005. The annual deliveries in the MCH Hospital in Fuyang and in the People's Hospital in Jin-Yun are 3000 and 1000 respectively. Mothers were voluntary participants chosen randomly from the all 5 obstetrical wards within city Women's Hospital and the same approach was used in suburb and rural area for mothers' recruitment over the period 2004 to 2005. The principal researcher was the staff in Women's Hospital and she also was responsible for monitoring the provincial maternal and child health care in her daily work. The new mothers delivering in MCH hospital in Fu-Yang (suburban) and in People's Hospital in Jin-Yun (rural) were also recruited on a daily basis with the help of local hospital senior medical and nursing staff. Interviews were conducted by nursing staff who attended a training course conducted by the researcher before data collection commenced. Before the study officially starting in each location the pilot test was done for modifying the questionnaires to Zhejiang culture and testing the interviewer qualification. The principal researcher visited the research sites on a regular basis to monitor the data collection quality. The recruitment stopped when the required sample size was been reached. Mothers were not interviewed if hospital staff advised that she was too tired or ill. (see the pictures for pilot test, training and monitoring)

Figure 1 The principal researcher was training local nurses





Figure 2 Nurse doing pilot test

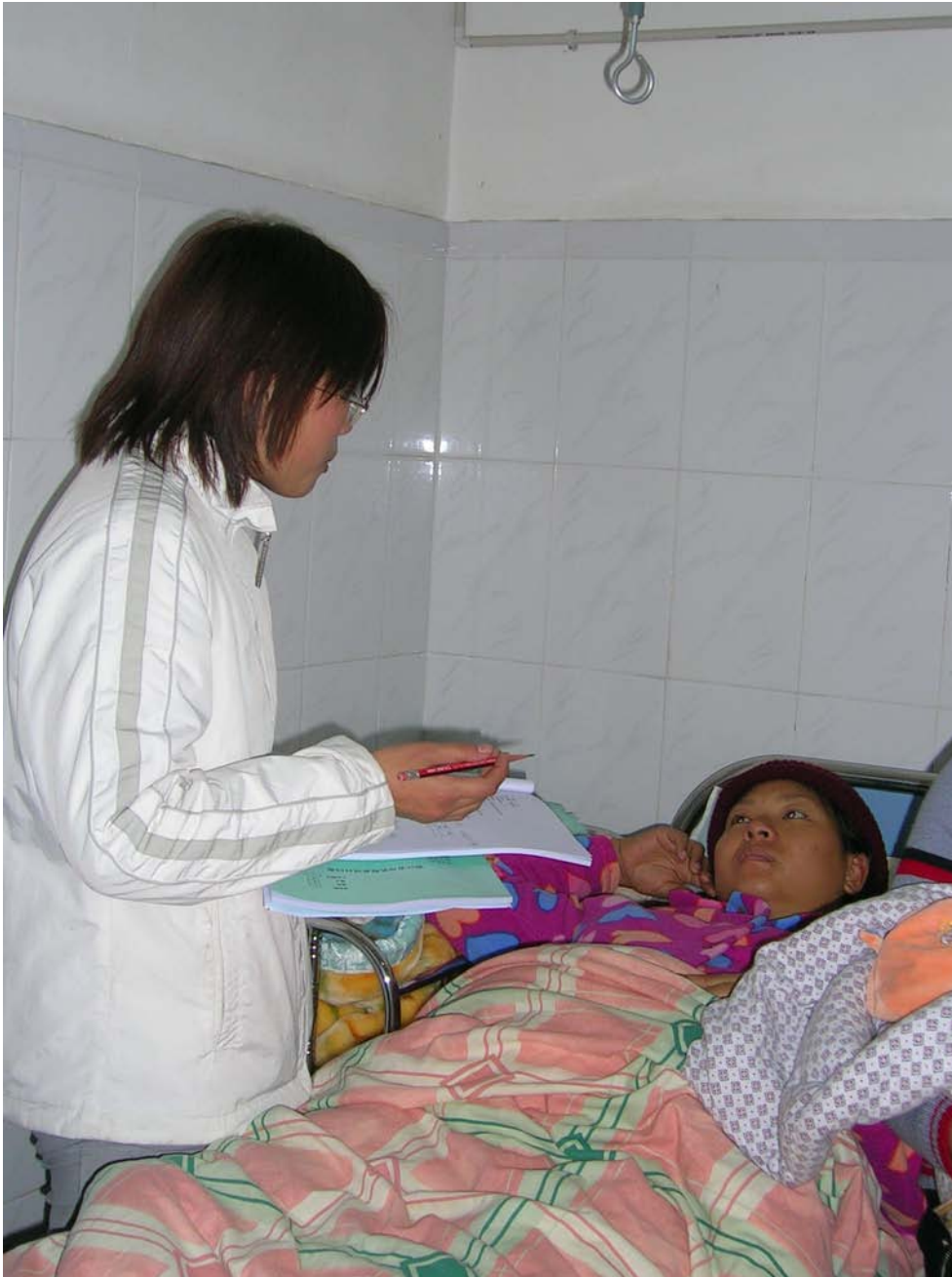


Figure 3 Principal research doing field monitoring



The average length of stay in the city hospital was 5.3 days and in the rural areas was 4 days, which allowed sufficient time for almost all mothers to be interviewed prior to discharge.

Within the restrictions noted above the sample was unselected and consecutive. The questionnaires administered by interviewers. The completed questionnaires were checked by interviewer after every interview to make sure that they were complete.

Literacy was not a problem in Zhejiang province and all mothers were able answer the questions in Chinese (Mandarin).

### **3.8 Data cleaning and data analysis**

After finishing the serial follow up, all the questionnaires were sent to Women's Hospital, Zhejiang University School of Medicine. The principal researcher checked the questionnaires every half month to make sure no important information was missing like mothers contact information, baby's birth day, interviewer. The data entering assistants were trained prior to data entry. All data analyses were carried out using the Statistical Package for Social Science (SPSS), release 14.0 (SPSS Inc., Chicago, IL, USA). Descriptive techniques, including frequencies distributions were undertaken to identifying any coding and data entry errors. Out of range responses and inconsistent data which were compared with the original questionnaire and data were corrected where appropriate. Between-coder variation was avoided by having the same individual code all questionnaires.

Descriptive statistics and cross-tabulations were generated for demographic factors. Descriptive techniques, life tables and survival analysis were used to document breastfeeding rates and duration. As a preliminary investigation of the data, contingency tables of breastfeeding versus potential explanatory factors were made along with univariate logistic regression analysis. Multivariate logistic regression analysis was employed to determine which individual variables could best predict the chosen method of feeding. All variables reported in the literature to be associated with the decision to breastfeed, along with a variety of interaction terms, were included in the full model. The full model was reduced using the backward stepwise procedure and the fitness of the model was assessed at every step to avoid dropping non-significant variables that affected the model fitness. No statistically significant interaction effects were found between variables in the model. All variables in the final model were variables for which when excluded the change in deviance compared with the corresponding  $X^2$  test statistic on the relevant degrees of freedom was significant. The factors likely to be involved in breastfeeding initiation were entered into logistic regression models. Cox regression analysis was undertaken to explore factors affecting breastfeeding. Relative risks, hazard

ratios and odds ratios of significant variables are presented in the following results chapters.

Survival analysis was used to examine the duration of breastfeeding as it provides a good understanding of breast-feeding behaviour over time. This type of analysis is used due to the presence of censored data. The use of the term “censored data” refers to data from those cases where breastfeeding continued beyond the end of the study period (6 months) or in the few cases where the subject dropped out of the study. Survival plots based on Kaplan-Meier survival estimates are used to demonstrate the duration of the breastfeeding period.

The effect of individual variables on the duration of breast-feeding was initially evaluated using the Kaplan-Meier estimate of survival and the log-rank test was used to assess the equality of the survival curves. Variables reported in the literature to have an effect on the duration of breastfeeding were investigated using Cox’s proportional hazards model. Variables reported in the literature to be associated with breastfeeding duration were included in the full model which was then reduced using the backward stepwise procedure.

### **3.9 Sample details**

A total of 638 mothers to deliver babies in the Zhejiang University Women’s Hospital were recruited for the study, which constituted the urban arm of the study. In the suburb of Fuyang a total of 347 mothers were recruited from the maternal and child health hospital. Finally in the rural area of Jinyun 535 mothers were included in the study. The total number of questionnaires analysed was 1520.

**Table 3.1 Demographic details of mothers in the city, suburban and rural areas (n=1520)**

Variable	Value	City		Suburb		Rural		Total	
		N	%	N	%	N	%	N	%
Residence		638	42.0	347	22.8	535	35.2	1520	100.0
Maternal Age (years)	<25	77	12.0	124	35.7	158	30.6	358	23.9
	25-29	383	60.2	165	47.6	255	49.2	800	53.5
	30-34	151	23.9	51	14.7	80	15.5	282	18.9
	≥35	25	3.9	7	2.0	24	4.7	56	3.7
	Unkno wn	5		0		19		24	
Maternal education(years)	≤9	57	9.0	206	59.4	282	53.1	544	36.0
	10-12	172	26.9	78	22.5	121	22.9	370	24.5
	>12	407	64.1	63	18.2	127	24.0	597	39.5
	Unkno wn	3				6		9	
Maternal employment	Labor job	67	10.5	188	55.1	238	47.1	492	33.3
	Office job	494	78.4	90	26.4	179	35.4	763	51.7
	No job	70	11.1	63	18.5	89	17.4	221	15.0
	Unkno wn	8		6		30		44	
Gestation(weeks)	<37	30	4.7	7	2.0	12	2.4	49	3.3
	≥37	605	95.3	340	98.0	499	97.6	1443	96.7
	Unkno wn	3		0		25		28	
Birth weight (g)	<2500	9	1.4	7	2.0	11	2.1	27	1.8
	2500-3999	583	91.8	310	89.3	489	93.3	1382	91.8
	≥4000	43	6.8	30	8.6	24	4.6	97	6.4
	Unkno wn	3		0		11		14	
Delivery method	Vaginal	155	24.3	90	25.9	252	47.2	495	32.7
	Caesarean	481	75.7	257	74.1	281	52.8	1019	67.3
	Unkno wn	3		0		3		6	
Birth order	1	615	96.9	290	84.1	442	83.4	1347	89.2
	≥2	20	3.1	55	15.9	89	16.6	163	10.8
	Unkno wn	3		2		5		10	
Baby's gender	Male	347	54.2	162	47.4	260	49.7	767	51.1
	female	291	45.8	180	52.6	263	50.3	734	48.9
	Unkno wn	2		5		12		19	
Monthly family income* (RMB)	≤1500	6	1.0	51	15.0	158	31.3	215	14.6
	1501-3000	75	11.9	145	42.8	182	35.9	401	27.2
	3001-5000	227	35.7	97	28.6	129	25.6	451	30.6
	> 5000	326	51.5	46	13.6	36	7.1	407	27.6
	Unkno wn	7		8		31		46	

Almost all of the mothers agreed to participate in the study and the overall recruitment rate was 97%. A total of 1520 mothers were recruited and completed these six-month follow-up, a dropout rate of 2%. These were the mothers who were included in the analysis of the study. Mothers from the city were 42% of the sample, 23% from the suburban area and 35% from the rural area. Almost all of the mothers were married and most belonged to the Han ethnic group (97.5%). The mothers from the city had generally higher levels of education and a greater proportion were, or had been, employed in office work. The family income levels in the city were higher than in the suburban and rural areas. The approximate monthly family income levels were 5000 yuan in the city, 3000 in the suburb and 2500 in the rural area. At the time of the study the exchange rate was approximately 1 US dollar for 7 yuan.

Mothers from the city were slightly older and only 12% of mothers in the city had their baby before 25 years of age compared to 36% in the suburb and 31% in the rural location. Mothers in the city and suburban areas were more likely to give birth by caesarean section. Over all these caesarean section rates were 75.7% in the city, 74% in the suburban area and 53% in the rural area.

The total sample included in the analysis for the study was 1520. The response rate of 98% was considered to be high for this type of study. The dropout rate during the follow up of the cohort was also low. In the next chapter the descriptive responses to the questionnaires are given.

## CHAPTER 4

# **DESCRIPTIVE RESULTS**

#### 4.1 Demographic factors and mothers opinions: a univariate analysis of the initial questionnaire

Mothers were initially interviewed while in hospital and were invited to complete the initial questionnaire. The answers compiled in this section are from mothers who agreed to participate in the study. The questions were read out by trained interviewers to ensure that there were no differences between the three locations used in the study due to differences in levels of literacy. This chapter provides descriptive statistics of the results of the initial questionnaire.

The first section describes variables related to the mothers and their families. This is followed by details of the infants and birth and attitudes to breastfeeding.

Table 4.1 Mothers age group in city, suburban and rural area (years)

Residence	≤25	26-30	31-34	≥35	Total
City	77 (12.1%)	383 (60.2%)	151 (23.7%)	25 (3.9%)	636 (100%)
Suburban	124 (35.7%)	165 (47.6%)	51(14.7%)	7 (2%)	347 (100%)
Rural	158 (30.6%)	255 (49.3%)	80 (15.5%)	24 (4.6%)	517 (100%)

Chi-Square =94.55 df = 6, p< 0.001

Table 4.2 Mean age of mothers (years) by place of residence

Place	Mean (years)	N	Std. Deviation
City	28.03	636	3.30
Suburb	26.07	347	3.60
Rural	26.65	511	3.88

On average mothers in the city were about 2 years older than the rural or suburban mothers. This was because of the fewer mothers under the age of 25 years in the city.



Table 4.3 Mothers' birth place and current residence sameness

Residence	No	Yes	Total
City	290 (45.45%)	348 (54.55%)	638
Suburb	64 (18.44%)	283 (81.56%)	347
Rural	20 (3.74%)	515 (96.26%)	535

Chi-Square = 282.17 df = 2, p < 0.0001

In Chinese society where a mother is living in the same location as she was born, it usually means mother can get help from her parents or her relations. In the case of Hangzhou city, 45% of the mothers in the study were born outside the city area. This was significantly higher (P < 0.001) than the suburban and rural locations, which not unexpectedly showed much greater demographic stability.

Table 4.4 The mother was living with others in the same house

Location	With other people	Only couple by themselves	Total
City	227 (35.7%)	409 (64.3%)	636 (100.0%)
Suburb	230 (66.3%)	117 (33.7%)	347 (100.0%)
Rural	286 (54.8%)	236 (45.2%)	522 (100.0%)
Total	743 (49.4%)	762 (50.6%)	1505 (100.0%)

Pearson Chi-Square = 93.444 df = 2, p < 0.001

In the rural area it was more common for couples to live with an extended family. On the other hand in the city significantly more couples lived by themselves. This is often the pattern in China, reflecting the values of traditional Chinese society in the rural areas, but as many families (or individuals) migrate to the cities to seek work, traditional living arrangements change. There is no doubt that the Chinese government's "one child policy" has also been a major factor in changing social arrangements.

Table 4.5 Ethnic minorities included in the study

Location	minority	Han	Total
City	6 (0.94%)	632 (99.06%)	638
Suburb	8 (2.31%)	338 (97.69%)	346
Rural	24 (4.50%)	509 (95.50%)	533
Total	38 (2.50%)	1479 (97.50%)	1517

Pearson Chi-Square = 15.158 df = 2, p < 0.001

In Zhejiang Province Han people is dominated in population about 97.11% in 2006. In our study total about 2.5% mothers were minority people who mainly were living in rural area.

#### Mother's Marital status

In the total sample of just over 1500 people there are only two mothers who were not married at the time of delivery. One was living in the suburban area and the other in the rural location. Birth outside of marriage is uncommon in China and this was reflected in the study sample.

Table 4.6 Mothers Education by location

	Primary or less	Middle School	High School or Technical	University	Total
City	2 (0.31%)	55 (8.62%)	172 (26.96%)	409 (64.11%)	638
Suburb	26 (7.49%)	180 (51.87%)	78 (22.48%)	63 (18.16%)	347
Rural	30 (5.66%)	252 (47.55%)	121 (22.83%)	127 (23.96%)	530
Total	58 (3.83%)	487 (32.15%)	371 (24.49%)	599 (39.54%)	1515

Pearson Chi-Square =401.174 df= 6, p<0.001

Zhejiang is a province with a rapidly developing economy and a high level of education. There were significantly more mothers with university level education in the city sample. In the overall sample most of the mothers had concluded a high school education.

Table 4.7 Father's Education by location

	Primary	Middle school	High school	University	Total
City	1(0.2%)	39(6.1%)	138(21.6%)	460(72.1%)	638(100.0%)
Suburb	17(4.9%)	165(47.6%)	102(29.4%)	63(18.2%)	347(100.0%)
Rural	26(4.9%)	230(43.4%)	128(24.2%)	146(27.5%)	530(100.0%)
Total	44(2.9%)	434(28.6%)	368(24.3%)	669(44.2%)	1515(100.0%)

Pearson Chi-Square =429.908 df=6, p< 0.001

The high level of education in Zhejiang Province is again reflected in the level of the Father's education. In the city 72% of the fathers had concluded university education compared to 68% of the mothers. In the rural sample the level of territory education were

still high with 27% of the fathers having completed university education, as was the level of the mothers where 24% had tertiary education.

Table 4.8 Work status of mothers prior to becoming pregnant by location

	Full time		Part time		Not working		Other		Total	
	N	%	N	%	N	%	N	%	N	%
City	436	55.2	45	41.7	93	17.5	0	0.0	574	40.0
Suburb	141	17.8	30	27.8	173	32.6	1	12.5	345	24.0
Rural	213	27.0	33	30.6	264	49.8	7	87.5	517	36.0
Total	790		108		530		8		1436	

Pearson Chi-Square =198.50 df=6, p< 0.001

More than half of the mothers in the sample were working full-time prior to becoming pregnant. There was a significant difference between the different locations. A higher proportion of the mothers were working full-time in the city and in the suburbs. In the rural area, a higher proportion of the mothers were working full-time mainly as workers in the family farm.

Table 4.9 Maternal health care insurance coverage by location

	Yes		No		Total	
	N	%	N	%	N	%
City	496	79.7	130	16.3	626	44.1
Suburb	78	12.5	265	33.2	343	24.2
Rural	48	7.7	403	50.5	451	31.8
Total	622		798		1420	

Pearson Chi-Square =582.507 df = 2, p< 0.001

The health insurance industry only has a short history in China. Normally very few women have special maternal and child care insurance. In our study 43.8% of the mothers were covered by health insurance for the delivery, but this ranged from 8% in the rural areas to almost 80% in the city. It is very common for health insurance to be provided as an employment benefit, reflected in the high rates in the city. In the rural areas co-operative insurance programmes exist and farmers are encouraged to pay a modest

annual premium. However there are a very low percentage of rural inhabitants covered by health insurance.

Table 4.10 Health insurance coverage for the infant

Location	Yes		No		Total	
	N	%	N	%	N	%
City	311	94.8	316	26.9	627	41.8
Suburb	6	1.8	341	29.1	347	23.1
Rural	11	3.4	516	44.0	527	35.1
Total	328		1173		1501	

Pearson Chi-Square= 485.557 df = 2, p<0.001

Health insurance for mothers and infants are covered by separate policies in China. In this sample 78% of infants did not have coverage for hospital expenses. This means that if the infant requires prolonged stays in hospital, such as in a neonatal intensive care unit this can be a financial burden for the family.

Table 4.11 Father's employment by location

	Farmer	Service	Administration Officer	Professional	Private Business	Temporarily unemployed	Jobless	Other	Total
City	48 (7.7%)	1 (0.2%)	27 (4.4%)	194 (31.3%)	227 (36.6%)	113 (18.2%)	0 (0.0%)	10 (0.0%)	620 (100.0%)
Suburb	77 (22.4%)	41 (12.0%)	38 (11.1%)	23 (6.7%)	38 (11.1%)	107 (31.2%)	11 (3.2%)	8 (0.0%)	343 (100.0%)
Rural	87 (17.7%)	99 (20.2%)	46 (9.4%)	43 (8.8%)	52 (10.6%)	125 (25.5%)	23 (4.7%)	15 (0.2%)	490 (100.0%)
Total	212 (14.6%)	141 (9.7%)	111 (7.6%)	260 (17.9%)	317 (21.8%)	345 (23.7%)	34 (2.3%)	33 (2.3%)	1454 (100.0%)

Pearson Chi-Square=448.875 df=24, p<0.001

Not unexpectedly there were a higher proportion of farmers in the rural location and more professional and private businessmen in the city. The category of service personnel included work categories such as waiters and supermarket attendants. The professional category included medical practitioners and teachers. Administrative offices included those employed by all levels of government. Private business were those who were working for themselves in a small business such as retail shops and small factories.

Table 4.12 Sufficient resources for living independently as a couple by location

	Yes	No	Total
City	620(97.2%)	18(2.8%)	638(100.0%)
Suburb	344(99.1%)	3(0.9%)	347(100.0%)
Rural	479(91.2%)	46(8.8%)	525(100.0%)
Total	1443(95.6%)	67(4.4%)	1510(100.0%)

Pearson Chi-Square=37.531 df= 2, p< 0.001

In this question the mothers were asked to whether they had sufficient financial resources to live independently from the rest of the family. Overall almost 96% of families felt that they were able to live independently. There were significantly fewer couples in the rural areas who are able to live independently. In the cases where extra financial support was required this was almost always (90%) provided by parents. That 96% regard themselves as independent financially reflects the rapid economic development of China in the past decades and also the relative affluence of Zhejiang Province compared to the poorer inland areas.

#### 4.2 Variables related to the infant and to the birth

Table 4.14 Gender of the infant by location

	Boy	Girl	Total
City	347(54.4%)	290(45.5%)	638(100.0%)
Suburb	167(48.1%)	180(51.9%)	347(100.0%)
Rural	261(49.8%)	263(50.2%)	524(100.0%)
Total	775(51.4%)	733(48.6%)	1509(100.0%)

Chi square = 4.43 df = 2, p=0.109

There were no significant differences between locations with respect to the gender of the infant.

Table 4.15 Infants born before 37 gestation weeks

	<37	>=37	Total infants born
City	30(4.7%)	608(95.3%)	638(100.0%)
Suburb	7(2.0%)	340(98.0%)	347 (100.0%)
Rural	12(2.3%)	499(97.7%)	511(100.0%)
Total	49(3.3%)	1447(96.7%)	1496 (100.0%)

Pearson Chi-Square=7.220 df = 2, p< 0.027

There were slightly more infants born before 37 weeks in the city when compared to the other two locations. Over the rate of premature delivery is relatively low compared to other countries in the region.

Table 4.16 Infant birth weight by location

	<2499G	2500-3999G	≥4000G	Total
City	9(1.4%)	586(91.8%)	43(6.7%)	638(100.0%)
Suburb	7(2.0%)	310(89.3%)	30(8.6%)	347(100.0%)
Rural	11(2.1%)	490(93.3%)	24(4.6%)	525(100.0%)
Total	27(1.8%)	1386(91.8%)	97(6.4%)	1510(100.0%)

Overall the rate of low birthweight was 1.8%. There were no differences in infant weight between the three locations. The rate of low birth weight is lower than most western countries and is considerably lower than other countries in the region such as Japan. For example currently in Japan the rate of low birthweight is 9.5% and for the province of Okinawa is 11% (Hokama and Binns 2008).

The World Health organisation reported in 2006 that low birthweight rate for China was 6% and gave the following regional figures:

Region of the Americas	9%
South-East Asia Region	26%
European Region	8%
Eastern Mediterranean Region	17%
Western Pacific Region	8%

Quoted in (World Health Organization 2006)

The only explanation that can be given for this result is that Zhejiang is a more affluent region than other regions of the China. Further study of the reasons for this favourable public health outcome would be of value to other countries in the region.

Table 4.17 Monthly family income (yuan) in three locations

	<500	501 ~ 1500	1501 ~ 3000	3001~5000	5001~7000	>7000	Total
City	1 (0.2%)	5 (0.8%)	75 (11.8%)	227 (35.8%)	123 (19.4%)	203 (32.0%)	634 (100.0%)
Suburb	1 (0.3%)	50 (14.7%)	145 (42.8%)	97 (28.6%)	26 (7.7%)	20 (5.9%)	339 (100.0%)
Rural	20 (4.0%)	138 (27.3%)	182 (36.0%)	129 (25.5%)	36 (7.1%)	0 (0.0%)	505 (100.0%)
Total	22 (1.5%)	193 (13.1%)	402 (27.2%)	453 (30.6%)	185 (12.5%)	223 (15.1%)	1478 (100.0%)

Pearson Chi-Square= 551.833 df = 10, p< 0.001

Not surprisingly the family income was higher in the city than in the rural area. At the time of the study the approximate currency conversion rate was one US dollar was equal to seven yuan. In the city one third of this sample had a monthly income of greater than 1000 US dollars per month.

In 2004 the National per capita GDP was \$5350.

Table 4.18 Infants first feed with breast milk or not in three locations.

	Breastfed	Not breastfed	Total
City	474(74.3%)	164(25.7%)	638 (100.0%)
Suburb	247(71.6%)	98(28.4%)	345(100.0%)
Rural	209(41.4%)	296(58.6%)	505(100.0%)
Total	930(62.5%)	558(37.5%)	1488(100.0%)

Pearson Chi-Square= 146.097 df= 2, p< 0.001

The type of food given to the infant as their first feed differed between locations. In the rural area it is customary to give the infant water or occasionally tea as their first food. The use of prelacteal feeds is further discussed in the next chapter.

Table 4.19 Feeding of tea to the infant before one month of age

	Yes	No	Total
City	2(0.4%)	460(99.6%)	462(100.0%)
Suburb	0(0.0%)	152(100.0%)	152(100.0%)
Rural	64(15.6%)	345(84.4%)	409(100.0%)
Total	66(6.5%)	957(93.5%)	1023(100.0%)

Pearson Chi-Square= 95.524 df = 2, p< 0.001

Within one month of birth 6.5% of the infants in the study had been given tea to drink. Almost all of these infants were living in the rural area and the difference was highly significant. This is a traditional practice which has become uncommon in the city.

Table 4.20 Mother's illness during pregnancy

	Yes	No	Total
City	55(9.5%)	521(90.5%)	576(100.0%)
Suburb	36(11.0%)	290(89.0%)	326(100.0%)
Rural	56(11.1%)	449(88.9%)	505(100.0%)
Total	147(10.4%)	1260(89.6%)	1407(100.0%)

Overall 10.4% of the mothers developed an illness during their pregnancy. There was no significant difference between the locations used in the study and the incidence of maternal illness.

Table 4.21 Mother Using medication during pregnancy.

	No	Yes	Total
City	458(72.1%)	177(27.9%)	635(100.0%)
Suburb	241(69.7%)	105(30.3%)	346(100.0%)
Rural	376(72.3%)	144 (27.7%)	520(100.0%)
Total	1075(71.6%)	426(28.4%)	1501(100.0%)

There were no significant differences between locations in the use of medications between the different areas in the study. In this study there was no information obtained on the different types of western and Chinese medicines used.



Table 4.22 Mother smoking during pregnancy.

	No	Yes	Total
City	630(72.1%)	8(1.3%)	638(100.0%)
Suburb	341(69.7%)	5(1.43%)	346(100.0%)
Rural	523(72.3%)	9(1.7%)	532(100.0%)
Total	1494(98.5%)	22(1.5%)	1516(100.0%)

The rate of smoking during pregnancy in Zhejiang is very low compared to western countries. For example the comparable figure for Australia is 26%. (Giglia, Binns et al. 2007)

Table 4.23 Husband smoked during wife pregnancy.

	No	Yes	Total
City	350(54.9%)	288(45.1%)	638(100.0%)
Suburb	139(40.1%)	208(59.9%)	347 (100.0%)
Rural	267(50.2%)	265(49.8%)	532(100.0%)
Total	756(49.8%)	761(50.2%)	1517(100.0%)

Chi square = 19.737 df=2, p<0.001

The rate of smoking by the husband during pregnancy in China was quite high compared to western countries. For example the comparable figure for Australia is approximately half the Chinese rate (Giglia, Binns et al. 2007). In Zhejiang the rate of husband smoking was lowest in the city and highest in the suburban location.

Table 4.24 Drinking alcohol during pregnancy.

	No	Yes	Total
City	626(98.1%)	12(1.9%)	638(100.0%)
Suburb	343(98.8%)	4(1.2%)	347(100.0%)
Rural	507(95.1%)	25(4.9%)	532(100.0%)
Total	1476(97.3%)	41(2.7%)	1517(100.0%)

Chi square = 12.11 df=2, p=0.002

The proportion of mothers who drank alcohol during their pregnancy was low, but was significantly higher in the rural area.

### 4.3 Breastfeeding Variables

Mothers were asked a series of questions about breastfeeding, including their attitudes and practices.

Table 4.25 Who made the decision to breastfeed your baby?

	N	%
Myself	1171	77.04
Husband	14	0.92
My mother	8	0.53
Relation	1	0.07
Friends	3	0.20
Doctor	13	0.86
Nurse	5	0.33
Other Person(s)	2	0.13
Multiple persons	292	19.21
Total responses	1509	99.28
Missing data	11	0.72
Total number	1520	100.00

Almost all of the mothers responded to this question. In most cases (77%) the mother stated that she made the decision by herself. In about 20% of cases where the mother said that multiple people were involved, it was usually the father or the grand mother. Only in a few cases were health workers involved in making decisions about infant feeding method.

Table 4.26 Mother's reasons for breastfeeding her infant

	N	%
Good for baby	398	26.18
Convenient	15	0.99
Cheap	3	0.20
Closer to baby	5	0.33
My mother says its good for the baby	2	0.13
Other reasons	9	0.59
Multiple reasons	1041	68.49
Total responses	1473	96.91
Missing data	47	3.09
Total	1520	100.00

There were multiple responses to the question. Mothers wanted to breastfeed their infant. Mothers believed breastfeeding would be good for their babies.

Table 4.27 Mother's reasons for not breastfeeding her infant.

	N	%
Not enough breastmilk	81	5.33
Maternal illness	12	0.79
Medical staff suggestion	4	0.26
Multiple reasons	3	0.20
Total responses	100	6.58
Missing	1420	93.42
Total	1520	100.00

The number of mothers who were not breastfeeding their infants was relatively small and hence the results were not analysed by location. Similar to many countries the most common reason given was insufficient milk, which has been suggested as a socially acceptable.(Scott, Landers et al. 2001)

Table 4.28 What does your husband think about the method of infant feeding?

	N	%
Prefers breastfeeding	1406	92.50
Prefers formula feeding	18	1.18
Depends on my choice	35	2.30
Never discussed before birth	14	0.92
Total responses	1473	96.91
Missing data	47	3.09
Total	1520	100.00

Most fathers were strongly supportive of breastfeeding. This probably reflects the publicity given by the Chinese Ministry of Health in support of breastfeeding. However while there has been some education in support of breastfeeding, there is also considerable advertising for infant formula in China.

Table 4.29 Which people were important in supporting your decision to breastfeed?

	N	%
Husband	60	3.95
Mother or mother-in-law	48	3.16
The friend or all relation	3	0.20
Doctor or nurse	10	0.66
Multiple persons	1354	89.08
Total responses	1475	97.04
Missing data	45	2.96
Total	1520	100.00

Most mothers had the support of their husband, their own mothers and other family members in their decision to breastfeed their infant.

Table 4.30 What method of infant feeding did your own mother prefer?

	N	%
Prefers formula feed	51	3.36
Prefers breast-feeding	1395	91.78
Depends on my decision	20	1.32
Never discussed to	21	1.38
Total responses	1488	97.89
Missing data	33	2.18
Total	1520	100.00

Table 4.31 How did your closest friend feed her own infant?

	N	%
Formula feeding	51	3.36
Breast-feeding	1056	69.47
Mixed breast-feeding and the formula	286	18.82
No children	53	3.49
Unknown	44	2.9
Total responses	1490	98.03
Missing data	30	1.97
Total	1520	100.00

The exposure of potential mothers to other mothers who are breastfeeding is important for breastfeeding education. In previous generations this would automatically occur within the family. However with the Chinese “one child policy” it is less common to have a family member who has breastfed infant. These results are encouraging because new mothers are noting that their friends are breastfeeding.

Table 4.32 Who encouraged you to breastfeed while you were in hospital?

	N	%
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Nobody	71	4.67
Doctor	72	4.74
Nurse	78	5.13
Other	6	0.39
Multiple persons	1278	84.08
Total responses	1505	99.01
Missing data	15	0.99
Total	1520	100.00

Table 4.33 Were you encouraged to let your baby breastfeed soon after birth?

	N	%
Yes	1316	86.58
No	188	12.37
Total responses	1504	98.95
Missing data	16	1.05
Total	1520	100.00

These results show that on the whole the hospitals encouraged mothers to breastfeed and to commence breastfeeding soon after birth. However, it is disappointing that 5% of the mothers were not encouraged by anyone to breastfeed their infants.

Table 4.34 How often did the hospital require (or suggest) you to feed your baby?

	N	%
Feed on demand	1176	77.37
Every 2 hours	158	10.39
Every 3 hours	24	1.58
No instructions given	116	7.63
Other answers	22	1.45
Total responses	1496	98.42
Missing data	24	1.58
Total	1520	100.00

The majority (77%) of mothers were encouraged to breastfeed on demand, which is the standard for good infant feeding practice.

Table 4.35 Are you able to follow the hospital’s requirements for feeding your infant?

	N	%
Yes	1328	87.37
No	130	8.55
Total responses	1459	95.99
Missing data	62	4.08
Total	1520	100.00

Table 4.36 Did the hospital show you how to hold your baby while you were breastfeeding?

	N	%
Yes	1198	78.82
No or insufficient information	273	17.96
Not necessary	26	1.71
Total responses	1498	98.55
Missing data	23	1.52
Total	1520	100.00

Correct attachment is most important to minimise complications of breastfeeding and to maximise duration. Most of the mothers were able to follow the hospital instructions. What is significant is that 18% of mothers said that they did not receive enough information on attachment.

Table 4.37 Rooming in: How much time does your baby spend in your room each day?

	N	%
24 hours	1475	97.04
Day time	9	0.59
Night time	1	0.07
Has never been in room since birth	13	0.86
Other	1	0.07
Total responses	1499	98.62
Missing data	21	1.38
Total	1520	100.00

Rooming in was almost universal in all locations in this study.

Table 4.38 How long after birth before your breastmilk came in (lactogenesis II)?

	N	%
Within 1 day	770	50.66
Within 2 days	376	24.74
Within 3 days	316	20.79
Still no breast milk	33	2.17
Other	4	0.26
Total responses	1499	98.62
Missing data	21	1.38
Total	1520	100.00

The above displayed a typical pattern similar to other studies (Scott, Binns et al. 2007).



Table 4.39 Did you eat different foods on the first day after your baby was born?

	N	%
Different	1170	76.97
Same	327	21.51
Total responses	1497	98.49
Missing data	23	1.51
Title	1520	100.00

Table 4.40 Did you eat more or less food on the first day after your infant was born?

	N	%
More	92	6.05
Less	1082	71.18
Total responses	1174	77.24
The missing data	346	22.76
Total	1520	100.00

According Chinese tradition mothers eat less immediately after the birth of their infant. These mothers followed the traditional pattern.

Table 4.41 Do you feel you have sufficient breastmilk for your baby?

	N	%
Enough	841	55.33
Not Enough	593	39.01
Not Clear	48	3.16
Sometimes enough	4	0.26
Total responses	1486	97.76
Missing data	34	2.24
Total	1520	100.00

About 40% of the mothers felt they had insufficient breastmilk for the baby, which could be due to a number of reasons.

Table 4.42 How do you know that you have enough milk for your infant?

	N	%
My breast is engorged	197	12.96
Baby is quiet after feeding	235	15.46
Feel baby sucking stronger	10	0.66
Multiple reasons	395	25.99
Total responses	837	55.07
Missing data	683	44.93
Total	1520	100.00

Table 4.43 How do you know if your breastmilk is not sufficient?

	N	%
Baby sucking strongly for some time but still wants to suck	171	11.25
Wants to feed again within 1 hour	84	5.53
Does not feel engorged before feeding	137	9.01
A multiple reasons	335	22.04
Total responses	727	47.83
Missing data	793	52.17
Total	1520	100.00

About half (55.07%) of mothers were feeling having enough breast milk to feed baby before discharge in hospital.

Table 4.44 If you do not have enough breastmilk what method could you use to produce more milk?

	N	%
More sucking	81	5.33
Mother eat more	435	28.62
Take medicine	21	1.38
Physical therapy	2	0.13
Multiple methods	426	28.03
Total responses	965	63.49
Missing data	555	36.51
Total	1520	100.00

Table 4.45 Who is the key person supporting your breastfeeding?

	N	%
Husband	271	17.83
Mother and mother in-law	314	20.66
Medical staff	177	11.64
Other support staff	3	0.20
More than one person	527	34.67
Total responses	1292	85.00
Missing data	228	15.00
Total	1520	100.00

Table 4.46 Who would you prefer to consult if you have a breastfeeding problem after discharge from hospital?

	N	%
The hospital staff	471	30.99
Community health worker	32	2.11
Village health worker	2	0.13
Nursing-home assistance	15	0.99
Mother or mother-in-law	253	16.64
Relatives	99	6.51
Multiple persons	488	32.11
Total responses	1360	89.47
Missing data	160	10.53
Total	1520	100.00

About one third of mothers (30.99%) thought the breastfeeding problem should consult nurses or medical doctors.

Table 4.47 Where did you attend a prenatal course?

	N	%
Outpatient clinic prenatal course	436	28.68
While in hospital	79	5.20
Other place	3	0.20
Outpatient clinic and in hospital	372	24.47
Hospital and other place	1	0.07
Total responses	891	58.62
Missing data	629	41.38
Total	1520	100.00

The answers to this question suggest that there were 41% of mothers who might not have attended prenatal classes.

Table 4.48 What was your main source of breastfeeding information?

	N	%
Pamphlet	85	5.59
Television	53	3.49
Lecture	29	1.91
Medical staff consultant	41	2.70
Book/Magazine	75	4.93
No information	15	0.99
Multiple sources	800	52.63
Total response	1098	72.24
Missing data	422	27.76
Total	1520	100.00

This suggested that mothers were keen to receive information on breastfeeding and used multiple sources.

Table 4.49 Do you feel you received enough information about breastfeeding from the hospital?

	N	%
Yes	825	54.28
No	106	6.97
Not certain	48	3.16
Total responses	979	64.41
Missing data	541	35.59
Total	1520	100.00

Table 4.50 Did you receive enough information about breast-feeding from the outpatient clinic?

	N	%
Yes	714	46.97
No	123	8.09
Not certain	92	6.05
Total responses	929	61.12
Missing data	591	38.88
Total	1520	100.00

The mothers apparently received sufficient information for those who answered the question.

Table 4.51 How much help with infant feeding do you really received from the hospital?

	N	%
Much help	494	32.50
Some help	421	27.70
Not necessary	11	0.72
Did not get knowledge I needed	52	3.42
Total responses	978	64.34
Missing data	542	35.66
Title	1520	100.00

Very few mothers did not receive help from the hospital with regard to infant feeding.

Table 4.52 How strong is your confidence in your ability to breastfeed?

	N	%
No confidence at all	9	0.59
Not enough confidence	27	1.78
Generally confident	94	6.18
Confident	446	29.34
Strong confidence	900	59.21
Too early say if confidence	7	0.46
Do not know	14	0.92
Total responses	1497	98.49
The missing data	23	1.51
Title	1520	100.00

Most mothers felt confident in their ability to breastfeed their infant.

Table 4.53 How much do you like breastfeeding?

	N	%
Do not like at all	2	0.13
Don't like	18	1.18
Do not like or dislike	152	10.00
Like	748	49.21
Like very much	571	37.57
Too early to say if I like	5	0.33
Total responses	1502	98.82
Missing data	24	1.57
Total	1520	100.00

Table 4.54 Do you feel satisfied with breastfeeding your baby?

	N	%
Not satisfied at all	9	0.59
Not satisfied	135	8.88
Generally satisfied	298	19.61
Satisfied	711	46.78
Satisfied very much	302	19.87
Too early to say if satisfied	15	0.99
Do not know	30	1.97
Total responses	1500	98.68
Missing data	20	1.32
Total	1520	100.00

Table 4.55 How you feel about breastfeeding in front of other people?

	N	%
Very uncomfortable	21	1.38
Uncomfortable	342	22.50
Don't care	316	20.79
Acceptable	656	43.16
Feel proud	121	7.96
Too early to say if comfortable	2	0.13
Do not know	42	2.76
Total responses	1500	98.68
Missing data	20	1.32
Total	1520	100.00



Table 4.56 How do you feel about breastfeeding in front of a male?

	N	%
Very uncomfortable	213	14.01
Uncomfortable	558	36.71
Don't care	257	16.91
Acceptable	362	23.82
Very Proud	53	3.49
To early to say if comfortable	6	0.39
Total responses	1500	98.68
Missing data	71	4.68
Total	1520	100.00

Table 4.57 What are your plans for the next six months?

	N	%
Take care baby in home	754	49.61
Go back to work	333	21.91
Do part time job	54	3.55
Study	3	0.20
Not decided yet	83	5.46
To find a new job	136	8.95
No plan	121	7.96
Total responses	1484	97.63
Missing data	36	2.37
Total	1520	100.00

Table 4.58 Do you receive pay during your maternity leave?

	N	%
Yes	686	45.13
To	383	25.20
Total responses	1069	70.33
Missing data	451	29.67
Total	1520	100.00

Table 4.59 What kind of work schedule would you like after your maternity leave has finished?

	N	%
Full time	354	23.29
Part time	72	4.74
Flexible schedule	534	35.13
Total responses	961	63.22
Missing data	560	36.85
Total	1520	100.00

Table 4.60 Reasons for not breastfeeding after you return to work.

	N	%
Too far away for feeding baby	54	3.55
No feeding time	103	6.78
Multiple reasons	25	1.64
Total responses	182	11.97
Missing data	1338	88.03
Total	1520	100.00

Table 4.61 To you think there is any difference between breastfeeding a boy and girl?

	N	%
Yes	38	2.50
No	1457	95.86
Total responses	1496	98.42
Missing data	25	1.65
Total	1520	100.00

Table 4.62 Which gender of infant do you think you would prefer to breastfeed?

	N	%
Boy	26	1.71
Girl	7	0.46
Total responses	33	2.17
Missing data	1487	97.83
Total	1520	100.00

Table 4.63 Mothers got formula gift while in hospital

	Yes	No	Total
City	246(38.5%)	392(61.4%)	638(100.0%)
Suburb	88(25.4%)	258(74.6%)	346(100.0%)
Rural	157(31.7%)	338(68.3%)	495(100.0%)
Total	491(33.2%)	988(66.8%)	1479(100.0%)

Chi Square=18.16 df = 2, p<0.001

Significant differences existed between the three locations in relation to gift of formula while in hospital, with about 40% of city mothers receiving formula gifts. It is customary in Chinese society to give a gift to the mother after birth. In recent years a gift of infant formula has become a common thing to bring. In this study it was the gift given in about one third of births. The rate was slightly higher in the city births.

## Summary

The variables that will be included in the multivariate analyses presented in subsequent sections are described in this chapter. There are a number of variables that differ between the locations that were included in this study. These include basic demographic variables such as income, employment and health insurance. Also mothers living in the city tended to be older than their rural counterparts.

Chinese mothers smoked less than their western counterparts, but on the other hand were more likely to be exposed to sidestream smoke from their husbands. Very few Chinese mothers consumed alcohol during their pregnancy or while breastfeeding.

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## **CHAPTER 5**

### **RESULTS: PUBLISHED PAPERS**

**(Note copyright and contribution forms are in the Appendix)**

# **Paper One**

## **Infants' first feeds in Hangzhou, PR China**

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## Infants' first feeds in Hangzhou, PR China

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## **Abstract**

Breastfeeding is the foundation of good nutrition and provides the basis for health throughout the life span. The WHO and the Chinese Ministry of Public Health recommend exclusive breastfeeding to six months of age. The practice of giving pre-lacteal feeds may interfere with the establishment of good breastfeeding practices and is contrary to the principles of Baby Friendly Hospital accreditation. The objective of this study was to investigate the prevalence of prelacteal feeds in a hospital in Hangzhou and the influence of this practice on breastfeeding at discharge. A longitudinal study of infant feeding was conducted in Hangzhou, China and a total of 638 mothers were recruited and interviewed while in hospital. The questionnaire included full details of infant feeding methods and factors likely to influence the initiation and duration of breastfeeding. Binary logistic regression was used to analyse factors influencing breastfeeding on discharge.

In Hangzhou almost all babies are born in hospital, the median length of stay was 5.6 days and 77% of births were by caesarian section. In 26% of births the infants were given formula, water or milk as their first feed. At the time of discharge from hospital 91% of infants were receiving some breastmilk, but only 36% of mothers were exclusively breastfeeding. Breastfeeding on discharge from hospital was inversely related to giving prelacteal feeds (OR 0.115, 95% CI 0.055-0.238). While in hospital just over one quarter of infants received prelacteal feeds and these infants had a lower rate of breastfeeding on discharge.



## **BACKGROUND**

Breastfeeding is the foundation of good nutrition and provides the basis for health throughout the life span. The benefits of breastfeeding to both newborn babies and the mother have been widely recognized and many national and international organizations strongly advocate breastfeeding. The WHO, UNICEF and the Chinese Ministry of Public Health recommend exclusive breastfeeding to six months of age.<sup>1,2</sup> Breastmilk can continue to provide up to half or more of an infant's nutrients during the second half of the first year of life and up to one third of nutrients during the second year of life.<sup>3</sup> The WHO policy on breastfeeding initiation and duration was summarised by the European Region in the following way: "Colostrum, secreted during the first few days of life, is particularly rich in immunoprotective factors and some vitamins and minerals, and should not be discarded or withheld from infants in favour of prelacteal feeds. Exclusive breastfeeding provides milk of sufficient quantity and quality to meet the increasing needs of the growing infant until about 6 months of age".<sup>4</sup>

Prelacteal feeds are defined as any feeds given before the onset of lactogenesis II, which is the onset of copious lactation that occurs within four days of birth.<sup>5</sup>

Prelacteal feeds are not recommended because of their influence on the onset of lactation and on perinatal morbidity and mortality.<sup>6</sup> By definition, an infant who receives prelacteal feeds is not exclusively breastfed.

Despite the benefits of breastfeeding and the establishment of 'Baby Friendly' hospitals throughout China and Zhejiang Province, exclusive breastfeeding up to 4 months is still uncommon.<sup>7,8</sup> A cross-sectional survey in 1997 of 391 mothers in five cities of Zhejiang Province found that the average duration of exclusive breastfeeding was 2.5 months.<sup>9</sup> The Chinese government set a national target of an 'exclusive breastfeeding' rate at four months of 80% by 2000 in the Chinese Children's Development Plan for the 1990's, but this target has not yet been reached

and prelacteal feeds remain commonly used.<sup>10,11</sup> There have been studies of prelacteal feeds from Shandong Province and the remote Xinjiang and Tibet Regions, but none from the eastern provinces including the Zhejiang Province.<sup>12-14</sup> Published studies have documented a number of reasons, including demographic, social and family factors that influence the initiation and duration of breastfeeding in other regions of China.<sup>15-17</sup>

The objectives of this study were to document the prevalence and types of prelacteal feeds given to infants while in hospital in Hangzhou and the influence of this practice on breastfeeding rates at discharge.

## **METHODS**

A longitudinal study of infant feeding was conducted in Hangzhou, China during 2005. Hangzhou is a prosperous city of 6.5 million people, the capital of Zhejiang Province, located 175km south of Shanghai. A cohort of 638 mothers were recruited from the First Affiliated Women's Hospital and interviewed before discharge and at regular intervals until their infants were six months of age. The questionnaire included full details of infant feeding methods and factors likely to influence the initiation and duration of breastfeeding. The questionnaire was based on those used in breastfeeding cohort studies undertaken in Australia, Vietnam and Kenya<sup>6,18-20</sup>. After translation into Mandarin the questionnaire was tested in focus groups in Hangzhou to ensure cultural appropriateness.

The project was approved by the Zhejiang local research authorities (Zhejiang University, First Affiliated Women's Hospital) and the Human Research Ethics Committee of Curtin University, Australia. The purpose of the study was explained to the mothers and those who agreed to participate were assured of confidentiality and were asked to sign the consent page of the questionnaire. They were informed of their rights to withdraw from the follow up process at anytime without prejudice.

Statistical analyses were performed using the Statistical Package for Social Science (SPSS), release 12.0 (SPSS Inc., Chicago, IL, USA). Logistic regression was undertaken to analyse factors associated with prelacteal feeds and breastfeeding on discharge. The definition of ‘any breastfeeding’ was taken to be the child having received breastmilk (direct from the breast or expressed) with or without other drinks, formula or other infant food.<sup>21</sup>

## **Results and Discussion**

In Hangzhou almost all babies are born in hospital and in this study the median length of stay was 5.6 days. The response rate of the mothers approached to participate in the study was 96% and the incidence of caesarian section was high at 77%. The average age of the mothers was 28.5 years (SD 3.3) and almost all mothers were having their first baby. Table 1 provides the descriptive statistics, characteristics of the study participants and the proportion of mothers giving prelacteal feeds. Overall 26% of the infants were given prelacteal feeds, mostly infant formula and a few were given water. Two infants from rural areas were given cows milk by their mothers. The factors related to giving prelacteal feeds are detailed in Table 2. Results from logistic regression analysis (Table 2) indicate that admission to a neonatal intensive care unit (NICU) and mother’s education were significantly related to the decision to give a prelacteal feed. Almost all infants admitted to NICU were given a first feed other than breastmilk, with adjusted odds ratio (OR) 17.83 (95% CI 10.45-30.42). On the other hand, mothers who were more educated (received at least 12 years of education) were less likely to give prelacteal feeds to their infants (OR 0.610, 95% CI 0.379-0.982).

On discharge from hospital 91% of infants were receiving some breastmilk, but only 36% of mothers were exclusively breastfeeding. Table 3 presents the logistic regression results for any breastfeeding on discharge. We found that ‘any breastfeeding’ on discharge from hospital was inversely related to giving prelacteal

feeds (OR 0.115, 95% CI 0.055-0.238). Other significant factors related to ‘any breastfeeding’ on discharge (Table 3) were admission to NICU (OR 0.386, 0.162-0.922), the father’s occupation (‘workers’, that is those with middle level manufacturing employment, were more likely to breastfeed, OR 2.687, 1.226-5.888) and the grandmother’s preference (being supportive of breastfeeding, OR3.595, 1.430-9.038).

While prelacteal feeds are not routinely recommended by any expert authority, it is widely practiced in many different cultures, including China. A study in Jinan City, Shandong Province found that prelacteal feeds were common and that 66% were given water, infant formula, glucose or other prelacteal feeds.<sup>12</sup> In the west of China, in the Xinjiang Uygur Autonomous Region, the overall rate of prelacteal feeds was 52%, but it was lower in the Han ethnic group at 22%, similar to the mothers in Hangzhou.<sup>14</sup> In other developing countries high rates are often found and in rural Bangladesh rates as high as 77% were reported in a 1995 study.<sup>22</sup> In a lower-socio economic area of Karachi, Pakistan, the rate was 55%, where ethnicity and the type of birth attendant influenced prelacteal feeds.<sup>23</sup>

Colostrum, the secretion produced in the first few days after giving birth, provides all the nutrients, including water, required by the neonate.<sup>4</sup> In composition, it differs from both transitional milk and mature milk, containing higher levels of protein, vitamin A and vitamin B12 and less fat. It also contains lactoferrin, immunoglobulin A, enzymes, maternal antibodies, living cells— leukocytes, neutrophils and macrophages, and non-pathogenic bacteria, which act in the gut of the newborn to limit the growth of pathogenic bacteria and viruses and to protect against illness.<sup>24</sup> Best practice in infant feeding is to place the infant at the breast as soon as practicable after delivery, within one hour, and to offer colostrum to the infant<sup>25</sup>. In a systematic review of the influence of prelacteal feeds on breastfeeding at 4 and 16 weeks, Szajewska identified 56 studies, but only one met all of their inclusion

criteria.<sup>26</sup> In this study from Spain giving prelacteal feeds of glucose water reduced the proportion of infants subsequently being breastfed.<sup>27</sup>

Ideally a randomised controlled trial should be undertaken to study the effects of prelacteal feeds of breastfeeding outcomes. However because of the existing evidence and the benefits of exclusive breastfeeding, it is doubtful that such a study would be approved by institutional ethics committees.<sup>28</sup> The accumulation of evidence from well conducted observational studies from different regions of the world may have to suffice in providing evidence of the disadvantages of prelacteal feeds. While the present study is an observational study, it does provide additional evidence of links between prelacteal feeds and reduced breastfeeding initiation.

The European Commission has released a series of recommendations on infant feeding and state: ‘the healthy newborn infant should not be given supplements of infant formula, glucose solution, water, tea or camomile tea.’<sup>29</sup> They detail the few medical indications for the use of supplementary feeds, which includes a birth weight <1500 grams, gestational age <32 weeks, >10% weight loss and serious illness. The Chinese government has set breastfeeding policies that are consistent with international recommendations. Although the appropriate targets and policies have been set, many infants are given prelacteal feeds. Further education of mothers and health staff about the adverse effects of prelacteal feeds is required.

There are several limitations that should be considered when interpreting the results of this study. The sample was restricted to the City of Hangzhou and further studies are needed to document the practices in other parts of the Province, including suburban and rural areas.

While in hospital most infants received supplementary feeds. The use of prelacteal feeds was related to breastfeeding at discharge. The relatively high rate of prelacteal

feeds suggests that further education for mothers and health services staff on achieving breastfeeding guidelines would be of benefit.

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Table 1. Characteristics of sample and whether prelacteal feed given(n = 638)

Variable		n	%	Prelacteal Feed Given(%)
Age of mother (years) <sup>NS</sup>	<30 years	459	72.3	25.5
	>30 years	176	27.7	25.5
Baby gender*	Male	347	54	29.4
	female	291	46	20
Birth weight*	< 2500 gm	13	2	53.5
	≥ 2500 gm	625	98	25.1
Delivery method <sup>NS</sup>	Vaginal delivery	155	23	29.7
	Caesarean section	483	77	24.4
Admission to NICU**	Yes	108	17	74.5
	No	530	83	15.5
Health insurance*	Yes	508	79	25.4
	No	130	21	33
Monthly family income**	< 5000 RMB	312	49	31.4
	≥ 5000 RMB	326	51	20.9
Mother's education**	High school or below	229	36	31.4
	University	409	64	22.5
Breastfeeding education for mother*	Yes	560	88	24
	No	78	12	38.5
Mother's occupation <sup>NS</sup>	Worker	138	22	28.3
	Professional	494	78	25.3

Relationship between the specified variable and whether prelacteal feeds given: NS not significant, \*  $p < 0.05$ , \*\*  $p < 0.01$

**Table 2. Factors associated with giving a prelacteal feed in Hangzhou**

Variable	Adjusted odds ratio	95% confidence interval	<i>p</i> value
Admission to NICU	17.83	10.45-30.42	0.00
Mother's education (2 groups)	0.61	0.18-0.90	0.04

-2 log likelihood 540.744

\* Results of stepwise logistic regression including the following variables: age of mother, attended antenatal breastfeeding education class, birth weight, delivery method, mother's education, father's attitude to breastfeeding, father's occupation, grandmother breastfed her children, grandmother's feeding preference, family income, mother's occupation, admission to NICU, and when infant feeding method decision was made.

**Table3. Significant factors associated with ‘any breastfeeding’ at discharge**

Variable	Adjusted odds ratio	95% confidence interval	<i>P</i> value
Prelacteal feed given	0.115	0.055-0.238	0.000
Admission to NICU	0.386	0.162-0.922	0.032
Father’s occupation(worker)	2.687	1.226-5.888	0.014
Grandmother’s preference (supported breastfeeding)	3.595	1.430-9.038	0.007

-2 log likelihood 385.977

\* Results of stepwise logistic regression including the following variables: age of mother, attended antenatal breastfeeding education class, birth weight, delivery method, mother’s education, father’s attitude to breastfeeding, father’s occupation, grandmother breastfed her children, grandmother’s feeding preference, family income, mother’s occupation, admission to NICU, and when infant feeding method decision was made

## **Paper 2**

### **A cohort study of infant feeding practices in city, suburban and rural areas in Zhejiang Province, PR China**

Qiu L, Zhao Y, Binns CW, Lee A, Xie X

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**A cohort study of infant feeding practices in city, suburban and rural areas in Zhejiang Province, PR China**

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## **Abstract**

### **Background**

Breastfeeding is the basis for appropriate nutrition for infants and is strongly supported by the Ministry of Health in China. However there are differences in infant feeding practices in different areas of the country. The aim of this study was to compare the infant feeding practices and the prevalence of risk factors for initiation and continuing to breastfeeding until six months of age of city, suburb and rural areas in Zhejiang Province, PRC.

### **Methods**

A longitudinal cohort study of infant feeding practices was undertaken in city, suburban and rural areas. Mothers were enrolled and interviewed before discharge from hospitals. A total of 1520 mothers were recruited into the study. Follow-up interviews were administered at 1, 3 and 6 months after birth to obtain details of infant feeding practices.

### **Results**

‘Any breastfeeding’ rates were high before discharge at all three locations, 96.5% in city, 96.8% in suburb and 97.4% in the rural area. The ‘exclusive breastfeeding’ rates in the city, suburban and rural areas before discharge were 38%, 63.4% and 61% respectively. By sixth months the ‘any breastfeeding’ rates had declined to 62.8%, 76.9% and 83.6% and the ‘exclusive breastfeeding’ rates had fallen to 0.2%, 0.5% and 7.2% in city, suburb and rural areas respectively. There were differences in feeding practices between the three locations, including the use of prelacteal feeds and the introduction of supplementary feeds.

### **Conclusions**

Mothers who lived in the city were least likely to be ‘exclusive breastfeeding’ at discharge. At six months the city infants also had lower rates of ‘any breastfeeding’ and ‘exclusive breastfeeding’

## **Background**

The Chinese Ministry of Health has recognized the importance of breastfeeding in infant nutrition and recommends exclusive breastfeeding for the first six months of life<sup>30</sup>. Like other developing countries, China was influenced in the 19<sup>th</sup> and 20<sup>th</sup> centuries by western practices and its traditional pattern of home-based delivery became hospital based. Mothers were often separated from their infants in hospitals and infant formula became more readily available. These factors and the improving economy led to a decline in the breastfeeding rate. In one of China's largest cities, Shanghai, in 1980 a large cross-sectional study supported by WHO included a total of 3845 mothers recruited from the city and suburbs. The data from this study showed the 'any breastfeeding' rate had declined to 24.8% in the city and 77.0% in the suburbs for 0-6 month old babies<sup>31</sup>. This study was technically supported by WHO and used the period prevalence method of recording breastfeeding rates recommended by WHO<sup>32</sup>. In the following years further surveys revealed similar trends in other regions of the country. In 1983 a national cross-section survey of 111,348 infants aged 0-6 months found that the 'any breastfeeding' rate was 49.3% in city and 75.1% in rural areas<sup>33</sup>. The decline in breastfeeding rates was a challenge for China as she sought to achieve the goals set at the International Child Survival Conference in 1990 and endorsed by the Chinese Premier<sup>30</sup>.

The Chinese government strongly supported the international goals as a way of improving the nutritional status of her children and in the early 1990's the Ministry of Public Health in China began promoting breastfeeding on a large scale across the nation. Several projects were launched to encourage breastfeeding and promote its benefits to parents and health professionals. These projects included initiating scientific research on the promotion of breastfeeding, promoting 'rooming in' and increasing health education about the benefits of breastfeeding. The State Council passed regulations to extend maternity leave from 6 weeks to 3 months to support breastfeeding. Employers were instructed to ensure that mothers had sufficient time for nursing if still breastfeeding and nursing rooms were required to be provided in

work units. At the same time the first draft of the “National Program for the Promotion of Breast Feeding in China” was circulated.<sup>30</sup> The promotion of the “Baby Friendly Hospital Initiative” was commenced in China, and initially a few maternity hospitals were accredited followed by some of the larger integrated hospitals. Breastfeeding rates began to rise in the 1990’s as “baby friendly accreditation” promoted by the Ministry of Health spread across the country.

Zhejiang Province is located on the east coast of China, south of Shanghai and in 2006 had a population of 49 million. Since the Chinese economic reforms began 30 years ago, Zhejiang Province has developed its economy, education and health care systems and has become one of the most prosperous regions in the nation. The capital of Zhejiang Province is Hangzhou, a city of 4 million, first made famous when Marco Polo was appointed its governor in the 12<sup>th</sup> century. Hangzhou has become the centre of large information technology and electronics industries, while remaining one of the most beautiful cities of China (see Figures 1, 2). Like other large cities in China, in Hangzhou, the breastfeeding rate declined with the introduction of western patterns of obstetric services. However after the nationwide launch of the baby-friendly hospital initiative in China, more than 85% of maternal and integrated hospitals in Zhejiang Province changed their existing systems to become baby friendly meeting the WHO/UNICEF criteria. However, some barriers to breastfeeding still exist in hospitals and in the community and exclusive breastfeeding of infants to six months is uncommon in Zhejiang Province. The rate is much lower than Chinese and international targets. This has important implications for the health of the children of the province.

Because breastfeeding statistics are incomplete and there is little information about the reasons for breastfeeding and ‘not breastfeeding’ a longitudinal cohort study was commenced in Zhejiang Province. The aim of the study was to identify the prevalence of breastfeeding and prevalence of risk factors for initiation and continuing to



breastfeeding until six months of age in city, suburban and rural areas of Zhejiang Province.

## **Methods**

A longitudinal cohort study of infant feeding practices was undertaken in three locations in Zhejiang Province, in the capital city (Hangzhou), in a suburban location (Fuyang) which is located 50 km to the southwest of Hangzhou, and in a mountainous rural area a further 300 km to the south-west. All the mothers in the study were recruited while in hospital during the period October 2004 to December 2005. The first interview was undertaken by a nurse or women's health worker before discharge from hospital and follow up interviews were held at one month, three months and six months post partum. The first interview was always undertaken in person, and most (92%) of the follow-up interviews were undertaken by telephone. In the few instances where mothers could not be reached by telephone, the follow-up interviews were completed at the routine examinations in the community child care clinics. A total of 1520 mothers were recruited from four hospitals, the Women's Hospital, School of Medicine, Zhejiang University in the city, Fu-yang Maternal and Child Hospital in the suburban location and Jin-Yun People's Hospital and Li-Shui Maternal and Child Hospital in the rural area. Each of these hospitals is typical of the health care facilities in the area they are located. The inclusion criteria for the study were that the mother had delivered a live child, the mother and neonate did not have serious diseases and that she was resident in the service area of that hospital. In Hangzhou almost one half of the deliveries are not by local residents and were excluded from the study. However in the suburban and rural areas almost all mothers were local residents and were eligible to participate. In order to be able to manage the number being interviewed on any one day, selection was made using a series of random numbers. The response rate was high and 98% of mothers (1520 out of 1551) agreed to participate in the study.

The questionnaire was based on those developed by Scott, Binns, Xu and Duong that have been used extensively in breastfeeding cohort studies in Australia, Xinjiang, China and Vietnam<sup>6,34,35</sup>. The questionnaires were designed to identify the feeding method and to collect information on factors associated with breastfeeding. After translation the questionnaires were pilot tested in city and rural areas and were modified for the Zhejiang language and culture.

The project was approved by the Research Administration Section of the Women's Hospital, School of Medicine, Zhejiang University and the Human Research Ethics Committee of Curtin University, Australia. The purpose of the study was explained to the mothers and assurance was given that all information would be kept confidential. Any mother had the right to withdraw from the study at anytime without prejudice. After the purpose of the study had been explained to the mothers were then given a consent letter to sign. The questionnaire and the interviewing nurses used standard terminology and the local dialect to ensure mothers' understanding.

All data analyses were carried out using the Statistical Package for the Social Sciences, release 14.0 (SPSS Inc.). Descriptive statistics and cross-tabulations were generated for demographic factors, life tables were used for breastfeeding rates and binary logistic regression was used to calculate odds ratio of infant formula use. The definitions of breastfeeding used in this paper are based on standard definitions and were the same as those used in Xu's study in Xinjiang Province, in the west of China<sup>35</sup>:

- *Any breastfeeding*: The infant receives breastmilk (direct from the breast or expressed) with or without other drink, formula or other infant food.
- *Exclusive breastfeeding*: Breastfeeding while giving no other food or liquid, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine.

Prelacteal feeds are defined as any feeds given before the onset of lactogenesis II, which is the onset of copious lactation that occurs within four days of birth<sup>36</sup>.

## Results

A total of 1520 mothers were recruited into the study, 42% from the city, 22.8% from the suburban area and 35.2% from the rural area. Almost all mothers were married (99.9%), and most belonged to the Han ethnic group (97.5%). The details of the study sample and the prevalence of the major demographic variables in the city, suburban and rural areas are shown in Table 1.

Generally the mothers from the city had higher levels of education, a higher proportion of office employment and higher family income compared to the mothers in the suburban and rural areas. Mothers from the city usually were older and only 12% of mothers in the city had their baby before 25 years old compared to 35.7% in the suburban and 30.6% in the rural location. Mothers in the city and suburban area were more likely to deliver by caesarean section, 75.7% in city and 74.1% in the suburban area, compared to 52.8% in the rural area.

The percentage of mothers breastfeeding before discharge from the three locations are shown in Table 2. More than 95% mothers in each location initiated breastfeeding, but the exclusive breastfeeding rate was much lower in the city. A high percentage of mothers used prelacteal feeds on at least one occasion before discharge as previously reported<sup>37</sup>.

The breastfeeding rates in the three locations were analysed using life table analysis and are detailed in Table 3. Figure 3 shows the ‘any breastfeeding’ rates and Figure 4 the ‘exclusive breastfeeding’ rates for the three locations in Zhejiang Province.

While the majority of mothers were still breastfeeding at 6 months, only a few mothers were still exclusively breastfed at this age, especially in the city and suburbs.

The exclusive breastfeeding rate was lower than the national target (80% till four months of age) in all locations and at all ages. A lower proportion of mothers in the

city (38%) were exclusively breastfeeding compared to the suburban (63.4%) and rural (61%) areas on discharge

The prevalence data were converted to period prevalence, to allow comparison with WHO statistics and are shown in Table 4.

Supplementary feeding with infant formula and other complementary foods is quite common in China. The prevalence of formula feeding at the different locations at 3 and 6 months of baby's age is described in Table 5.

In Table 5 the crude odds ratio and confidence intervals were calculated using binary logistic regression analysis. Compared with mothers living in rural areas, mothers who lived in the city were more likely to use formula (OR = 2.1, 95% CI = 1.61, 2.73) by the third month after birth. Mothers who lived in the suburban area were less likely to using formula feeding (OR = 0.665, 95% CI = 0.50, 0.88).

By the sixth month very few mothers in both city and suburban area were exclusively breastfeeding (0.2% and 0.5% respectively), but in the rural area the rate was higher and 7.2% mothers were still exclusively breastfeeding. The infant feeding practices of the city and suburban mothers were similar and when these two groups were combined and compared to the rural group the contrast at six months was even stronger (Crude OR = 11.38, 95% CI 5.13, 25.24).

## **Discussion**

The economy of Zhejiang Province has grown rapidly in recent years, particularly since the beginning of the 21st century and the per capita GDP in Hangzhou was \$6,700 in 2006. The rise in living standards accompanying the economic growth has led to a demand for improved health care, and in particular, the application of advanced medical technologies. Infant feeding practice is another part of culture which has been influenced by economic development. There is now widespread

promotion of infant formula and mothers are fascinated by the prospect of a high-technology product which promises much for their infants. On the other hand, cultural beliefs are still strong, and most mothers commence breastfeeding, but they tend to combine this in the early months of their infant's lives with infant formula.

Chinese society has changed rapidly, and in the "high-tech" city of Hangzhou it is now very common for women to go to higher education institutes and to marry later in life. The women of Hangzhou are highly educated and in our study 64.1% of the women had post secondary education compared with the rates of 18.2% in the suburban area and 24.0% in the rural area. Almost half of the mothers (45.5%), considered for recruitment into the study, were not the native residents of the city, compared to the suburban (18.4%) and the rural areas (3.7%). This reflects the dynamic nature of the Hangzhou population resulting from the rapid economic development.

There have been rapid changes in medical practice in the past decades and this is reflected in changes in birthing methods. Overall in the study, two thirds of mothers were delivered by caesarean section. The rates in the city and suburban and rural areas were 75.7%, 74%, and 52.7% respectively. After the Baby Friendly Hospital Initiative (BFHI) was promoted in China in the 1990s, the majority of hospitals in the Province reformed their obstetric practices. The hospital environment became friendly towards babies, as the 10 steps to successful breastfeeding were required in all hospitals and MCH centres. These included 'rooming in', early skin contact, early breastfeeding, and the encouragement of mothers' breastfeeding by the doctors and nurses in the obstetric departments. The Bureau of Public Health of Zhejiang Province was responsible for providing a team to regularly evaluate the baby friendly hospitals in the Province and to maintain the quality of the BFHI. In this atmosphere of encouragement, breastfeeding initiation rates improved. Almost all mothers understood the benefits of breastfeeding from antenatal classes, from post natal education or from the media.

In our study more than 96% mothers were breastfeeding on discharge from hospital. The initiation of breastfeeding has returned to higher levels in the past two decades, and the rates of breastfeeding initiation in Zhejiang are now higher than reported from other provinces in China. A study of infant feeding in Xinjiang Uygur Autonomous China found an ‘any breastfeeding rate at discharge of 92.2%<sup>35</sup>. The “Beijing and Four Provinces Study” found that the ‘ever breastfed rate was 90.1% in China 2002<sup>38</sup>. This rate was similar to an Australia infant feeding study from West Australia where 93.5% of mothers were breastfeeding at discharge from hospital<sup>39</sup>.

The ‘any breastfeeding’ rate for the city is higher than the rate reported for Shanghai, the closest large city to Hangzhou in the 1980’s<sup>31</sup>. This probably reflects a renewed interest in breastfeeding in China. However the situation for ‘exclusive breastfeeding’ is not as encouraging. The WHO reported the 0-6months exclusive breastfeeding rate in China to be 51%<sup>40</sup>. Our results for ‘exclusive breastfeeding’ are far below this figure and may reflect different methodology. The WHO-UNICEF methodology relies on 24 hour recall of no foods or fluids in addition to breastfeeding in the past 24 hours. China is a vast country with a huge population and another reason for the difference may be sample selection. The variation from our study suggests that larger and more widespread studies of breastfeeding are needed and they should preferably use the longitudinal methodology used in this study. Another factor influencing breastfeeding in the city is the economic pressure of the developing economy. In an ethnographic study of women in Beijing, Gottschang (page 64) summarized the pressures on urban mothers in the following way “global intervention in the form of the WHO-UNICEF sponsored Baby Friendly Hospital Initiative promotes breastfeeding as a women’s duty at the same time that market forces counter this message”<sup>41</sup>.

Most mothers had an understanding of the need for breastfeeding at the beginning of their infant’s life, but the exclusive breastfeeding rates after discharge from hospital

declined rapidly. The exclusive breastfeeding rate was considerably lower than the national target of 80% of babies being exclusively breastfed until four months of age. In our study the exclusive breastfeeding rate at discharge was only one third (38%) in the city and even in the suburban and the rural areas, the rates were 63.4% and 61% respectively. Prelacteal feeds were common in the initial days after birth, details of which have previously been reported<sup>37</sup>. The exclusive breastfeeding rate in Zhejiang was lower than that in Xinjiang Uygur Autonomous Region, China and in Vietnam, where the rates at discharge were 66.2%<sup>35</sup> and 83.6% respectively<sup>6</sup>. However the exclusive breastfeeding rate at 6 months in Xinjiang was similar to the rural area in this study.

At three months one half of the mothers were regularly giving their infants some infant formula. A common reason for giving formula or other complementary feeding is the belief “the more or the quicker the baby gained weight, the healthier the baby is”. In the Chinese culture, parents and grandparents are devoted to their children and with the “one child policy” the centrality of the child in Chinese culture has increased in recent decades. Thus there is always cultural pressure to give the infant supplementary foods.

The breastfeeding rates found in this study are well below international and national targets. If the rates found in this study reflect national trends in China, it would mean that China is falling behind in its quest to meet the Millennium goals. This suggests that further health promotion programs for breastfeeding, and particularly for the extension of the period of exclusive breastfeeding are required. There needs to be continuing monitoring of the implementation of the Baby Friendly Hospital principles in the Province. Further research is needed into ways of increasing community support for breastfeeding and into increasing the number of baby-friendly workplaces.

There are some limitations that need to be considered when interpreting the results of this study. The hospitals used were selected to be representative of their locations, but a larger probability sample would be required to be certain that the sample represented Zhejiang Province. A series of focus group discussions and or further in depth interviews with mothers and the extended families would help in understanding further details about breastfeeding problems and beliefs about infant growth and supplementary feeds.

### **Conclusions**

This is the first longitudinal cohort study published on infant feeding practices in city, suburban and rural areas in Zhejiang province, an economically advanced area typical of eastern China. The overall ‘any breastfeeding’ rate was high before discharge at 96.5% in city, 96.8% in suburban and 97.4% in rural areas. The ‘exclusive breastfeeding’ rates in city, suburban and rural areas before discharge were 38%, 63.4% and 61%. The exclusive breastfeeding rate was lower than the national target at discharge and also during the whole follow-up period till the infant was 6 months of age.. The lower exclusive breastfeeding trend was most marked in the city. More studies are needed to find the detail reasons related to exclusive breastfeeding problem.

### **Competing interests**

The authors declare that they have no competing interests

### **Authors' contributions**

All authors contributed to the study. LQ designed the research, collected and analyzed data, drafted the manuscript. YZ analyzed data and revised the manuscript. CWB designed the research, drafted and revised the manuscript. AL analyzed data and



revised the manuscript.. XX designed the research, collected data and revised the manuscript.

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**Table 1 Demographic details of mother's in the city, suburb and rural areas, Zhejiang Province, People's Republic of China, 2004-2005 (n =1520)**

Variable	Value	City		Suburb		Rural		Total	
		N	%	N	%	N	%	N	%
Residence		638	42.0	347	22.8	535	35.2	1520	100.0
Maternal Age (years)*	<25	77	12.0	124	35.7	158	30.6	358	23.9
	25-29	383	60.2	165	47.6	255	49.2	800	53.5
	30-34	151	23.9	51	14.7	80	15.5	282	18.9
	≥35	25	3.9	7	2.0	24	4.7	56	3.7
	Unknown	5		0		19		24	
Maternal education(years)*	≤9	57	9.0	206	59.4	282	53.1	544	36.0
	10-12	172	26.9	78	22.5	121	22.9	370	24.5
	>12	407	64.1	63	18.2	127	24.0	597	39.5
	Unknown	3				6		9	
Maternal employment*	Labor job	67	10.5	188	55.1	238	47.1	492	33.3
	Office job	494	78.4	90	26.4	179	35.4	763	51.7
	No job	70	11.1	63	18.5	89	17.4	221	15.0
	Unknown	8		6		30		44	
Gestation(weeks)*	<37	30	4.7	7	2.0	12	2.4	49	3.3
	≥37	605	95.3	340	98.0	499	97.6	1443	96.7
	Unknown	3		0		25		28	
Birth weight (g)	<2500	9	1.4	7	2.0	11	2.1	27	1.8
	2500-3999	583	91.8	310	89.3	489	93.3	1382	91.8
	≥4000	43	6.8	30	8.6	24	4.6	97	6.4
	Unknown	3		0		11		14	
Delivery method*	Vaginal	155	24.3	90	25.9	252	47.2	495	32.7
	Caesarean	481	75.7	257	74.1	281	52.8	1019	67.3
	Unknown	3		0		3		6	
Birth order*	1	615	96.9	290	84.1	442	83.4	1347	89.2
	≥2	20	3.1	55	15.9	89	16.6	163	10.8
	Unknown	3		2		5		10	
Baby's gender	Male	347	54.2	162	47.4	260	49.7	767	51.1
	female	291	45.8	180	52.6	263	50.3	734	48.9
	Unknown	2		5		12		19	
Monthly family income* (RMB)	≤1500	6	1.0	51	15.0	158	31.3	215	14.6
	1501-3000	75	11.9	145	42.8	182	35.9	401	27.2
	3001-5000	227	35.7	97	28.6	129	25.6	451	30.6
	> 5000	326	51.5	46	13.6	36	7.1	407	27.6
	Unknown	7		8		31		46	

\* p<0.05

**Table 2 ‘Any breastfeeding’, ‘exclusive breastfeeding’ and prelacteal feeding rates at discharge in Zhejiang Province, PR China, 2004-2005**

	Any breastfeeding		Exclusive breastfeeding		Prelacteal feeding	
	n	%	N	%	N	%
City	613	96.5	233	38.0	380	62.0
Suburb	336	96.8	213	63.4	123	36.6
Rural	518	97.4	316	61.0	202	39.0

**Table 3 ‘Any breastfeeding’ and ‘exclusive breastfeeding’ rates from 1-6 months in city, suburban and rural Zhejiang Province, PR China**

Location	Age Months	Any breastfeeding			Exclusive breastfeedin g		
		N	%	95%CI	N	%	95%CI
<b>City</b>	1~	590	91.7	89.4,93.9	166	24.4	21.0,27.7
	2~	380	88.6	85.8,91.3	119	18.8	15.6,22.0
	3~	367	84.0	80.7,87.2	92	13.7	10.8,16.6
	4~	347	76.2	72.3,80.1	67	5.5	3.5,7.5
	5~	315	69.7	65.4,74.0	27	1.8	0.7,3.0
	6~	288	62.8	57.7,67.9	9	0.2	NA
<b>Suburb</b>	1~	325	90.4	87.3,93.5	174	47.0	41.7,52.3
	2~	311	88.4	85.0,91.8	161	45.8	40.6,51.1
	3~	304	86.6	83.0,90.2	157	41.7	36.5,46.9
	4~	290	84.5	80.7,88.3	140	16.1	12.2,20.0
	5~	283	82.7	78.7,86.7	54	4.5	2.3,6.7
	6~	277	76.9	71.8,82.0	15	0.5	NA
<b>Rural</b>	1~	499	93.5	91.4,95.6	201	42.7	38.1,47.3
	2~	486	90.6	88.1,93.1	189	39.8	35.2,44.3
	3~	471	89.0	86.4,91.7	176	33.1	28.8,37.5
	4~	456	86.9	84.0,89.8	143	18.3	14.7,21.9
	5~	445	85.1	82.1,88.2	79	8.1	5.5,10.7
	6~	436	83.6	80.2,87.0	35	7.2	4.7,9.8

**Table 4 The period prevalence (0-6 months) of ‘any’ and ‘exclusive’ breastfeeding in Zhejiang Province, PR China**

		<b>‘Any breastfeeding’</b>	<b>‘Exclusive breastfeeding’</b>
	N	%	%
<b>City</b>	406	81.1	13.0
<b>Suburb</b>	342	86.0	29.5
<b>Rural</b>	530	89.2	27.8

**Table 5 The prevalence of infant formula or other complementary food use in city, suburb and rural areas Zhejiang Province, PR China**

	Using infant formula or other complementary food at 3 month				Using infant formula or other complementary food at 6 months			
	N	%	OR*	95% CI	N	%	OR*	95% CI
Rural	530	42.3	1		469	89.8	1	
City	406	32.7	2.10	1.61,2.73	705 <sup>#</sup>	99.0	11.38	5.13,25.24
Suburb	342	60.6	0.67	0.50,0.88				

\*OR = crude odds ratio

<sup>#</sup> City and suburban data are combined to calculate the odds ratio at 6 months



Figure 1. Stone bridge on the West Lake, Hangzhou



Figure 2. Boats on the West Lake, Hangzhou



Figure 3. 'Any breastfeeding' rates Zhejiang Province

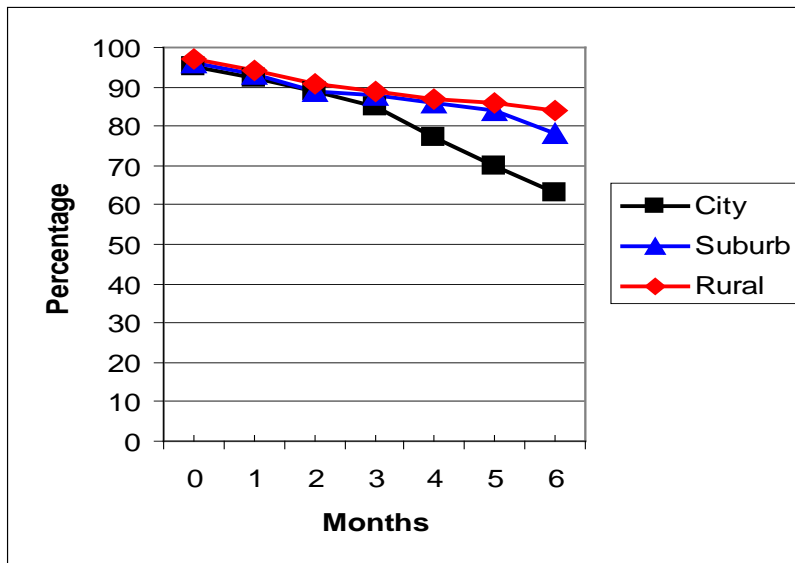
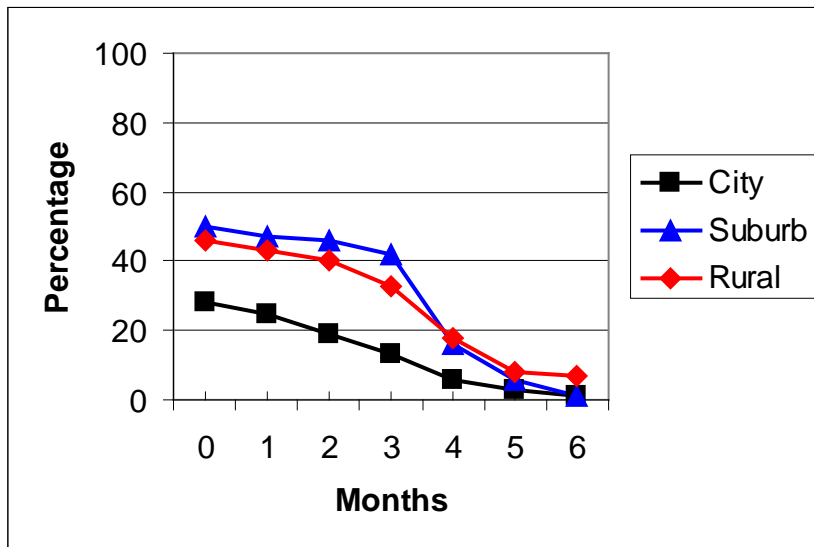


Figure 4. 'Exclusive breastfeeding' rates Zhejiang Province



## **Paper 3**

### **Initiation of breastfeeding and prevalence of exclusive breastfeeding at hospital discharge in urban, suburban and rural areas of Zhejiang China**

Qiu L, Zhao Y, Binns CW, Lee AH, Xie X

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**Initiation of breastfeeding and prevalence of exclusive breastfeeding at hospital discharge in urban, suburban and rural areas of Zhejiang China**

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## **Abstract**

**Background:** Rates of exclusive breastfeeding in China are relatively low and below national targets. The aim of this study was to document the factors that influence exclusive breastfeeding initiation in Zhejiang, PR China.

**Methods:** A cohort study of infant feeding practices was undertaken in Zhejiang Province, an eastern coastal region of China. A total of 1520 mothers who delivered in four hospitals located in city, suburb and rural areas during late 2004 to 2005 were enrolled in the study. Multivariate logistic regression analysis was used to explore factors related to exclusive breastfeeding initiation.

**Results:** On discharge from hospital, 50.3% of the mothers were exclusively breastfeeding their infants out of 96.9% of the mothers who had earlier initiated breastfeeding. Exclusive breastfeeding was positively related to delivery method, baby's first feed, mother's living place, mother's age, mothers' education level and family income.

**Conclusions:** The exclusive breastfeeding rate in Zhejiang is only 50.3% on discharge and does not reach Chinese or international targets. A number of behaviours have been identified in the study that could be potentially incorporated into health promotion activities.

## **Keywords:**

Breastfeeding

Exclusive

Initiation

Zhejiang Province

China

Cohort study

## **Background**

Breastfeeding has many health and developmental advantages for infants and mothers and is the preferred way of feeding infants to promote optimal infant health and reduced morbidity later in life <sup>42-45</sup>. In Asian cultures, and perhaps more generally, breastfeeding also protects against early H pylori infection <sup>46-48</sup>. A recent cohort study from Shanghai suggests that breastfeeding may offer a mother some protection against developing Type II Diabetes <sup>49</sup>. Breastfeeding has received increased emphasis in China over the past two decades as its importance for child health has become recognized. In order to implement the spirit of the World Summit for Children, the Chinese government issued the “National Programme of Action for Child Development in China in the 1990’s” <sup>50</sup>.

A number of cross-sectional and longitudinal studies in China showed that the ‘ever breastfed’ rate, both in urban and rural areas was over 80% in the 1950s and 1960s. During the 1970’s and 80’s the use of breast milk substitutes became more popular and the national ‘ever breastfed’ rate decreased gradually dropping from about 80% in 1960s to 42.7% in 1975 and it then fell further to 33.6% in 1985 (Wang , Zhu & Tong 1991). The trend was even more marked in the large cities such as Shanghai, where the rate fell to 22.2% in 1982 and again to 13% in 1989 <sup>51,52</sup>.

The International Baby-Friendly Hospital Program was introduced with the goal of ensuring that all infants are breastfeeding before their discharge from the hospital and that 80% would be exclusive breastfed for the first 6 months of life <sup>53</sup>. By 1994 in China a total of 947 hospitals had passed the National Baby Friendly Hospital assessment<sup>54</sup> and since that time the number of BFHI certified hospitals has continued to increase. During the 1990’s the Chinese government introduced women and child health protection legislation, society support programs and education programs to support breastfeeding promotion.



Following the introduction of these programs the breastfeeding initiation rate began to rise again. A survey in one of the largest cities of western China, Chengdu, Sichuan province showed that ‘ever breastfed’ rate had risen to 88% in 1993<sup>55</sup>. A longitudinal study found that the ‘full breastfeeding rate’ rate was 78% at 6 weeks in the east coast city of Zibo, Shandong province in 1996<sup>56</sup>. A survey of mothers from 105 counties showed that by 1995 the breastfeeding initiation rate was well over 90%, but the exclusive breastfeeding rate was low<sup>57</sup>. In a cohort study from the west of China the any breastfeeding rate on discharge was 92% and 73% were still breastfeeding at six months<sup>35</sup>. While the trend in breastfeeding rates is encouraging, many of these studies were cross-sectional surveys and have inherent limitations in the information provided on risk factors that could be used in health promotion programs.

Factors that are important in the initiation of breastfeeding include a favourable paternal attitude toward breastfeeding, as perceived by the mother<sup>58</sup>, whether the mother had an operative delivery, giving prelacteal feeds and ethnicity<sup>59</sup>. The time that the decision to breastfeed is made, maternal age and education and smoking patterns are also important in some societies<sup>41,60</sup>.

Zhejiang province is located in the mid-east coast region of China and has benefited from economic reforms and for the past three decades has had one of the fastest growing regional economies in the country. The economic improvement has created many new job opportunities for the younger generation in high technology industries and has resulted in a large, well educated middle class in the Provincial capital of Hangzhou. The rural areas have not benefited as much from the rapid development and people from rural Zhejiang and other provinces continue to move to the capital city and suburban areas in search of a more prosperous city life. In 2006 the provincial population was 49 million with one of the highest population densities in the country. Hangzhou, has a population of 6 million and advertises itself as the “most

beautiful city in China” and the many emperors and government officials who have holidayed therein the past bear testament to this fact.

Like other big cities in China, the breastfeeding experience of Zhejiang women has changed over time. A cross-section survey undertaken in five cities Zhejiang in 1997 found that the exclusive breastfeeding rate before discharge was 74.4% and this dropped to 43.7% in 10 weeks<sup>61</sup>. This rate was lower than the WHO target for initiation and for exclusive breastfeeding for 6 months. In China at the present time the initiation rates of breastfeeding are high and the most important issue is the rate of exclusive breastfeeding<sup>62</sup>. A recent review and study of breastfeeding in rural China confirmed the low rate of exclusive breastfeeding and concluded “health care providers need to intensify education and counseling concerning breastfeeding and especially emphasize the importance of exclusive breastfeeding from birth to 4 to 6 months of age”<sup>63</sup>. A literature search of the English and Chinese language medical literature failed to find any previous longitudinal studies of breastfeeding in Zhejiang Province. This study explores the factors that are important in the initiation of exclusive breastfeeding in Zhejiang Province, PR China.

## **Methodology**

A cohort study of breastfeeding was undertaken in Zhejiang Province, PR China during the period October 2004 to December 2005. The study was designed as a longitudinal study of infant feeding practices with four interviews over a period of six months. In this paper the results from the first two interviews are used in the analysis. The first interview was held one or two days before discharge from hospital. The exact date of discharge and infant feeding information on infant feeding at discharge was obtained from the second interview one mother later. The majority of interviews were by telephone, but in the few cases where women could not be reached by telephone, mothers were interviewed at child health clinics or in their homes. The study included mothers from the capital city, Hangzhou, a suburban area on the outskirts of the metropolitan area, Fu-yang, and a mountainous rural area

approximately 300km to the southwest. A total of 1520 mothers were recruited from hospitals in each location (two in the rural area). Each of these hospitals is typical of the health care facilities in the area they are located. All the mothers in the study were recruited while in hospital and in the larger facilities where there were a number of deliveries on one day, a system of random numbers was used to select the mothers to be included.

The project was approved by the Zhejiang local research authorities (Zhejiang University, Women's Hospital Ethics Committee) and the Human Research Ethics Committee of Curtin University, Australia. Mothers who agreed to participate in the study signed the consent page attached to the questionnaire and were informed of their rights to withdraw from the follow up process at anytime without prejudice. They were assured that all of the personal data collected would be kept confidential and identifying data was removed from the computer files.

The first interview was undertaken in person by a nurse or women's health worker before discharge from hospital and follow up interviews were held at one month, three months and six months post partum. Most of the follow-up interviews (92%) were undertaken by telephone, a testimony to the rapid economic development of this province. In the few instances where mothers could not be reached by telephone, the follow-up interviews were completed at the routine examinations in the community child care clinics.

The study sample consisted of 1520 mothers who were recruited from the three locations. The inclusion criteria were that the mother had delivered a live child, the mother and neonate did not have serious diseases and that she was resident in the service area of that hospital. Mothers who were not local residents were not included in the study. While in Hangzhou this included almost one half of the deliveries, in the suburban and rural areas almost all mothers were local residents and

were eligible to participate. The response rate was high and 98% of mothers (1520 out of 1551) agreed to participate in the study.

The questionnaire included full details of infant feeding methods and factors likely to influence the initiation and duration of breastfeeding and was based on those questionnaire that have been extensively used in breastfeeding cohort studies in China, Australia, Vietnam and Kenya<sup>6,18-20,59</sup>. The questionnaires were translated and were then tested in focus groups to ensure cultural appropriateness.

All data analyses were carried out using the Statistical Package for Social Science (SPSS), release 14.0 (SPSS Inc., Chicago, IL, USA). Multivariate logistic regression was used to determine factors associated with exclusive breastfeeding at discharge. Backward elimination procedure was applied to remove those variables with non-significant effect.

Definitions used in this study were from<sup>35</sup> and the WHO definition of exclusive breastfeeding<sup>64</sup>:

*'Any breastfeeding'*: The child has received breastmilk (direct from the breast or expressed) with or without other drinks, formula or other infant food.

*'Exclusive breastfeeding'*: Breastfeeding while giving no other food or liquid, not even water, within 24 hours of interview, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine.

## **Results:**

The details of the sample are shown in Table 1 with the relationship between demographic factors and exclusive breastfeeding rates. The 'any breastfeeding' rate at discharge from hospital was 96.9%. No significant differences in the 'any breastfeeding' rates were found between the city, suburban and rural areas. The exclusive breastfeeding rate on discharge in Zhejiang was 50.3%, but differed significantly between the three locations; 38% in the city and 63.4% and 61% in the

suburban and rural areas<sup>65</sup>. The average hospital stay was 6.4 days and 93% of women were discharged before 8 days. The average stay in hospital following a c-section was 6.9 days, compared to 5.3 days following vaginal delivery. In the univariate analysis in Table 1 the other significant factors were maternal age and education,, having a caesarean section, living with parents, the time the decision to breastfeed was made, parity, attendance at antenatal class, monthly income and whether breastmilk was the first feed given to the infant.

Differences in the mother's feeding practices and the factors which may influence feeding practices before discharge for city, suburban and rural areas are detailed in Table 2. In this study many mothers, overall 41.4%, believed that their breast milk was insufficient to feed their babies. This perception was worse in city, where 47.9% of mothers felt they lacked enough breastmilk compared to 34.4% in the suburb and 38% in the rural area respectively.

The factors that could be involved in exclusive breastfeeding were incorporated into a multivariate logistic regression model. When adjusted for potential confounding factors, the factors which were related to exclusive breastfeeding are described in Table 3. The factors that significantly contributed to decreasing the likelihood of exclusive breastfeeding included mothers who had caesarean section (OR=0.762). Demographic factors that were positively associated with exclusive breastfeeding at discharge were living in the suburb (OR=2.166) and rural areas (OR=2.332). Mothers who were older than 24 years (OR=0.583, OR=0.507), who did not make the decision to breastfeed until after birth (OR=0.57) and who didn't give breastmilk as the first feed (OR=0.557) were less likely to be exclusively breastfeeding on discharge.

### **Discussion:**

The use of prelacteal feeds were common in all locations (37.5%) and their use in Hangzhou city have been described in more detail<sup>37</sup>. Their use was most common in the rural location where it is traditional not to breastfeed for some time after birth.

This is also the case in the far west of China, where delayed first feeds were common, but the use of prelacteal feeds was not as high as Hangzhou<sup>62</sup>. In Vietnam the use of fluids other than breastmilk as a first feed is also common, but there it is less likely to be infant formula<sup>6</sup>. All of the hospitals in our study are “Baby Friendly Hospital” accredited as are most Chinese hospitals. In theory all hospitals are required to practice the WHO 10 steps for the promotion breastfeeding. Practically the hospitals find that there are some difficulties in following these steps strictly. If a mother (or often her family) feels she does not have enough milk, they can easily get infant formula either from her family or from the hospital.

In this study here are several factors that could be potentially modified to increase exclusive breastfeeding rates. The length of time to the first feed is an important factor and is used to monitor progress towards the millennium goals for child health<sup>32</sup>. In this study only one third (33.4%) of infants began breastfeeding within 30 minutes of delivery. Delivery room practices need to be modified to make this possible.

According to Chinese tradition it is the practice of Chinese friends or relations of postpartum women to visit the mother and they bring gifts which could be eaten or worn by the new baby. In recent times infant formula has become the most popular gift for new mothers. Gifts of infant formula were given to one third of new mothers by friends or relations (see Table 2).

The time that the decision is made to breastfeed has an important relationship of breastfeeding outcomes in a number of different cultures<sup>66,67</sup>. This is a function of antenatal preparation and health professionals need to encourage prospective parents to think about the importance of breastfeeding at the earliest opportunity and to continue to discuss this at subsequent contacts. Assisting mothers to make an early decision could also include education of the infant’s father and grandmother about the benefits of breastfeeding.

Exclusive breastfeeding rates were lower in infants who were delivered by caesarean section. This is a common risk factor for not breastfeeding in Asian societies, but not in Australia<sup>6,68,69</sup>. In our study population women with caesarean section had lower rates of exclusive breastfeeding than with vaginal delivery. After surgery mothers feel pain in their abdominal incision, movement is limited because of catheterization and intravenous lines, and Chinese mothers worry about the side effects of medicines which may pass to baby from breastfeeding. These factors are believed in this culture to influence lactogenesis. Further studies are needed to obtain more details on the reasons for the higher prevalence of caesarean section in this population and the influence on breastfeeding.

There are several limitations that need to be considered when interpreting the results of this study. The sample was restricted to three locations in Zhejiang Province. While these locations were selected to be representative of Zhejiang and the response rate was this should be born in mind when interpreting the results. As economic and health system developments occur in Zhejiang Province it will be important to repeat cohort studies so that breastfeeding is continued to be promoted.

### **Conclusions:**

In Zhejiang Province the exclusive breastfeeding rate on discharge from hospital was only 50.3%, ranging from a low of 38% in the city to 63% in the suburbs. Risk factors for not exclusive breastfeeding include having a caesarean section, the time at which the decision to breastfeed was made, the place of residence and whether a prelacteal feed was given. Biological factors included maternal age and parity. Some of these factors could be incorporated into trials to increase exclusive breastfeeding rates.

## **Competing interests**

The authors declare that they have no competing interests

## **Authors' contributions**

All authors contributed to the study. LQ designed the research, collected and analyzed data, drafted the manuscript. YZ analyzed data and revised the manuscript. CWB designed the research, drafted and revised the manuscript. AL analyzed data and revised the manuscript.. XX designed the research, collected data and revised the manuscript.

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**Table 1** Initiation of breastfeeding and prevalence of exclusive breastfeeding at hospital discharge

	Total		Exclusive breastfeeding		Crude OR	95% CI	
	N of women	%	N	%			
<b>Resident</b>							
City	635	41.9	233	38.0	1		
Suburb	347	22.9	213	63.4	2.82	2.14	3.72
Rural	532	35.2	316	61.0	2.55	2.01	3.24
<b>Maternal age</b>							
<25	358	23.9	225	64.8	1		
25-29	800	53.5	379	48.6	0.51	0.39	0.67
≥30	338	22.6	148	45.8	0.46	0.336	0.63
<b>Caesarean Section</b>							
No	495	32.7	282	58.6	1		
Yes	1019	67.3	480	48.7	0.67	0.54	0.83
<b>Maternal education (years)</b>							
≤ 9 years	544	36.0	330	62.7	1		
10-12 years	370	24.5	178	49.4	0.58	0.44	0.76
> 12 years	597	39.5	251	43.4	0.46	0.36	0.58
<b>Baby's gender</b>							
Male	772	51.3	378	50.5	1		
Female	732	48.6	379	53.5	1.13	0.92	1.39
<b>Time Breastfeeding decision made</b>							
Before pregnancy	1089	72.3	564	53.2	1		
During pregnancy	263	17.5	136	54.2	1.04	0.79	1.37
After baby born	154	10.2	59	39.9	0.58	0.41	0.83
<b>Parity</b>							
Primiparous	1347	89.2	655	50.2	1		
Multiparous	163	10.8	104	65.4	1.87	1.33	2.64
<b>Gestational age(weeks)</b>							
<37	49	3.3	18	41.9	1		
≥37	1443	96.7	731	52.1	1.51	0.82	2.80
<b>Living with parents</b>							
Yes	742	49.4	414	57.4	1		
No	759	50.6	346	47.1	0.66	0.54	0.81
<b>First feed</b>							
Breastmilk	928	62.5	499	53.9	1		
Other	557	37.5	245	47.7	0.78	0.63	0.97
<b>Mather's employment</b>							

Laborer	492	33.3	295	61.3	1		
Office work	763	51.7	330	44.7	0.51	0.40	0.64
Not employed	221	15.0	110	52.4	0.69	0.50	0.96
<b>Attended antenatal class</b>							
Yes	949	63.1	445	48.0	1		
No	555	36.9	310	58.5	1.53	1.23	1.89
<b>Birth weight</b>							
<2500	27	1.8	14	58.3	1		
2500-3999	1382	91.8	700	52.1	0.78	0.34	1.76
≥4000	97	6.4	42	45.7	0.60	0.24	1.49
<b>Admitted to NICU</b>							
Yes	147	9.9	55	40.4	1		
No	1333	90.1	687	52.9	1.66	1.16	2.37
<b>Family monthly income (RMB)*</b>							
≤1500	215	14.6	135	64.6	1		
1501-3000	401	27.2	236	59.9	0.82	0.58	1.16
3001-5000	451	30.6	195	45.1	0.45	0.32	0.63
> 5000	407	27.6	170	43.1	0.42	0.29	0.59
<b>Grandmother breastfed</b>							
Yes	1408	96.0	705	51.7	1		
No	58	4.0	39	51.3	0.98	0.62	1.56

**The exchange rate at the time of the study was RMB 7.5. = 1 USD, RMB 10.6 = 1 Euro.**

**Table 2 The mother's feeding practices in city, suburb and rural areas, Zhejiang (2004-2005)**

Variable	Value	City		Suburb		Rural		Total	
		n	%	n	%	N	%	n	%
First feed	Breast milk	472	74.3	247	71.6	209	41.4	928	62.5
	Not breast milk	163	25.7	98	28.4	296	58.6	557	37.5
	Missing	3		2		30		35	
Time breastfeeding decision made	Before pregnancy	482	75.9	255	73.5	352	67.2	1089	72.3
	During pregnancy	103	16.2	73	21.0	87	16.6	263	17.5
	After baby born	50	7.9	19	5.5	85	16.2	154	10.2
	Unknown	3		0		11		14	
Mother received gift of formula	Yes	246	38.7	88	25.4	157	31.8	491	33.3
	No	389	61.3	258	74.6	337	68.2	984	66.7
	Unknown	3		1		41		45	
First breastfeed	≤30 Min	163	27.0	178	53.5	142	27.8	483	33.4
	>30 Min	441	73.0	155	46.5	369	72.2	965	66.6
	Unknown	34		14		24		72	
Colostrum secretion	≤1 day	403	64.1	164	47.4	182	36.2	749	50.7
	≥2 days	226	35.9	182	52.6	321	63.8	729	49.3
	Unknown	9		1		32		42	
Baby admitted to NICU	Yes	106	16.7	19	5.5	22	4.4	147	9.9
	No	528	83.3	326	94.5	479	95.6	1333	90.1
	Unknown	4		2		34		40	

**Table 3 Factors associated with exclusive breastfeeding initiation after adjustment for potential confounders in Zhejiang Province, China, 2004-2005**

Factors	Value	n	Adjusted OR	95%CI	
Delivery method	Vaginal	407	1		
	Caesarean	865	0.76	0.59	0.99
First feed	Breast milk	828	1		
	Other	444	0.56	0.43	0.73
Living place	City	599	1		
	Suburb	318	2.17	1.59	2.95
	Rural	355	2.33	1.69	3.21
	Maternal age	<25	298	1	
	25~29	684	0.58	0.43	0.79
	≥30	290	0.51	0.34	0.75
Breastfeeding decision	Before pregnancy	946	1		
	During pregnancy	201	1.03	0.75	1.43
	After birth	125	0.57	0.38	0.86
Parity	Primiparous	1142	1		
	Multiparous	130	1.67	1.08	2.57

- -2 log likelihood = 1637.86, d.f = 11
- Non-significant variables were maternal age, cesarean section, maternal education, infants' gender, when decided feeding method, parity, first feed, gestation week, mothers' job, if mothers attended antenatal classes, infant birth weight, if infants admitted to special care nursery? Living place, family income, maternal grandmother breastfed? Living with other people or only the couple.
- All variables of interested were included in the full model in the initial step and then backward elimination procedure was applied to obtain the final model, using 5% critical value of  $\chi^2$  test for the appropriate degrees of freedom.

# **Paper 4**

## **Breastfeeding Following Caesarean Section in Zhejiang Province: public health implications**

Qiu L, Zhao Y, Binns CW, Lee AH, Xie X

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**Breastfeeding following caesarean section in Zhejiang Province: public health implications**

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## **Abstract**

**Objective:** To describe the influence of caesarean section on breastfeeding rates in Zhejiang Province, People's Republic of China.

**Methods:** A longitudinal cohort study of infant feeding was conducted in Zhejiang Province, in city, suburban and rural areas. Mothers were recruited and interviewed while in hospital and then followed for six months. The sample size was 638 in the city, 347 in the suburban area and 532 in the remote mountainous rural area.

**Results:** In this study the highest caesarean section rate was in the city (76%), a similar rate in the suburbs (74%) and the lowest in the rural area (53%). The overall the breastfeeding initiation rate was 94%. Mothers who had a caesarean section were less likely to be exclusively breastfeeding on discharge (35.8% in city, 59.6% in the suburbs) compared to vaginal delivery where the rates were 45% and 74.4% respectively. The adjusted odds ratio for exclusive breastfeeding in caesarean section deliveries in the city and suburban mothers was 0.64 (95% CI 0.46, 0.88).

**Conclusions:** Caesarean section is increasingly being used for routine deliveries in China and other countries in the region. Mothers who have an operative delivery have lower rates of exclusive breastfeeding on hospital discharge. These mothers will need extra support and encouragement to commence and maintain breastfeeding.

### **Keywords:**

Caesarean Section,

Breastfeeding,

China,

Zhejiang Province,

Cohort study

## **Introduction**

Safe motherhood and childbirth is a health priority of health care around the world, including China. Several decades ago a WHO consensus conference suggested that the upper limit of caesarean section rate should be in the range of 12-15% <sup>70,71</sup>. A commentary in the Lancet suggested that the lower limit range should range from a minimum of 1% to an optimum target of 5% to avoid death and severe morbidity in the mother <sup>72</sup>

Breastfeeding is the first priority of infant nutrition and provides substantial health benefits, both in the short term and later in life <sup>44,73</sup>. Exclusive breastfeeding to six months and the nation wide provision of baby friendly hospitals is the policy of the PR China Ministry of Health. Mothers who are delivered by caesarean section may have lower rates of breastfeeding, although the effect is not universal. In Vietnam it has been shown that breastfeeding initiation rates are lower where a caesarean section has been performed, probably due to the prolonged delay before the baby is placed at the mothers breast <sup>6</sup>. However in Australia no relationship was found between operative delivery and vaginal delivery on breastfeeding in several studies <sup>66,74</sup>.

Despite the apparent consensus that operative intervention should be limited to minimize morbidity there has been a substantial increase in caesarian section rates in most countries that have reported trend data. This includes countries as diverse in culture and economic development as the USA, UK, Sri Lanka and Taiwan China <sup>75-78</sup>. In the USA the overall caesarean section rate increased from 20.7% in 1996 to 27.1% in 2003 for all primiparous women <sup>79</sup>. Many countries from all parts of the world, have reported rates of operative delivery much greater than these despite reports of possible impacts on public health. Rates as high as 40% in Chile and even up to 80% in some Brazilian hospitals have been reported <sup>80</sup>.

There has been a shift in health service provision in China in recent decades towards the provision of market driven health care<sup>81</sup>. Obstetric practice in China has been particularly subject to the pressures of the marketplace and rates of caesarean section have increased considerably. The caesarean section rate in China was reported as being 1-2% in 1950s, 4-6% in 1960s, rising to be more than 20% in 1980s<sup>82</sup>. More recently rates of caesarean section in China have risen rapidly to reach as high as 77% in Hangzhou<sup>37</sup>.

This study was undertaken in Zhejiang Province has population of 49 million and is located on the east coast of China, south of Shanghai. Zhejiang Province is undergoing rapid development and its capital, Hangzhou, a city of 4 million, was first made famous when Marco Polo was appointed its governor in the 12<sup>th</sup> century. Zhejiang Province had a decline in breastfeeding rates with the introduction of western patterns of obstetric services. However the promotion of breastfeeding by the Ministry of Health has resulted in more than 85% of maternal and integrated hospitals in Zhejiang Province being certified to meet the WHO/UNICEF baby friendly hospital criteria<sup>83</sup>. Breastfeeding rates are now improving, but the rates have not yet reached national targets. The aim of this paper is to describe the influence of caesarean section on breastfeeding rates in Zhejiang Province, People's Republic of China.

## **Method**

A longitudinal study of infant feeding was conducted three locations in Zhejiang Province, in the capital city (Hangzhou), in a suburban location (Fuyang) which is located 50 km to the southwest of Hangzhou, and in a mountainous rural area (Jinyun) a further 300 km to the south-west during 2005. A total of 1520 mothers were recruited from the three representative locations and were interviewed while in hospital and at regular intervals until their infants were six months of age. The inclusion criteria for the study were that the mother had delivered a live child, the mother and neonate did not have serious diseases and that she was resident in the

service area of that hospital. In order to be able to manage the number being interviewed on any one day, selection was made using a series of random numbers. The response rate was high and 98% of mothers (1520 out of 1551) agreed to participate in the study.

The questionnaire included full details of infant feeding methods and factors likely to influence the initiation and duration of breastfeeding and was based on those developed by Binns, Scott and Duong that have been extensively used in breastfeeding cohort studies in Australia, Vietnam and Kenya<sup>6,18-20</sup>. The questionnaires were translated and were then tested in focus groups to ensure cultural appropriateness.

The project was approved by the Zhejiang local research authorities (Women's Hospital, School of Medicine, Zhejiang University) and the Human Research Ethics Committee of Curtin University, Australia.

All data analyses were carried out using the Statistical Package for Social Science (SPSS), release 14.0 (SPSS Inc., Chicago, IL, USA). Multivariate logistic regression model were used to analyse factors associated with prelacteal feeds and breastfeeding on discharge. Variables found having non significant effects were removed from the model using backward elimination procedure.

Definitions used in this study<sup>35</sup>:

*'Any breastfeeding'*: The child has received breastmilk with or without other drinks or foods.

*'Exclusive breastfeeding'*: Breastfeeding while giving no other food or liquid

**Results.** The highest rate of caesarean was in the city (76%), but the suburban rate was not significantly different at 74%. The lowest of the three locations was the rural area with a 53% caesarean section rate (See Table 1). Details of the binary

logistic regression model are shown in Table 2 and mothers living in the city and suburbs, who were older than 25 years old, and better educated were more likely to deliver by caesarean section.

The 'any breastfeeding' initiation rate was 94%, and there was no significant difference by delivery method. However mothers who had a caesarian section were less likely to be exclusively breastfeeding on discharge (35.8% in city, 59.6% in the suburbs) compared to vaginal delivery where the rates were 45% and 74.4% respectively (Table 3). The adjusted odds ratio for exclusive breastfeeding in caesarean section deliveries in the city and suburban mothers was 0.64 (95% CI 0.46, 0.88).

Mothers who had a caesarean section put their baby to their breasts later than mothers having a vaginal delivery. Only 23.2% of infants who had been born by caesarean section were placed on the breast within 30 minutes of delivery, compared to 54.2% of infants from a vaginal delivery (Chi square =138.262, p=0.000)

## **Discussion**

The rates of caesarean section in this study are high, amongst the highest rates reported in the literature. These rates are comparable to the cities of Korea and South America, such as Seoul and Rio de Janeiro, where rates in some hospitals are in excess of 80%<sup>80,84-86</sup>. It would appear from our study that pain management is an issue in China and mothers often reported that they requested a caesarean section for pain relief. From our observations, it would appear that mothers had more support in rural areas and therefore fewer opted for a caesarean section

In this study having a caesarean section had a significant influence on exclusive breastfeeding rates. This has not been the case in other countries. It would appear that in countries which provided routine spinal anaesthesia, have less effect on breast-feeding rates. For example during a caesarean section in Australia it is

common for a mother to begin to breast-feed her infant within 10 minutes of the infant being removed from the uterus. In this study, the mothers who had a caesarean section were significantly slower in giving the first breastfeed to their infants. This may explain the lower rate of the exclusive breast-feeding.

The WHO and UNICEF both recommend exclusive breast-feeding of infants until six months of age because of increased morbidity and mortality to infants who are not fed this way<sup>45</sup>. Thus the loss of the opportunity to exclusively breastfeed through current caesarean section practices in China, exposes infants to increased risk and the health system to increased costs. Care will also have to be taken to ensure that the impact of caesarean sections on exclusive breastfeeding does not extend to ‘any’ breastfeeding in the future. A concerted programme is needed to both reduce the number of caesarean sections and to promote the rapid breastfeeding of all infants.

There are several limitations that need to be borne in mind when considering the interpretation of the study. The sample was recruited from three locations in Zhejiang Province, which was selected to be representative of the province so care will need to be taken when extrapolating to the whole province. Further studies are needed to document the impacts of caesarean sections on maternal and infant morbidity and mortality.

## **Conclusions**

Caesarean section is increasingly being used for routine deliveries in China and other countries in the region. Mothers who have an operative delivery have lower rates of exclusive breastfeeding on hospital discharge. Particular attention needs to be given to modifying hospital practices to allow mothers who have a caesarean section to breastfeed their infants as soon as possible and to minimize the use of prelacteal feeds. These mothers will need extra support and encouragement to commence and maintain breastfeeding.

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**Table 1. The rate of caesarean section in city, suburb and rural areas, Zhejiang Province, China, 2004-2005**

Variable	City			Suburb			Rural			Total		
	C-section		P-value	C-section		P-value	C-section		P-value	C-section		P-value
	Yes (%)	No (%)		Yes (%)	No (%)		Yes (%)	No (%)		Yes (%)	No (%)	
<b>Place of Residence</b>												#
City										483 (75.7)	155 (24.3)	
Suburb										257 (74.1)	90 (25.9)	
Rural										281 (52.7)	252 (47.3)	
<b>Age (years)</b>			0.073			0.091				<b>0.040</b>		#
< 25	54 (11.2)	23 (14.8)		84 (32.7)	40 (44.4)		70 (25.6)	88 (36.1)		208 (57.9)	151 (42.1)	
25 ~ 29	282 (58.6)	101 (65.2)		127 (49.4)	38 (42.2)		149 (54.6)	106 (43.3)		558 (69.5)	245 (30.5)	
30 ~ 34	123 (25.6)	28 (18.1)		42 (16.3)	9 (10.0)		43 (15.8)	37 (15.2)		208 (73.8)	74 (26.2)	
≥ 35	22 (4.60)	3 (1.90)		4 (1.60)	3 (3.30)		11 (4.00)	13 (5.30)		37 (66.1)	19 (33.9)	
<b>Family income (RMB)</b>			0.656			0.293				<b>0.027</b>		#
≤ 1500	4 (0.80)	2 (1.30)		42 (16.8)	9 (10.1)		106 (42.4)	39 (43.8)		125 (58.1)	90 (41.9)	
1501~3000	54 (11.3)	21 (13.6)		72 (28.8)	25 (28.1)		30 (12.0)	16 (18.0)		245 (60.9)	157 (39.1)	
3001~5000	170 (35.4)	57 (37.0)		79 (29.8)	79 (32.9)		85 (32.1)	97 (40.4)		324 (71.5)	129 (28.5)	
> 5000	252 (52.5)	74 (48.1)		82 (30.9)	47 (19.6)		19 (7.20)	17 (7.10)		301 (73.8)	107 (26.2)	
<b>Maternal education (years)</b>			0.175			0.536			#			#
≤9	48 (9.90)	9 (5.80)		149 (58.0)	57 (63.3)		129 (46.2)	153 (61.0)		326 (59.8)	219 (40.2)	
10 ~ 12	124 (25.7)	48 (31.0)		58 (22.6)	20 (22.2)		64 (22.9)	57 (22.7)		246 (66.3)	125 (33.7)	

> 12	311 (64.4)	98 (63.2)	50 (19.5)	13 (14.4)	86 (30.8)	41 (16.3)	447 (74.6)	152 (25.4)
<b>Birth weight (g)</b>	<b>0.002</b>		0.237		0.746		<b>0.004</b>	
< 2500	7 (1.40)	2 (1.30)	5 (1.90)	2 (2.20)	7 (2.50)	4 (1.60)	19 (70.4)	8 (29.6)
2500~3999	435 (90.1)	151 (97.4)	226 (87.9)	84 (93.3)	256 (92.8)	234 (94.0)	917 (66.2)	469 (33.8)
≥ 4000	41 (8.50)	2 (1.30)	26 (10.1)	4 (4.40)	13 (4.70)	11 (4.40)	80 (82.5)	17 (17.5)

# p-value < 0.0005

**Table 2 Factors associated with having a caesarean section in Zhejiang province**

Variable	Caesarean Section	
	Adjusted OR	95% CI
Living place		
Rural	1	
Suburb	2.216	(1.666, 2.948)
City	2.704	(1.995, 3.665)
Maternal age		
< 25	1	
25 ~ 29	1.412	(1.066, 1.872)
>= 30	1.642	(1.168, 2.308)
Maternal education (years)		
<= 9	1	
10 ~ 12	1.178	(0.867, 1.600)
> 12	1.531	(1.126, 2.081)

-2 log likelihood = 1749.208, d.f = 6

Non significant variables included in the model were family income.

**Table 3. Breastfeeding rates on discharge by delivery type and location**

Rate	City	Suburb	Rural
Any Breastfeeding			
C-section	96.5	97.3	96.8
Vaginal	96.8	95.6	98
Exclusive Breastfeeding			
C-section	35.8*	59.6**	60.7
Vaginal	45.0	74.4	61.4
Number	635	347	532

\* $\chi^2= 4.043$ ,  $p<0.05$

\*\* $\chi^2= 6.055$ ,  $p<0.05$

**Table 4. Factors Associated With Exclusive Breastfeeding Initiation After Adjustment for Potential Confounders in Zhejiang Province, China (year2005)**

<b>Factor</b>	<b>n</b>	<b>Adjusted OR</b>	<b>95%CI</b>	
Delivery method				
Vaginal	231	1		
Caesarean	686	0.637	0.462	0.877
First feed				
Breast milk	690	1		
Other	227	0.631	0.456	0.873
Living place				
Suburb	599	1		
City	318	0.614	0.424	0.890
Maternal age				
<24	182	1		
25~29	520	0.640	0.435	0.942
>34	215	0.627	0.397	0.990
Maternal education (years)				
<= 9	235	1		
10 ~ 12	235	0.473	0.309	0.725
> 12	447	0.631	0.413	0.965
Family income				
< 3000	263	1		
3000~5000	301	0.560	0.381	0.823
5000+	353	0.734	0.488	1.104
Living with parents				
Yes	425	1		
No	492	0.779	0.579	1.048

- **-2 Log Likelihood = 1162.879, d.f = 10.**
- **Non-significant variables were infants' gender, when decided feeding method, parity, gestation week, mothers' job, when the decision of breastfeeding had made, infant birth weight, if infants admitted to special care nursery, maternal grandmother breastfed? living with other people or only the couple .**
- **All variables of interested were included in the full model in the initial step and then backward elimination procedure was applied to obtain the final model, using 5% critical value of  $\chi^2$  test for the appropriate degrees of freedom.**

## **Paper 5**

### **Combating the melamine disaster in China by improving breastfeeding duration: a cohort study of infant feeding practices in Zhejiang Province, PR China**

Qiu L, Binns CW, Zhao Y, Lee AH, Xie X

Under review

**Combating the Melamine disaster in China by improving breastfeeding duration: A cohort study of infant feeding practices in Zhejiang Province, PR China**

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**Original research article**

**Short running head:** Breastfeeding duration in Zhejiang, China

## **ABSTRACT**

A prospective cohort study of 1520 mothers from the Zhejiang Province of China was undertaken to determine the duration of breastfeeding and associated factors during the first six months postpartum. Almost all mothers had introduced complementary foods by six months, making them at risk from contaminated infant formula. The mean duration of 'any breastfeeding' was greater than 180 days, but only 48 days for 'exclusive breastfeeding'. Factors related to cessation of 'any breastfeeding' were maternal age, timing of the breastfeeding decision, admission of infant to special care nursery, mother's return to work, the early introduction of water and/or other complementary foods, and their location of residence. On the other hand, the duration of 'exclusive breastfeeding' was significantly affected by their early return to work and location of residence. To combat the Melamine disaster, strategies to improve the breastfeeding duration must be developed taking account of these factors.

**Key words:** Breastfeeding duration; China; Cohort study; Exclusive breastfeeding; Melamine disaster.



## INTRODUCTION

A recent market report concluded that the world infant formula production was 907,000 tons during 2008 and the market is still growing rapidly. Sales were valued at US\$ 9 billion while 53% of the market was in Asia (1). China is the largest market for infant formula in the world, a market shared by the major multi-national formula companies and about 150 local producers.

The recent contamination of infant formula with melamine in China has caused a public health crisis, with reports of at least 50,000 infants being admitted to hospitals with renal stones (2). Melamine has high nitrogen content; it is added to milk to conceal the low protein content. In 2007 melamine was found in protein concentrate exported to the USA for use in the manufacture of pet food. The contaminated food was responsible for the death from renal failure of hundreds of cats and dogs. There is little information on the toxicity of melamine in humans, but it is known to cause renal calculi, renal failure and haematuria (2,3). Immediately following notification of the contamination, mothers of children younger than three years of age were asked to contact their local child health clinic. A total of 1.5 million infants were screened in Zhejiang Province for use of the formula brands that had been contaminated, while 3,000 infants were admitted to hospitals for further assessment.

Internationally, exclusive breastfeeding is recommended until six months of age and then continued breastfeeding for 12 months and beyond (4-7). Breastfeeding has been

emphasized in public health programs by the Chinese Ministry of Health, particularly over the past two decades. It was the centre piece of the “National Program of Action for Child Development in China in the 1990’s” issued in 1994 (8). In traditional Chinese society, breastfeeding was always the focus of child health. But despite recent increases, breastfeeding rates have still not reached national targets.

Identifying the subgroup of mothers with a short duration of breastfeeding is an important public health strategy because they are susceptible to contaminated infant formula. Previous studies in China and Vietnam suggested that successful breastfeeding depends on many factors related to the mother, the infant and the surrounding environment. Breastfeeding duration has been shown to be positively associated with maternal age, maternal education, hospital environment, timing of the decision to breastfeed, early use of pacifier and time lapse before the first breastfeed (9-13). Meanwhile, the use of complementary feeds during hospital stay, maternal and paternal smoking, maternal obesity and an early return to work will shorten the duration of breastfeeding (14,15).

In the Zhejiang Province of China, the rural areas have not progressed as rapidly as the cities and urban areas, while people from the rural west and nearby provinces continue to migrate to the major cities in search of more lucrative employment. In 2006 the Zhejiang population of 49 millions represented one of the most populated province in China. A cross-sectional survey undertaken in five cities of Zhejiang in

1997 found that the exclusive breastfeeding rate before discharge was 74.4% but dropped to 43.7% by 10 weeks (16). This rate was lower than the WHO target for initiation and exclusive breastfeeding of six months. The purpose of this study was to update the breastfeeding rates and to identify the factors that prolong or shorten the duration of breastfeeding in Zhejiang Province. The findings are important for avoiding another melamine disaster in the future.

## **MATERIALS AND METHODS**

A prospective cohort study of breastfeeding was undertaken in Zhejiang Province from October 2004 to December 2005. This longitudinal study of infant feeding practices comprised four interviews conducted at baseline, one, three and six months postpartum. Mothers were recruited from Hangzhou (capital city of Zhejiang), a suburban area and a mountainous rural area approximately 300 km to the southwest of Hangzhou. Of the 1,551 mothers invited to participate, 1520 (98%) agreed and consented to the study. The three hospitals were selected to be representative of the healthcare facilities in the region where they resided. All mothers were recruited during their stay at hospital. Random selection of mothers was adopted in the larger facilities where a number of deliveries occurred on a particular day. Ethics approval was obtained from the Human Research Ethics Committee of Curtin University and the participating hospitals in China. All consented participants were assured of confidentiality and their right to withdraw at any time without prejudice. The data were subsequently de-identified to ensure privacy of the information collected.

The first interview was conducted face-to-face by a nurse or health worker before discharge, whereas follow up interviews were mostly conducted by telephone (92%), a testimony to the rapid economic development of this province. For the remaining cases, follow up interviews were completed during routine examination at community child care clinics. The inclusion criteria for the study were: delivery of a live child; both mother and neonate did not have any serious illness; and the mother was a resident within the service area of the hospital.

The questionnaire used for the interviews solicited information on infant feeding methods and variables likely to affect the duration of breastfeeding. It was based on validated and reliable instruments that have been developed for, and extensively used, in breastfeeding cohort studies in China, Australia, Vietnam and Kenya (17-21). The questionnaire was translated into Mandarin and back-translated by professionals. Its appropriateness and cultural relevance were confirmed via focus groups. Zhejiang has its own dialect so that local words and phrases were included as necessary. All interviews were conducted by staff familiar with the local dialect.

The definitions used in a previous study (11) were adopted, as follows.

- *Any breastfeeding*: The child has received breastmilk (direct from the breast or expressed) with or without other drinks, formula or infant food.
- *Exclusive breastfeeding*: Breastfeeding while giving no other food or liquid, not

even water, with the exception of drops of syrups consisting of vitamins, mineral supplements or medicine.

- *Full breastfeeding*: Almost exclusive breastfeeding with only small amounts of other fluids.

Data were entered and analyzed using the Statistical Package for Social Science, release 14.0 (SPSS Inc., Chicago, IL, USA). Survival analysis was performed on those women who still breastfed at the time of discharge. The duration of breastfeeding was estimated by the Kaplan-Meier method and compared between groups using the log-rank test. Cox proportional hazards regression was then applied to determine factors affecting the duration of ‘any’ and ‘exclusive’ breastfeeding, with significant variables selected based on the backward elimination procedure.

## **RESULTS**

Demographic characteristics of the sample, together with percentage of mothers still breastfed at six months, are shown in Table 1. The use of prelacteal formula feeds was common, with prevalence 62.0%, 36.6% and 39% in the city, suburban and rural areas, respectively (22). The ‘any breastfeeding’ rate at discharge from hospital was 96.9% overall but dropped to 74% after six months. The three locations were similar in terms of any breastfeeding rate.

Details of ‘exclusive breastfeeding’ in relation to the demographic and other factors are shown in Table 2. The ‘exclusive breastfeeding’ rates on discharge, 38% in city, 63.4% in suburban and 61% in rural areas, differed significantly between the three locations. The durations of ‘exclusive’, ‘full’ and ‘any breastfeeding’ for Zhejiang Province are presented in Figure 1. The mean time for the introduction of infant formula were 3.3 (city), 4.7 (suburban) and 4.4 (rural) months. Table 3 gives the prevalence of the various times when infant formula was introduced.

Table 4 presents the result of the Cox regression analysis for ‘any breastfeeding’ duration. The risk of cessation of ‘any breastfeeding’ was inversely related to age after accounting for other confounding factors. Mothers who were younger than 30 years were more likely to have stopped ‘any breastfeeding’ before six months when compared with mothers who were 30 years old and above. The timing of the breastfeeding decision was also a significant factor. The adjusted risk of discontinued ‘any breastfeeding’ before six months was higher among mothers who made breastfeeding decision after pregnancy (hazard ratio (HR) 1.64, 95% confidence interval (CI) 1.10 to 2.43) than those who made their breastfeeding decision before becoming pregnant.

Whenever infants were admitted to special care nursery, their duration of ‘any breastfeeding’ appeared to be shortened with adjusted HR 1.51, 95% CI 1.03 to 2.22. On the other hand, the breastfeeding duration was longer when the mother returned to

work later than those mothers who returned to work within six months postpartum; see Figure 2. Infants who had been given water to drink before turning one month old tended to incur a shorter duration of 'any breastfeeding', with HR 1.71, 95% CI 1.29 to 2.27. The time of introducing other complementary foods was another significant factor. For infants who had been introduced to other foods within three months of birth, their hazard of breastfeeding cessation before six months was relatively higher, with HR 1.46, 95% CI 1.07 to 1.98. Moreover, the family's place of residence was also associated with the duration of 'any breastfeeding'. As shown in Figure 3, mothers residing in the city were found to have shorter 'any breastfeeding' duration than mothers from suburban and rural areas.

Table 5 presents the multivariate Cox regression result for 'exclusive breastfeeding'. Only two significant factors were found. Firstly, mothers who returned to work within six months of delivery were at elevated risk of exclusive breastfeeding cessation, with adjusted HR 1.47, 95% CI 1.20 to 1.80, and hence had a shorter duration of any breastfeeding. Secondly, the location of residence also influenced the duration of exclusive breastfeeding up to six months. Again, mothers living in the city had a shorter duration and a higher risk of stopping exclusive breastfeeding by six months than their suburban and rural counterparts.

## **DISCUSSION**

Following the melamine crisis, the Zhejiang public health authorities attempted to contact all infants 0-3 years, a total of 1.54 million infants. During 2007, among the 581,068 reported live births, 197,382 (34%) were from parents migrated from another province (23). The contaminated formulas were inexpensive domestic brands mainly consumed by migrants. For example, 1229 (73%) of 1,673 infants in a Hangzhou migrant community had been fed with contaminated infant formula at an early age.

Common factors associated with both 'exclusive' and 'any' breastfeeding durations were the mothers' location of residence and their early return to work. The infant feeding practices were different between rural, suburban and city areas of Zhejiang Province (24). The importance of exclusive breastfeeding to six months of age (and breastfeeding beyond that time) is recognized (25, 26). To support breastfeeding, the Zhejiang Provincial Council has passed regulations to extend maternity leave from six weeks to three months, and employers are requested to ensure that mothers have sufficient time for breastfeeding their infants. Similar to the situation in other countries (27), Chinese mothers should be allowed sufficient time away from work to make feeding arrangements, although employment has less effect in situations where the infant is able to accompany the mother (20).

Another factor that adversely affected the 'any breastfeeding' duration was the feeding of liquids or food. With the early introduction of complementary foods the breast receives less stimulation from suckling so that milk production may decrease



(28-30). Mothers should be encouraged to delay the introduction of complementary foods until at least six months of age. The influence of complementary foods was consistent with previous studies in China (12, 21).

The timing of the breastfeeding decision was known to relate to breastfeeding outcomes in various cultures (10,31). This is a function of antenatal preparation. Health professionals should encourage prospective parents to consider breastfeeding at the earliest opportunity and continue to emphasize the advantages of breastfeeding during subsequent antenatal visits.

The majority of infants (city, 99.8%; suburban, 99.5%; rural, 92.8%) had consumed or were consuming some infant formula by six months. Education and health promotion programs taking account of the above factors to improve breastfeeding duration would reduce the risk associated with infant formula consumption. The recent contamination episode in China has resulted in the withdrawal of many local infant formula brands from the market. Mothers have few options to feed their infants. They can attempt to relactate, feed international infant formula brands at 3-400% increased costs. In some instances, they may seek cheaper substitutes such as cow's milk or even less healthy options (32).

Several limitations must be considered when interpreting the results. The study sites were restricted to three locations in Zhejiang Province based on the financial and

logistical support available for this project. While the study locations were selected to be representative of Zhejiang Province, further replications at other sites would strengthen the generalizability of the findings. This study was terminated after six months from hospital discharge. A longer follow-up period is recommended in future studies. Finally, focus group discussions and in-depth interviews with mothers and their extended families were not held. Such qualitative data would enable the understanding of detailed issues in relation to breastfeeding duration and the introduction of supplementary feeds.

In conclusion, this is the first longitudinal cohort study reporting infant feeding practices in the Zhejiang Province of China. The overall ‘any breastfeeding’ rate was high, but dropped to 74% after six months. Similarly, the ‘exclusive breastfeeding’ rate declined rapidly after hospital discharge. Fewer than 5% of infants reached the WHO and Chinese targets of exclusive breastfeeding until 6 months of age. The rate of infant formula usage was extremely high at 98%, exposing infants to the risk of diseases from contaminated formula. Strategies must be developed to improve the breastfeeding duration in order to avoid another melamine disaster in the future.

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**Table 1. Demographic factors affecting ‘any breastfeeding’ duration at six months postpartum in Zhejiang Province**

Factor	category	N	%	95% CI	p
Maternal education (years)	≤ 9	539	84	(80.1, 87.9)	<0.001
	10 ~ 12	370	71	(65.1, 76.9)	
	≥ 13	595	67	(63.1, 70.9)	
Maternal profession	Laborer	490	81	(77.1, 84.9)	0.002
	Office worker	758	69	(65.1, 72.9)	
	Not working	222	76	(70.1, 81.9)	
Maternal age (years)	≤ 24	355	77	(71.1, 82.9)	0.231
	25 ~ 29	800	72	(68.1, 75.9)	
	≥ 30	335	78	(72.1, 83.9)	
Maternal salary (Yuan)	≤ 3000	609	83	(79.1, 86.9)	<0.001
	3000 ~ 5000	452	73	(67.1, 78.9)	
	≥ 5001	406	61	(55.1, 66.9)	
Gestation (weeks)	< 37	48	47	(29.4, 64.6)	<0.001
	≥ 37	1438	76	(74.0, 78.0)	
Birth weight (g)	≤ 2499	27	73	(55.4, 90.6)	0.443
	2500 ~ 3999	1377	75	(73.0, 77.0)	
	≥ 4000	96	74	(64.2, 83.8)	
Parity	Primiparous	1341	74	(72.0, 76.0)	0.018
	Multiparous	162	85	(79.1, 90.9)	
Delivery method	Vaginal	492	76	(72.1, 79.9)	0.268
	Caesarean	1015	74	(70.1, 77.9)	
Breastfeeding decision made	Before pregnancy	1087	78	(74.1, 81.9)	<0.001
	During pregnancy	260	70	(64.1, 75.9)	
	After birth	152	65	(57.2, 72.8)	
Maternal grandmother breastfed	Yes	1398	75	(73.0, 77.0)	0.312
	No	80	63	(49.3, 76.7)	
Infant admitted to special care nursery	Yes	149	59	(49.2, 68.8)	<0.001
	No	1324	76	(74.0, 78.0)	
Suck time (minute)	≤ 30	480	79	(75.1, 82.9)	0.027
	> 30	960	75	(71.1, 78.9)	
Mother attended antenatal classes	Yes	949	73	(69.1, 76.9)	0.937
	No	549	77	(73.1, 80.9)	
First feed	Breast milk	927	77	(73.1, 80.9)	<0.001
	Other	551	71	(67.1, 74.9)	
Baby’s gender	Male	769	74	(70.1, 77.9)	0.800
	Female	728	75	(71.1, 78.9)	
Location	City	638	63	(57.1, 68.9)	<0.001
	Suburban	346	77	(71.1, 82.9)	
	Rural	524	84	(80.1, 87.9)	
Back to work	Before 6 months	497	64	(60.1, 67.9)	<0.001

	After 6 months	771	81	(77.1, 84.9)	
Consume water	Within 1 month	538	65	(59.1, 70.9)	<0.001
	After 1 month	947	80	(78.0, 82.0)	
Introduction of	Within 3 months	439	69	(65.1, 72.9)	0.003
complementary food	After 3 months	853	77	(73.1, 80.9)	

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**Table 2. Demographic factors affecting ‘exclusive breastfeeding’ duration at six months postpartum in Zhejiang Province**

Factor	category	n	Mean (days)	95% CI	p
Maternal education (years)	≤ 9	502	64.9	(58.9, 71.0)	<0.001
	10 ~ 12	347	43.4	(37.1, 49.7)	
	≥ 13	574	35.1	(30.6, 39.7)	
Maternal profession	Laborer	453	60.7	(54.6, 66.8)	<0.001
	Office worker	733	38.3	(34.1, 42.5)	
	Not working	212	51.0	(42.0, 60.0)	
Maternal age (years)	≤ 24	336	66.0	(58.5, 73.4)	<0.001
	25 ~ 29	757	43.5	(39.2, 47.9)	
	≥ 30	318	38.8	(32.3, 45.3)	
Maternal salary (Yuan)	≤ 3000	567	61.7	(56.2, 67.3)	<0.001
	3000 ~ 5000	431	40.2	(34.5, 45.8)	
	≥ 5001	396	34.9	(29.4, 40.3)	
Gestation (weeks)	< 37	49	31.9	(16.9, 46.9)	0.069
	≥ 37	1356	48.2	(44.8, 51.6)	
Birth weight (g)	≤ 2499	26	48.0	(24.9, 71.1)	0.894
	2500 ~ 3999	1302	47.9	(44.5, 51.4)	
	≥ 4000	90	45.8	(32.5, 59.0)	
Parity	Primiparous	1276	45.5	(42.1, 48.9)	0.013
	Multiparous	147	67.3	(56.2, 78.4)	
Delivery method	Caesarean	969	44.6	(40.7, 48.5)	0.001
	Vaginal	457	54.7	(48.6, 60.7)	
Breastfeeding decision made	Before pregnancy	1023	50.2	(46.2, 54.1)	0.048
	During pregnancy	252	47.8	(40.2, 55.4)	
	After birth	146	33.9	(24.6, 43.2)	
Maternal grandmother breastfed	Yes	1328	47.8	(44.4, 51.2)	0.812
	No	74	43.1	(29.2, 56.9)	
Infant admitted to special care nursery	No	1251	48.8	(45.3, 52.3)	0.199
	Yes	146	37.5	(27.5, 47.5)	
Suck time (minute)	≤ 30	452	61.6	(55.6, 67.6)	<0.001
	> 30	910	42.2	(38.2, 46.2)	
Mother attended antenatal classes	Yes	920	44.0	(40.1, 48.0)	<0.001
	No	496	54.0	(48.1, 59.8)	
First feed	Breast milk	890	51.4	(47.2, 55.5)	0.041
	Other	509	40.4	(35.0, 45.7)	
Baby’s gender	Male	719	45.1	(40.6, 49.7)	0.063
	Female	699	50.8	(46.0, 55.5)	
Location	City	634	30.0	(26.0, 34.0)	<0.001
	Suburban	344	64.2	(57.3, 71.1)	
	Rural	448	59.2	(52.9, 65.6)	
Back to work	Before 6 months	473	39.4	(34.3, 44.4)	<0.001
	After 6 months	714	60.4	(55.5, 65.4)	

**Table 3. Introduction of infant formula in Zhejiang Province**

<b>Location*</b>	<b>Age infant formula introduced</b>				
	At discharge	One month	Three months	Six months	more than six months
<b>City</b>	380 (67.7%)	70 (12.5%)	47 (8.4%)	62 (11.1%)	2 (0.4%)
<b>Suburban</b>	123 (36.9%)	42 (12.6%)	20 (6.0%)	145 (43.5%)	3 (0.9%)
<b>Rural</b>	202 (39.8%)	62 (12.2%)	41 (8.1%)	168 (33.3%)	34(6.7%)

\* Pearson  $\chi^2$  statistic 179.3,  $p < 0.001$

**Table 4. Cox regression results of significant factors associated with the cessation of ‘any breastfeeding’ in Zhejiang Province**

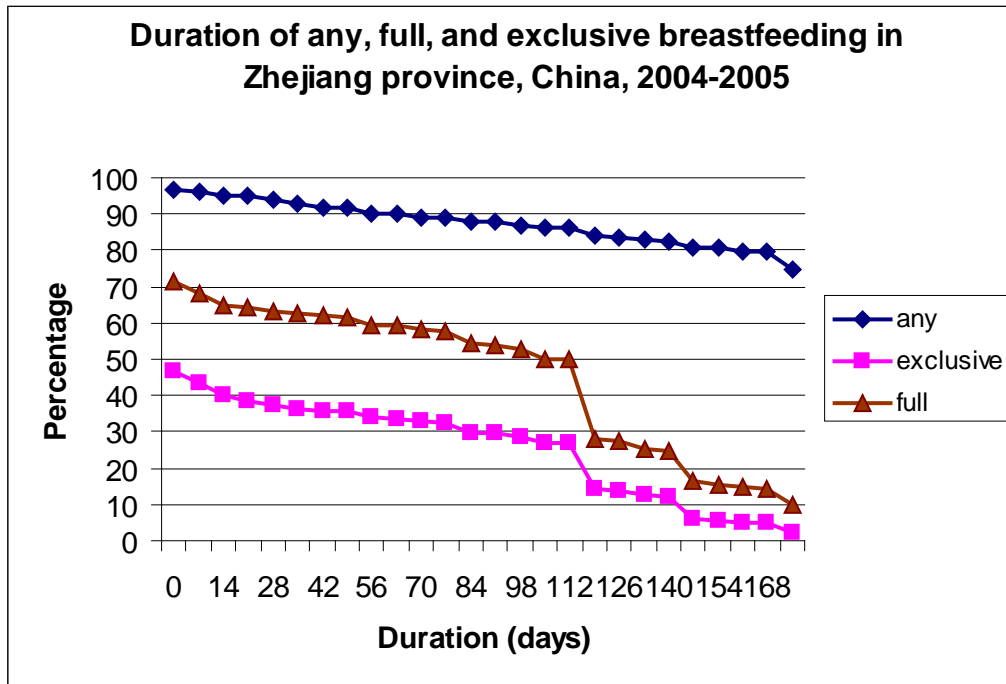
Factor	category	n	Hazard Ratio	95% CI
<b>Maternal age (years)</b>	≥ 30	218	1	
	25~29	509	1.710	(1.085, 2.698)
	≤ 24	247	1.520	(1.053, 2.194)
<b>Breastfeeding decision made</b>	Before pregnancy	689	1	
	During pregnancy	175	0.950	(0.664, 1.360)
	After Birth	110	1.635	(1.099, 2.434)
<b>Infant admitted to special care</b>	No	885	1	
	Yes	89	1.508	(1.025, 2.218)
<b>Back to work</b>	After 6 months	588	1	
	Before 6 months	386	1.520	(1.129, 2.046)
<b>Consume water</b>	After 1 month	632	1	
	Within 1 month	342	1.713	(1.290, 2.274)
<b>Introduction of complementary food</b>	After 3 months	677	1	
	Within 3 months	297	1.459	(1.074, 1.980)
<b>Location</b>	City	368	1	
	Suburban	296	0.672	(0.466, 0.970)
	Rural	310	0.291	(0.183, 0.461)

Table 5. Cox regression results of significant factors associated with the cessation of 'exclusive breastfeeding' in Zhejiang Province

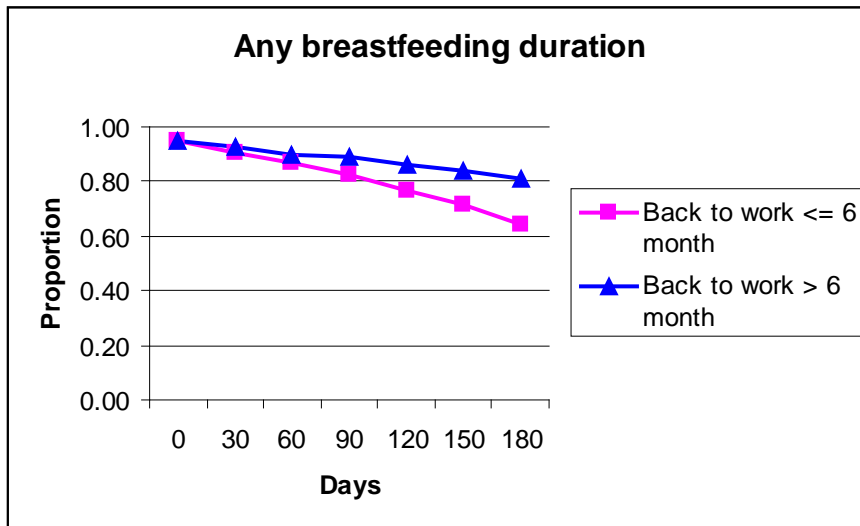
Factor	category	n	Hazard Ratio	95% CI
<b>Back to work</b>	After 6 months	337	1	
	Before 6 months	174	1.471	(1.204, 1.796)
<b>Location</b>	City	171	1	
	Suburban	189	0.739	(0.595, 0.918)
	Rural areas	151	0.590	(0.462, 0.754)

Figure 1. Duration of breastfeeding (any, full and exclusive) in Zhejiang

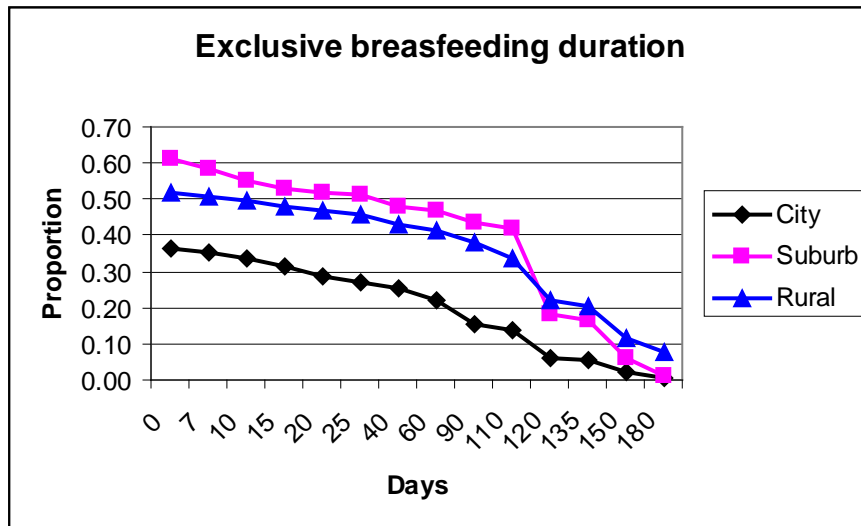
Province



**Figure 2. Duration of 'any breastfeeding' up to six months postpartum by returned to work status**



**Figure 3. Duration of 'exclusive breastfeeding' up to six months postpartum by location of residence**



# **CHAPTER 6**

# **CONCLUSION**



### **6.1 The aims of the study were to**

1. Document the prevalence and duration of breastfeeding and exclusive breastfeeding in Zhejiang Province, in city, in suburban and in rural areas.
2. To analyse the factors determining the initiation and the duration of breastfeeding in Zhejiang.
3. Document the use of prelacteal feeds in infants in Zhejiang.
4. To determine the factors influencing the use of prelacteal feeds and the introduction of complementary feeding.
5. Identify the prevalence of problems with breastfeeding and constraints to exclusive breastfeeding in Zhejiang.
6. To analyse the influence of caesarean section to breastfeeding.
7. Document mothers' knowledge about the benefits of breastfeeding.
8. Describe differences in breastfeeding in the geographic areas in the Zhejiang Province.

### **6.2 Benefits of the study**

This is the first longitudinal cohort study published on infant feeding practices in city, suburban and rural areas in Zhejiang province, an economically advanced area typical of eastern China. This study has provided information on the prevalence of breastfeeding in three areas of Zhejiang Province and an understanding of risk factors, which maximize the prevalence, and duration of breastfeeding. Analyses have been undertaken to respond to all of the aims of the study. The results from this research will provide useful information for the development of health promotion programs on infant feeding.

The economy of Zhejiang Province has grown rapidly in recent years, particularly since the beginning of the 21st century and the per capita GDP in Hangzhou was \$6,700 in 2006. The rise in living standards accompanying the economic growth has led to a demand for improved health care, and in particular, the application of

advanced medical technologies. Infant feeding practice is another part of culture which has been influenced by economic development. There is now widespread promotion of infant formula and mothers are fascinated by the prospect of a high-technology product which promises much for their infants. On the other hand, cultural beliefs are still strong, and most mothers commence breastfeeding, but they tend to combine this in the early months of their infant's lives with infant formula.

The women of Hangzhou (city) are highly educated and in our study 64.1% of the women had post secondary education compared with the rates of 18.2% in the suburban area and 24.0% in the rural area. Almost half of the mothers (45.5%), considered for recruitment into the study, were not the native residents of the city, compared to the suburban (18.4%) and the rural areas (3.7%). This reflects the dynamic nature of the Zhejiang population and the high level of education, particularly in the city, resulting from the rapid economic development.

After the Baby Friendly Hospital Initiative (BFHI) was promoted in China in the 1990s, the majority of hospitals in the Province reformed their obstetric practices. The hospital environment became friendly towards babies, as the 10 steps to successful breastfeeding were required in all hospitals and MCH centres. These included 'rooming in', early skin contact, early breastfeeding, and the encouragement of mothers' breastfeeding by the doctors and nurses in the obstetric departments. The Bureau of Public Health of Zhejiang Province is responsible for providing a team to regularly evaluate the baby friendly hospitals in the Province and to maintain the quality of the BFHI. In this atmosphere of encouragement, breastfeeding initiation rates improved. Almost all mothers understood the benefits of breastfeeding from antenatal classes, from post natal education or from the media.

In this study more than 96% mothers were breastfeeding on discharge from hospital. The initiation of breastfeeding has returned to higher levels in the past two decades, and the rates of breastfeeding initiation in Zhejiang are now higher than reported from

other provinces in China. A study of infant feeding in Xinjiang Uygur Autonomous China found an 'any breastfeeding rate at discharge of 92.2%(Xu, Binns et al. 2007). The "Beijing and Four Provinces Study" found that the 'ever breastfed rate was 90.1% in China 2002(Zhang W, Hao B et al. 2004). This rate was similar to an Australia infant feeding study from West Australia where 93.5% of mothers were breastfeeding at discharge from hospital(Win, Binns et al. 2006). The 'any breastfeeding' rate for the city is higher than the rate reported for Shanghai, the closest large city to Hangzhou in the 1980's (Shanghai Children's Hospital Department of Biostatistics 1995).

The 'any breastfeeding' rates in Zhejiang Province reflect a renewed interest in breastfeeding in China. However the situation for 'exclusive breastfeeding' is not as encouraging. The WHO reported the 0-6months exclusive breastfeeding rate in China to be 51% (UNICEF 2006). Our results for 'exclusive breastfeeding' are far below this figure and may reflect different methodology. The WHO-UNICEF methodology relies on 24 hour recall of no foods or fluids in addition to breastfeeding in the past 24 hours and is a period prevalence for the 0 to 6 months period.

Most mothers had an understanding of the need for breastfeeding at the beginning of their infant's life, but the exclusive breastfeeding rates after discharge from hospital declined rapidly. The exclusive breastfeeding rate was considerably lower than the national target of 80% of babies being exclusively breastfed until four months of age. In this study the exclusive breastfeeding rate at discharge was only one third (38%) in the city and even in the suburban and the rural areas, the rates were only 63.4% and 61% respectively. Prelacteal feeds were common in the initial days after birth, details of which have previously been reported (Qiu, Xie et al. 2007). The exclusive breastfeeding rate in Zhejiang was lower than that in Xinjiang Uygur Autonomous Region, China and in Vietnam, where the rates at discharge were 66.2%(Xu, Binns et al. 2007) and 83.6% respectively(Duong, Binns et al. 2004). However the exclusive breastfeeding rate at 6 months in Xinjiang was similar to the rural area in this study.

At three months, one half of the mothers were regularly giving their infants some infant formula. A common reason for giving formula or other complementary feeding is the belief “the more or the quicker the baby gained weight, the healthier the baby is”. In the Chinese culture, parents and grandparents are devoted to their children and with the “one child policy” the centrality of the child in Chinese culture has increased in recent decades. Thus there is always cultural pressure to give the infant supplementary foods.

### **6.3 Prelacteal Feeds**

In Hangzhou almost all babies are born in hospital and in this study the median length of stay was 5.6 days. Overall 26% of the infants were given prelacteal feeds, mostly infant formula and a few were given water. Two infants from rural areas were given cows milk by their mothers. The factors related to giving prelacteal feeds (logistic regression) indicate that admission to a neonatal intensive care unit (NICU) and mother’s education were significantly related to the decision to give a prelacteal feed. Almost all infants admitted to NICU were given a first feed other than breastmilk, with adjusted odds ratio (OR) 17.83 (95% CI 10.45-30.42). On the other hand, mothers who were more educated (received at least 12 years of education) were less likely to give prelacteal feeds to their infants (OR 0.610, 95% CI 0.379-0.982).

On discharge from hospital 91% of infants were receiving some breastmilk, but only 36% of mothers were exclusively breastfeeding. ‘Any breastfeeding’ on discharge from hospital was inversely related to giving prelacteal feeds (OR 0.115, 95% CI 0.055-0.238). Other significant factors related to ‘any breastfeeding’ on discharge were admission to NICU (OR 0.386, 0.162-0.922), the father’s occupation (‘workers’, that is those with middle level manufacturing employment, were more likely to breastfeed, OR 2.687, 1.226-5.888) and the grandmother’s preference (being supportive of breastfeeding, OR 3.595, 1.430-9.038).

While prelacteal feeds are not routinely recommended by any expert authority, it is widely practiced in many different cultures, including China. The Chinese government has set breastfeeding policies that are consistent with international recommendations. Although the appropriate targets and policies have been set, many infants are given prelacteal feeds. Further education of mothers and health staff about the adverse effects of prelacteal feeds is required.

#### **6.4 Exclusive Breastfeeding**

The use of prelacteal feeds (37.5%) was common in all three locations in this study, but was more common in the rural location where it is traditional not to breastfeed for some time after birth. This is also the case in the far west of China, where delayed first feeds were common, but the use of prelacteal feeds was not as high as Hangzhou (Xu, Binns et al. 2007). In Vietnam the use of fluids other than breastmilk as a first feed is also common, but there it was less likely to be infant formula (Duong, Binns et al. 2004). All of the hospitals in our study are “Baby Friendly Hospital” accredited as are most Chinese hospitals. In theory all hospitals are required to practice the WHO 10 steps for the promotion breastfeeding. Practically the hospitals find that there are some difficulties in following these steps strictly. If a mother (or often her family) feels she does not have enough milk, they can easily get infant formula either from her family or from the hospital pharmacy. Hospitals find that the sale of drugs, food and infant formula are a useful supplementary source of funds.

In this study here are several factors that could be potentially modified to increase exclusive breastfeeding rates. The length of time to the first feed is an important factor and is used to monitor progress towards the millennium goals for child health (WHO 2003). In this study only one third (33.4%) of infants began breastfeeding within 30 minutes of delivery. Delivery room practices need to be modified to make this possible.

According to Chinese tradition it is the practice of Chinese friends or relations of postpartum women to visit the mother and they bring gifts which could be eaten or worn by the new baby. In recent times infant formula has become the most popular gift for new mothers. Gifts of infant formula were given to one third of new mothers by friends or relations.

The time that the decision is made to breastfeed has an important relationship to breastfeeding outcomes in a number of different cultures. This is a function of antenatal preparation and health professionals need to encourage prospective parents to think about the importance of breastfeeding at the earliest opportunity and to continue to discuss this at subsequent contacts. Assisting mothers to make an early decision could also include education of the infant's father and grandmother about the benefits of breastfeeding.

Exclusive breastfeeding rates were lower in infants who were delivered by caesarean section. This is a common risk factor for not breastfeeding in Asian societies, but not in Australia. In our study population women with caesarean section had lower rates of exclusive breastfeeding than with vaginal delivery. After surgery mothers feel pain in their abdominal incision, movement is limited because of catheterization and intravenous lines, and Chinese mothers worry about the side effects of medicines which may pass to baby from breastfeeding. These factors are believed in this culture to influence lactogenesis. Further studies are needed to obtain more details on the reasons for the higher prevalence of caesarean section in this population and the influence on breastfeeding.

### **6.5 Caesarean Section and breastfeeding**

There have been rapid changes in medical practice in the past decades and this is reflected in changes in birthing methods. Overall in the study, two thirds of mothers were delivered by caesarean section. In Zhejiang Province the caesarean section rates

in the city and suburban and rural areas were 75.7%, 74%, and 52.7% respectively. The exclusive breastfeeding rate on discharge from hospital was only 50.3%, ranging from a low of 38% in the city to 63% in the suburbs. The risk factors for not exclusive breastfeeding in this study included having a caesarean section, the time at which the decision to breastfeed was made, the place of residence and whether a prelacteal feed was given. Biological factors included maternal age and parity. Some of these factors could be incorporated into trials to increase exclusive breastfeeding rates.

The rates of caesarean section in this study are high, amongst the highest rates reported in the literature. These rates are comparable to the cities of Korea and South America, such as Seoul and Rio de Janeiro, where rates in some hospitals are in excess of 80% (Hopkins 2000; Dola 2001; Lee, Khang et al. 2004; Ronsmans, Holtz et al. 2006). It would appear from our study that pain management is an issue in China and mothers often reported that they requested a caesarean section for pain relief. The social reasons are playing an important role for caesarean section reason comparing with medical reasons. The social reasons could be that women were worry about pain and want to special doctor or nurse attendance; family want to choose the specific birth day or delivering time; medical staffs want to speed the delivering process; hospitals get more payment from the patients. But from our observations, it would appear that mothers had more support in rural areas and therefore fewer opted for a caesarean section

In this study having a caesarean section had a significant influence on exclusive breastfeeding rates. This has not been the case in other countries. It would appear that in countries which provided routine spinal anaesthesia, have less effect on breastfeeding rates. For example during a caesarean section in Australia it is common for a mother to begin to breast-feed her infant within 10 minutes of the infant being removed from the uterus (Graham, Scott et al. 2005). In this study, the mothers who had a caesarean section were significantly slower in giving the first

breastfeed to their infants. This may explain the lower rate of the exclusive breast-feeding.

The WHO and UNICEF both recommend exclusive breast-feeding of infants until six months of age because of increased morbidity and mortality to infants who are not fed this way (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality 2000). Thus the loss of the opportunity to exclusively breastfeed through current caesarean section practices in China, exposes infants to increased risk and the health system to increased costs. Care will also have to be taken to ensure that the impact of caesarean sections on exclusive breastfeeding does not extend to 'any' breastfeeding in the future. A concerted programme is needed to both reduce the number of caesarean sections and to promote the rapid breastfeeding of all infants.

Caesarean section is increasingly being used for routine deliveries in China and other countries in the region. Mothers who have an operative delivery have lower rates of exclusive breastfeeding on hospital discharge. Particular attention needs to be given to modifying hospital practices to allow mothers who have a caesarean section to breastfeed their infants as soon as possible and to minimize the use of prelacteal feeds. These mothers will need extra support and encouragement to commence and maintain breastfeeding.

## **6.6 Duration of Breastfeeding**

There are differences in the infant feeding practices in rural, suburban and city areas of Zhejiang Province (Qiu, Zhao et al. 2008). Factors common to determining the duration of both 'exclusive' and 'any' breastfeeding were the 'time the mother returned to work' and the 'place of residence'. The State Council has passed regulations to extend maternity leave from 6 weeks to 3 months to support breastfeeding and employers are requested to ensure that mothers have sufficient time for breastfeeding their infants. The importance of exclusive breastfeeding to six



months of age (and breastfeeding beyond that time) are now recognized (World Health Organisation 2001; Ip, Chung et al. 2007) and it is important that mothers have a sufficient time away from their employment or other suitable feeding arrangements. This is similar to the situation in many other countries (Cooklin, Donath et al. 2008), although employment has less effect in situations where the infant is able to accompany the mother (Lakati, Binns et al. 2002).

Additional factors that were important for 'any breastfeeding' were the feeding of liquids or food. With the early introduction of complementary foods the breast receives less stimulation from suckling and milk production may decrease (Cohen, Brown et al. 1994; WHO and Organization 1998; Binns and Davidson 2003). Mothers should be encouraged to delay the introduction of complementary foods until close to six months of age. The influence of mothers return to work and the early introduction of complementary foods is similar to other studies from China (Xu, Binns et al. 2007; Xu, Binns et al. 2007).

The time that the decision is made to breastfeed has an important relationship to breastfeeding outcomes in a number of different cultures (Duong, Lee et al. 2005; Scott, Binns et al. 2006). This is a function of antenatal preparation and health professionals need to encourage prospective parents to think about the importance of breastfeeding at the earliest opportunity and to continue to discuss this at subsequent contacts.

Factors that could be incorporated into health promotion programs include teaching strategies for mothers return to work and the correct introduction of complementary foods. Education about the advantages of breastfeeding at the first antenatal visit would enable parents to make an informed decision on breastfeeding early in the pregnancy.

The overall 'any breastfeeding' rate was high, but declined to 74% after six months. The 'exclusive breastfeeding' rates in city, suburban and rural areas before discharge were 38%, 63.4% and 61% and declined rapidly after hospital discharge. Fewer than 5% of mothers reached the WHO and Chinese targets of exclusive breastfeeding until 6 months of age.

## **6.7 Limitations of study**

Several limitations needed to be considered when considering the results of this study.

6.7.1 During the study period if the mother stopped the breastfeeding more than one month, the nurses would not continue to interview the mothers. This was purely for resource reasons but it limits the comparisons that can be made between breastfeeding and not breastfeeding mothers and infants. If the study is to be repeated in the future it is recommended that it be continued on all mothers and infants until 12 months to allow for further analysis of breastfeeding duration and infant feeding trends.

6.7.2 The study was done in three locations in 1520 new mothers. In 2005 there were about 410,000 living birth in Zhejiang province. It is very small proportion of whole year new babies. It may not typically reflect all province breastfeeding variance. For more detail information more region sample selection would be needed.

6.7.3 Most mother did not stop the breastfeeding till the sixth month. So the exact breastfeeding duration could not be gotten from this study. Further long time follow-up study is necessary in order to understand the detail reason of breastfeeding ceasing.

6.7.4 Breastfeeding is the complicated baby feeding behaviour. The problem during the breastfeeding may be different from family to family. Only questionnaires interview could not find some special feeding problems. For future study focus group discussion may be needed. That kind of survey could find more detail reasons of breastfeeding problems.

## **6.8 Recommendations**

### **6.8.1 Implications for Health Promotion Programs**

Important findings from this study included the high rate of use of prelacteal feeds. The significant factors in determining breastfeeding duration were the mothers early return to work, the introduction of complementary foods and the time the decision to breastfeed was made. These factors could be incorporated into trials to increase breastfeeding duration rates. Fathers and family members should be involved in health education programs to increase their knowledge of the importance of exclusive breastfeeding in the first six months of life.

### **6.8.2 Further Research**

China is changing rapidly and particularly rapidly in Zhejiang Province. It will be important to repeat this research at regular intervals in order to monitor changes in the factors influencing infant feeding. In the future more focus groups should be undertaken to understand better the cultural factors in breastfeeding. This study focussed on the residents of Zhejiang. In modern China migrant workers are a major influence on the economy and should be included in future studies.

China is a vast country with a huge population and another reason for the difference may be sample selection. The variation from our study suggests that larger and more widespread studies of breastfeeding are needed and they should preferably use the longitudinal methodology used in this study.

The breastfeeding rates found in this study are well below international and national targets. If the rates found in this study reflect national trends in China, it would mean that China is falling behind in its quest to meet the Millennium goals. This suggests that further health promotion programs for breastfeeding, and particularly for the extension of the period of exclusive breastfeeding are required. There needs to be continuing monitoring of the implementation of the Baby Friendly Hospital principles in the Province. Further research is needed into ways of increasing

community support for breastfeeding and into increasing the number of baby-friendly workplaces.

The overall 'any breastfeeding' rate was high before discharge at 96.5% in city, 96.8% in suburban and 97.4% in rural areas. The 'exclusive breastfeeding' rates in city, suburban and rural areas before discharge were 38%, 63.4% and 61%. The exclusive breastfeeding rate was lower than the national target at discharge and also during the whole follow-up period till the infant was 6 months of age. The lower exclusive breastfeeding trend was most marked in the city.

Chairman Mao believed that the future of China rested on educating the children as the future of the country. Appropriate infant feeding, and particularly breastfeeding should be an important health initiative to strengthen the health of the Children of China.

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# **APPENDICES**

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**APPENDIX I**

**QUESTIONNAIRES**



## Questionnaires 1 Baseline questionnaire

### Breastfeeding in Zhejiang city, suburban and rural (Baseline before discharge in Hospital)

Hospital code      1 city    2 suburban      3 rural

Mother identification number:

101. Date of interview: \_\_\_/\_\_\_/\_\_\_

102. Name of interviewer: \_\_\_\_\_

#### SECTION 1(General information)

103. Mother's Name(in Chinese Version)

104. What is date of birth    DD/MM/YYYY

105. Your birth place? \_\_\_\_\_

106.1 If not the local resident, how long have you lived here? \_\_\_\_\_ Year

107. Are you from a minority group?(if yes, ask nationality)

No    1. go to 109

Yes    2.

108. if yes, which minority group?

Hui      1、

She      2、

Others    3、

109. Are you married?Married      1

Never married    2

Divorced or separated      3

Other (            )

110. What is the highest level of education you have completed?

Never to school before    1

drop in primary school    2

- Primary school 3
- Secondary school 4
- High school/ Occupational School 5
- University 6

111. Were you employed outside the home or studying for the past 6 months?

- Yes, full-time employed 1
- Yes, part-time employed 2
- No job
- Others (please specify)

112. What is your occupation?

- Worker 1
- Farmer 2
- Service employee 3
- Administrator 4
- Professional woman (research, teacher, medical staff) 5
- Private businesswoman 6
- Temporary worker 7
- Unemployed 8
- No job
- Others (please specify)

113. Do you do any other jobs to earn living outside this work?

- Yes 1
- No 2

114. If yes please specify?

115. What is your health insurance status?

	No insurance	Work unit benefit	Cooperation Medicare	Private insurance	Other
Total paid					
Partly ( % )	N/A				

116. What is your baby's health insurance?

	No insurance	Work unit benefit	Cooperation Medicare	Private insurance	Other
Total paid					

Partly ( % )	N/A				

117. Baby father's age \_\_\_\_\_

118. What is baby father's occupation in recent one year?

Worker

Farmer 2

Service employee 3

Administrator 4

Professional 5

Private business 6

Temporary worker 7

Unemployee 8

No job 9

Others (please specify)

119. Is baby's father a local resident?

local resident 1

not local resident 2

120. Baby father's education level

Never to school before/drop in primary school 1

Primary school 2

Secondary school 3

High school/ Occupational School 4

University 5

121. Who are you living with now??

With my husband's family 1

With my parent family 2

With my own family 3

With others(specify)

122. What is the family size which you are living with?

123. The monthly expense for food ( )

¥	≤ 100	≤ 200	≤ 300	≤ 400	≤ 600	≤ 800	≤ 1000	≤1200	≤1500	≤2000	≤2500	>2500

124. On average, your family has enough money for food or living expense or health care for whole year?

Yes 1 go to 126  
No 2

125. If NO, how does your family get support? ( you can have multiple choices )

Parents  
Relatives  
Government  
Others (specify)

126. Does the baby has name now?

Yes 1  
No 2

127. If yes, what is her/his name

\_\_\_\_\_

128 Gender

Male 1  
Female 2

129 Gestation \_\_\_\_\_ Weeks

130 Birth weight \_\_\_\_\_ kg

131 birth height ( \_\_\_\_\_ )cm

132 Date of Birth \_\_\_/\_\_\_/\_\_\_

## **SECTION 2(initial feeding behavior)**

201. How are you feeding your baby now?

Breastfeeding only-----1  
Mainly breast-feeding but “ topping up” with bottle-feeding-----2  
Mix feeding (breast milk and formula) 3  
Mainly bottle-feeding but also breast-feeding-----4  
Bottle-feeding only-----5  
Bank milk 6  
Other(please specify): \_\_\_\_\_

202. What was your baby’s first feed?

Breast milk (or colostrum) -----1  
Formula -----2  
Cow’s milk -----3

- Sugar water -----4
- Plain water -----5
- Bank milk 6
- Other (please specify) \_\_\_\_\_

**For formula feeding**

203. Why are feeding your baby with formula or cow's milk?

- No breast milk 1
- It is better than breast milk -----1
- It is as good as breast milk-----3
- It is available for fresh cow milk in hospital 4
- Others: \_\_\_\_\_

204. How much milk in first time feeding? \_\_\_\_\_( ml).

205. If you are only bottle-feeding, did you try to breast-feed your baby?

- No 1
- Yes 2

206 Did you try feeding your baby any other food?

- No 1 go to 210
- Yes 2

207 If yes, what is the food?\_\_\_\_\_

208 Why did you choose this food?\_\_

- formula or cow milk is not enough for baby
- these food give baby more nutrition element
- doctor /nurse suggestion
- other reason( please specify)

209 How many times a day or few days? \_\_\_\_\_time/( ) day

210. Do you feed tea to your baby after birth?

- No 1 go to 301
- Yes 2 (what kind of tea? )

211 Why you feed baby the tea?( )

**SECTION 3(social factors)**

301. When did you first decide how you were going to feed your new baby?

- Before I became pregnant .....1
- Early in my pregnancy (before 20weeks) .....2

Late in my pregnancy ...(after 20weeks) .....3  
After my baby was born 4  
Others: \_\_\_\_\_

302. Who helped you decide whether you would bottle-feed or breast-feed?  
(Please circle any answers that apply. You can have more than one answer)

No one, I decided myself .....1  
The baby's father. ....2  
My mother .....3  
Other relatives .....4  
Friends. ....5  
My doctor .....  
nurse, midwife.....7  
Other (please specify) \_\_\_\_\_

303. If you are breastfeeding

Why did you decide to breast-feed?

(Please circle any answers that apply) (You can have more than one answer)

Breast milk is better for the baby 1  
Breast-feeding is more convenient 2  
Breast-feeding is cheaper 3  
Mother and baby become closer 4  
Emptying breast is good for mother 5  
The baby's father wanted me to breast-feed 6  
My mother advised me to breast-feed 7  
Other (please specify) \_\_\_\_\_

304. If you decided to bottle-feed your baby from the start, what were the reasons for this choice?

(Please circle any answers that apply. You can have more than one answer)

I don't have enough milk 1  
Bottle-feeding is easier 2  
I don't like breast-feeding 3  
I will go back to work soon after the birth 4  
Mother had health problems 5 Disease name( )  
The baby's father prefers bottle-feeding 6  
Doctor and nurse suggested bottle-feeding 7  
Other (please specify) \_\_\_\_\_

305. Does the baby's father have any preference for how you feed your baby?

Yes, he prefers breast-feeding 1  
Yes, he prefers bottle-feeding 2  
He doesn't mind how I feed my baby 3  
Never really discussed the matter with him 4

306. Have any of the following people supported or encouraged you with breast-feeding?

(Please circle any answers that apply) (You can have more than one answer)

The baby's father 1

Your mother or mother in law 2

Your friends and other members of your family 3

doctor or other clinic staff 4

Community Women's Association 5

Other (please specify) \_\_\_\_\_

307. Did your mother breast-feed any of her children?

Yes 1

No 2

Don't know 3

308. Does your mother have any preference for how you feed your baby?

Yes, she prefers bottle-feeding 1

Yes, she prefers breast-feeding 2

She doesn't mind how I feed my baby 3

Never really discussed the matter with her 4

309. How have your friends fed their babies?

Most of them bottle-fed 1

Most of them breast-fed 2

Some breast-fed and some bottle-fed 3

Friends don't have babies 4

I don't know how they feed babies 5

310. Since delivery of the baby, did any relatives and/or friends visit you and give you some formula as a gift?

Yes 1

No 2

#### **SECTION 4 (Breastfeeding Practice)**

401. When in hospital have any of the following hospital medical staff supported or encouraged you with breast-feeding?

No, I have not any supporting or encouragement in hospital 1

Doctors 2

Nurses 3

Other (specify)

402. Did any hospital staff encourage you to put your baby to the breast right after the birth?

- Yes 1
- No 2 go to 404

403. If yes, who encouraged you to put your baby to the breast right after the birth?  
(Please circle any answers that apply) (You can have more than one answer)

- Doctor .....1
- Midwife .....2
- Nurse .....3
- Other (please specify) \_\_\_\_\_

404. How long after the birth was it before you put your new baby to the breast?

- Immediately after birth, cord still attached 1
- Within 15 minutes 2
- Between 15 and 30 minutes 3
- Between 30 minutes and 1 hour 4
- Within a few hours 5
- The next day 6
- I donot know 7
- Other (please specify) \_\_\_\_\_

405 According to the hospital rules, how often you should feed the baby?

- On demand -----1
- About every 2 hours -----2
- About every 3 hours 3 (Demand feeding is whenever the baby wants to feed, baby crying, waking)
- No body tells me how often I should feed the baby 4
- Others: \_\_\_\_\_

406. Have you followed the hospital feeding frequency rules

- Yes 1 go to 408
- No 2

407 if you can not follow this rule, what is the reason ? ( )

408 Does the hospital staff encourage you “demand feed”?

- yes 1
- no 2

409. Did any staff member teach you how to position and attach your baby to the breast?

- Yes 1



No 2  
I didn't need to be taught 3

410. Did any staff member check how your baby's mouth was attached to your breast when you first started feeding?

Yes 1  
No 2

411. After birth, how long did the baby stay in your room every day?

24 hours-----1  
Day time-----2  
Night Time-----3  
Never-----4  
Other: \_\_\_\_\_

412. How long was it before your milk came in?

Within one day of the birth  
The second day of the birth  
The third day of the birth  
Still waiting for the milk to come in  
Other (please specify) \_\_\_\_\_

413 What did you eat on the first day after delivering baby?

Mixed soup 1  
Soup with vegetable or broth 2  
Soft noodle with sugar 3  
Egg soup 4  
Rice soup 5  
Other special food (specify)

414. Did you eat differently from your usual food in the first day after delivery?

Yes  
No go to 416

415. If yes, do you eat less than your normal every day amount or eat more?

eat more 1 why? ( )  
eat less 2 why? ( )

416. About how long does your baby spend at the breast for a feed?

Baby is bottle-feeding  
Less than 15 minutes  
15 minutes to half an hour  
Half an hour to an hour  
Continuous, over an hour

Other (please specify) \_\_\_\_\_

417. About how many times per day do you feed your baby? (in a 24 hour period)  
\_\_\_\_\_ times

418. How many times you feed during the night? \_\_\_\_\_ (times)

419 Is your breast milk enough for your baby?

Yes ----1

No -----2 go to 421

Don't know -----3 go to 422

420 If YES, How do you know?

Breast is engorge -----1

Baby is satisfied and sleeps well after feeding-----2

Can feel effective sucking -----3

Others:\_\_\_\_\_

421 If breast milk is not enough, How do you know?

Baby sucks hard and long but is not satisfied -----1

Baby is hungry in an hour after breastfeeding -----2

Breast is not full before feeding -----3

Others:\_\_\_\_\_

422If breast milk is not enough, what do you do?

Baby sucks more 1

Eat more special food to increase my milk. 2

Take some traditional medicine to increase milk 3

others 4

423. Which person do you think the most helpful in supporting you to breastfeed

Husband 1

Mother or Mother in law 2

Medical/health worker 3

Others

424 Did you feed your baby with bank milk?

Yes 1

No 2

425. If yes, What device you used for feeding?

Bottle 1

Tube 2

Spoon 3

426. Before feeding bank milk, did baby suck your nipple?

Yes 1

No 2

427. At what age do you plan to stop breast-feeding your baby?

Before baby is 6 weeks old 1

Between 6 weeks and 2 months 2

Between 2 and 3 months 3

Between 4 and 6 months 4

Between 7 and 9 months 5

Between 10 and 12 months 6

Over 12 months 7

Other (please specify) \_\_\_\_\_

428. Have you experienced any of the following since you started breast-feeding?

(Please circle any answers that apply) (You can have more than one answer)

Inverted nipples

Cracked or sore nipples

Baby too tired to feed

Baby has problems sucking

Breasts engorged (too full)

Baby doesn't wake up for feeds

Not enough milk or colostrum for baby

Feeling that I'm not doing very well at breast-feeding

Other (please specify) \_\_\_\_\_

429. When you leave the hospital or health centre, who will/do you contact if you have problems with feeding your infant?

(Please circle any answers that apply) (You can have more than one answer)

hospital doctors 1

Health workers at Commune Health Centre 2

Village Health Workers ,family Planning Health workers 3

Maternal care center 4

Mother/Mother-in-laws 5

Friends and close relatives 6

Others (please specify)

## **SECTION 5 (Health information)**

501 . Have you taken breastfeeding education during pregnancy?

During this pregnancy 1

During previous pregnancy 2

Never have breastfeeding health education 3 go to 506

502 Where do you have breastfeeding education

- In antenatal school 1  
 During staying in hospital 2  
 Other place ( )

503 Your main sources of breastfeeding information (mark the table)

Booklets	
TV	
Lectures	
Individual consultation	
Book and magazine	
Other sources (Specify)	
Never get information	

504. In general, do you think you have had enough help and information about feeding your baby from antenatal class or clinic and hospital staff?

	In antenatal class or clinic	In Hospital
Yes		
No		
Do not want to comment		

505. How do you think about the information given by the hospital?

	In antenatal class or clinic	In Hospital
Very useful		
A little useful		
Not necessary		
Dose not meet the need		
Others		

506. What kind of information or help would you liked?

	In antenatal class or clinic	In Hospital	Other place
What kind of help			

507. Clinic and hospital staff members sometimes have conflicting ideas and opinions about infant feeding, do you feel you have been given conflicting advice by different members of this hospital staff about feeding you baby?

Yes -----1

No -----2

508. If yes, please explain: \_\_\_\_\_

**SECTION 6 (mother and baby's health and living )**

601. How many times have you been pregnant? \_\_\_\_\_

602. Did you have any health problem during this pregnancy?

No -----1

Yes, high blood pressure -----2

Yes, high blood glucose level -----3

Serious morning sick 4

Liver disease 5

Others: \_\_\_\_\_

603. Do you have regular prenatal care after pregnancy this time?

Yes 1

No 2

604. When do you have the first prenatal checking? \_\_\_\_\_ (gestation weeks)

605. Did you have any medications during the pregnancy?

No -----1 go to 607

Yes , it is \_\_\_\_\_

606. Why do you have the medication? \_\_\_\_\_

607 How about your health condition now?

Excellent-----1

General-----2

Not good-----3

I have disease:

608. What is your weight before delivering? ( )Kg

609 Did you drink teabefore pregnancy?

Regular drink 1

Seldom drink 2

never drink 3

610 Did you drink tea after pregnancy?

Never drink 1 go 615

drink tea 2

**If choose 2**

611. When did you drink?

the first semester of pregnancy 1

The second semester of pregnancy 2

the third semester of pregnancy 3

612. What kind of tea did you drink?

Green tea

Black tea

Both

613 what is total number of tea you drunk during the pregnancy

< 2 grams 1

2-5 grams 2

6-10 grams 3

10-20 grams 4

>20 grams 5

614. What is your habit of tea drinking during pregnancy?

Never or hardly ever 1

Few cups a day 2

few cups a week 3

few caps a month 4

Other habits ( )

615 If you change your tea drink habit during pregnancy, what is the reason?

Drink tea is not good for baby 1

Drink tea is not good for mother 2

Other reason ( )

616. How about your life during the pregnancy?

Very happy-----1

Good -----2

General -----3

Bad -----4

Others: \_\_\_\_\_

617. Do you smoke cigarettes during pregnancy?

Yes -----1  
 No -----2 go 619

**If yes**

618. How many cigarettes do you smoke every day? \_\_\_\_\_

619. Does your husband smoke?

Yes 1  
 No 2 go 621

620 Does your husband smoke in front of you or smoke in home during your pregnancy?

Yes 1  
 No 2

621 Do other people smoke in front of you besides your husband during pregnancy?

No 1  
 Few people (<2 person/day) 2  
 Often meet smoking people (>2person/day) 3

622 Do you drink alcohol during pregnancy?

yes -----1  
 No 2 go 624

623.If yes, how much do you drink? (ml)

	Beer	Table wine	rice wines	Spirits or liqueurs	Other alcohol liquid
Per day					
Per week					
small chance					

624. How long have you been in hospital before the delivery? \_\_\_\_\_(days)

625. How was your baby delivered?

Vaginal without forceps or suction  
 Vaginal with forceps or suction  
 Caesarean

626. How are you prefer to delivered baby during pregnancy

Vaginal  
 Caesarean

627. How are you prefer to delivered baby during labour

Vaginal

Caesarean

628. If C/S, what is the reason(could multiple choice)

Mother's reasons 1

Fetal reasons 2

Social reasons 3

Others (        )

629. How many mothers have you shared your hospital room with after deliver

630. Can baby's father stay with you during delivering baby?

Yes    1

No     2

631. How do you feel after delivery?

Very happy-----1

Good -----2

General -----3

Bad -----4

Others:\_\_\_\_\_

632. Do you have any medication after deliver?

No -----1

Yes,        2    it is \_\_\_\_\_

633 How about your baby's appetite?

Very good -----1

Good-----2

General -----3

Bad -----4

634 How about your baby's condition?

Easy going -----1

General -----2

Uneasy and noisy -----3

I don't know -----4

635. What is baby's Apgar score (checking the medical records)

1 minute

5 minute

636. Have your baby spent anytime in a Special Care Nursery?

No -----0



Yes -----1

637. If yes, how long was your baby in this nursery?

Baby still in the nursery (since birth ) -----1

\_\_\_\_\_hours -----2

\_\_\_\_\_days -----3

others: \_\_\_\_\_

638. How was your baby be fed when he/she in the nursery?

Breastfeed in day time, bottle feed in night -----1

Bottle feed breast milk from breast milk bank -----2

Bottle feed cow milk -----3

Bottle feed formula -----4

I don't know how the hospital feeds baby 5

Others: \_\_\_\_\_

639. Has your baby had any health problems, either since the pregnancy or as a result of the birth?

Yes 1

No 2

640. What health problems has your baby had?

641. Is this the first child you have given birth to?

Yes 1 go 701

No 2

642. If no, how long each child was breastfeed? please write how many weeks or months each child was breast-fed. OR please write bottle-fed if bottle-fed from birth

Order of Children	Gender	Birth day	Birth place	Exclusive breastfeed		Total breastfeed period		Height (one year old) (cm)
				Week	Month	Week	Month	

### SECTION 7 (confidence)

For the following questions, there is no right or wrong answer.

Please circle the response that you first think of.

For example, in question 701, if you feel very confident in breast-feeding, circle 5, if you don't feel confident, circle 1. If you fall somewhere in-between please circle the appropriate number between 1 and 5 (also you can mark the scale).



712 Can you continue breastfeeding after you go to work ( or study)?

Yes-----1 go 714

No-----2

713. If no, the reasons is

too far away to breastfeeding place 1

no feeding time 2

Other reason ( )

714If you cannot continue breastfeeding after return work who take care baby?

my parents-----1

parents-in-law -----2

Others: \_\_\_\_\_

715. Do you think you have gender difference for breastfeeding?

Yes 1

No 2

716. If yes, which gender you prefer breastfeeding more?

Male 1

Female 2

717.your present living place is \_\_\_\_\_

718. Approximately, what is the monthly income of your family (try best to probe the income per month of the family in RMB Yuan)

¥	≤300	301-500	501-1000	1001-1500	1501-2000	2001-3000	3001-4000	4001-5000	5001-7000	>7000

**THANK YOU VERY MUCH FOR YOUR PARTICIPATION!**

Your next follow up ring will be \_\_\_\_/\_\_\_\_/\_\_\_\_\_(dd/mm/yyyy)

The possible place for interview will be \_\_\_\_\_

The possible telephone number for next contact is \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_

The best time for interview daytime: \_\_\_\_\_ evening: \_\_\_\_\_ weekend

## Questionnaire 2 Follow up questionnaire

### Breastfeeding in Zhejiang city, suburban and rural (follow up questionnaire within 1- 6 months)

Identification number:

Date of interview: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ DD/MM/YYYY

Name of interviewers:

Mother name:

Baby name:

#### SECTION 1(General Information)

101 In the last visit, the feeding method I observed is -----? (Interviewer fills this question)

Breast-feeding only 1

Mainly breast-feeding and add small amount of water , formula or juice 2

Bottle-feeding only 3

Combination of breast-feeding and bottle-feeding 4

Bank milk 5

Other responses ( )

102 How old the baby is today \_\_\_\_\_ Days /months (Interviewer fills this question)

103 Who are you living with now?

With my husband's family (extended family)

With my parent family (extended family)

With my own family (not in extended family)

With others (specify) \_\_\_\_\_

104 Have you had help from anyone, on a daily or almost daily basis, since we last spoke (or since you left hospital)?

No 1

Yes, husband 2

Yes, my parents 3

- my parents in law 4
- Yes, other family member or relatives 5
- Yes, friends 6
- Yes, staffs in maternity service centre 7
- Yes, maternity servant 8
- Others ( )

105 Since you have been home, how helpful as your husband been in caring for the baby?

- Not helpful-----1
- Sometimes helpful or tries-----2
- Very helpful-----3
- Baby's father not around-----4

106 Who is the most important person to support your breastfeeding now?(go to 107 if not BF)

- No -----0
- Husband-----1
- My mother-----2
- Mother in law-----3
- Others: \_\_\_\_\_

107 How much does your husband like the baby?

- More and more -----1
- General -----2
- Less and less -----3 why? ( )
- Does not like the baby -----4 why? ( )
- Others: \_\_\_\_\_

108 Can you have enough sleep and relax?

- No -----1
- Not enough -----2
- Yes -----3

109. How many hours do you sleep on average now? (include the noon break) ( ) hours/day

how many hours could you have for following activity

- 110. Watch TV ( ) hours/day
- 111 Work or study ( ) hours/day
- 112 House work ( ) hours/day(eg. clean, laundry, cooking )
- 113 Shopping ( ) hours/day
- 114 Exercise ( ) hours/day
- What kind of exercise ( )

**SECTION 2 (Breastfeeding Experience)**

201 How are you feeding your baby?

- Breast-feeding only 1
- Mainly breast-feeding and add small amount of water , formula or juice 2
- Bottle-feeding only 3
- Combination of breast-feeding and bottle-feeding 4
- Other responses ( )

202 Did the mother change the feeding methods? (Interviewer answer this question)

- Yes 1
- No 2 go to 208

203 How old the baby was when you changed feeding method?

	Day	Week	Month
Time of change the feeding method			

204 Why did you change feeding methods?(Could have more than one answers)

- Not enough breast milk 1
- Nipple problems 2 (what is the problem? )
- Breast problems 3 (what is the problem? )
- Return work 4
- Baby sick 5
- Mother tired 6
- Mother sick 7
- Other reasons (specify)

205 Did you consult anyone to solve the above problems

- Yes 1
- No 2 Why not? ( ) go to 207

206 If yes, who?

- The baby's father 1
- My mother or mother in law 2
- Other relatives 3
- Friends 4
- Commune Health workers 5
- Hospital staff 6
- Private health workers 7
- Other responses (specify)

207 Did anyone help you decide to change in feeding method?

- Yes 1(who? )

No 2

208 Are you feeding by the clock or by demand ?

- Demand 1
- Every 2 hours 2
- every 3 hours 3
- every 4hours 4
- Others time schedule ( )

209 How many times per day on average do you feed your baby (24 hours) ( )times

210 How many times, on average would your baby feed between the hours of 10.00pm and 6.00 am? ( )times

211 What is the average length of each feed?

- < 15 minutes 1
- $\geq$  15 minutes but < 30 minutes 2
- $\geq$  30 minutes but 1 hour 3
- $\geq$  1 hour 4
- not regular time 5

212 After you stop feeding, what is the average length of time before baby wants another feed in daytime?

- < 30 minutes 1
- $\geq$  30 minutes but < 1 hour 2
- 1 hour but < 2 hours 3
- $\geq$  2 hours but < 3 hours 4
- $\geq$  3 hours but < 4 hours 5
- $\geq$  4 hours 6
- No regular time 7

213 After you stop feeding, what is the average length of time before baby wants another feed in the evening time?

- < 30 minutes 1
- $\geq$  30 minutes but < 1 hour 2
- $\geq$  1 hour but < 2 hours 3
- $\geq$  2 hours but < 3 hours 4
- $\geq$  3 hours but < 4 hours 5
- $\geq$  4 hours 6

no regular time 7

214 Which side breast do you feed more?

Feeding more in right breast 1

Feeding more in left breast 2

Both breast feeding 3

Breastfeeding only go to 220

215 If you are giving you baby any bottle-feeds, how many bottles did your baby have yesterday (24 hours)? ( ) ml

216 what times do you usually give your baby bottle-feeds?

No particular time 1

Mainly during the day 2

Mainly during the night 3

Late afternoon (around dinner time) 4

Other responses

217 when do you prepare the formula in general?

Before feeding

About half hour before feeding

Half hour to one hour

1-2 hour

2-3 hour

More than 3 hour

Within one day

Other ( )

218 How do you keep the rest bottle milk if you prepare too much?

Throw it away 1

Keep in refrigerator 2

Baby's parents drink it 3

Other

219 How do you clean the milk bottle?

I use boiling water for sterilization 1

I use the tap water to clean 2

I use microwave for sterilization 3

Other method

220 Do you have experience to express the breast milk?

Yes 1

No 2 go to 223



221 What method do you express the breast milk? Could be multiple answer

- Hand press 1
- Hand suction 2
- Electrical suction 3
- Other elder baby suck 4
- Husband suck 5

222 The reason you express the milk?

- Too much milk 1
- My baby is not able to suck mother nipples 2
- Other reason

223 Did you have the following experience after last interview?

- Not enough milk for baby 1
- Cracked or sore nipples or inverted nipples 2
- Breasts engorged (too full) 3 (left side, right side or both)
- Baby has difficulties sucking 4
- Baby bites the nipples 5
- Poor 'let-down' 6
- Baby refuses to breast-feed 7
- Baby too tired to feed i.e. falls asleep at breast 8
- Feeling that I'm not doing very well at breast-feeding 9
- Mastitis or breast infection 10 (left, right or both)
- Other problem

224 Does anyone check your feeding since last interview or discharge from hospital?

- Yes 1 (who?)
- No 2

225 do you have had help and advice about feeding since you left hospital (or since we last spoke)?

- Yes – I got help 1 (who help you? )
- No – I did not get help 2
- I did not need help 3 go to 227

226 if you did not get enough help what kind of help would you have liked?

- Hot line 1
- Community health workers 2
- Private doctor consultants 3
- Brochures 4
- Parents, other family members or friends help 5
- Maternity home 6

Others (specify)

227 Have you seen any advertisements for infant formula since we last spoke or since you left hospital?

Yes 1 (Go to 228)

No 2 (Go to 229)

228 If yes, where did you see the advertisement?

In market 1

In MCH clinic visiting 2

In TV/Radio 3

In Newspaper/ Magazine 4

From the relatives or friends 5

From selling promotion persons 6

Others (specify)

229 Have you used with any types of infant formula?

Yes (Go to 230) 1

No (Go to 232) 2

230 What type of formula? (Don't prompt, unless – 'I don't know', it could be multiple choice)

Domestic milk formula 1 brand \_\_\_\_\_

Import milk formula: 2 brand \_\_\_\_\_

Domestic cereal formula 3 brand: \_\_\_\_\_

Import cereal formula: 4 brand \_\_\_\_\_

Specialised infant formula / other

231 Why did you choose this particular formula? (Do not prompt but probe for more than one answer)

Recommended by hospital staff 1

Recommended by commune health staff 2

Recommended by Mother 3

Recommended by other family members or friend 4

Recommended by markets selling persons 5

Saw it advertised 6

It was the cheapest 7

It is safe for baby no fake formula 8

Available in trial size 9

Saw it being used in the hospital 10

I heard other people use this brand 11

Other reason (please specify)

232 Have you given baby complementary feeding ?

- Yes (go to question 233) 1
- No (go to question 237) 2

233 (If yes), what is your baby having? (Do not prompt, but probe for more than one answer)

- Rice or rice soup 1
- Fruit juice 2
- Infant cereal 3
- Milk-based desserts / yoghurt 4
- Biscuits in a bottle 5
- Fruit paste 6
- Vegetable paste 7
- Protein foods 8
- Other foods(specify)

234 How old is baby when you feed the above food? ( month day)

235 Have you given baby nutritional supplements ?

- no 1
- yes 2 What is the supplement name? (\_\_\_\_\_)

236 How old is baby when you feed the above nutritional supplements?

( month day)

237 Do you give baby water?

- No 1 go to 240
- Yes 2

238 If give baby water, what is the reason?

- Baby is thirsty 1
- Baby needs medicine or nutritional supplements 2
- Baby's stool is dry 3
- More water could help baby quiet 4
- Other reasons

239 How old is baby when you feed water?

( month day)

240 How often did you feed baby the above food or nutritional supplements or water

Food or nutrition name	Day time( hour/or day)	Night( hour/or day)

241 Do these foods change the length between breastfeed?

Yes -----1

No---2

242 Is your baby using any of the following devices to feed?

Bottle -----1

Feeding spoon -----2

Feeding cup -----3

Others: \_\_\_\_\_

243 Do you feed baby tea since last interview?

Yes 1

No 2

244 if yes, how old he/she is when you feed? ( / )day/month

245 What kind of tea do you feed?

Green 1

Black 2

Herb tea 3

246 The reason of feeding the tea? ( )

247 Has your baby experienced any health problems since I spoke to you last (or since leaving hospital)?

No -----1

Yes -----2

248 If yes, type of problem

Vomiting 1

Diarrhoea 2

Respiratory 3

Skin – rash, dermatitis, etc., 4

Jaundice 5

Fever 6

Accident 7

Others

249 Did you take your baby to see anyone about this problem?

No 1

Yes, Commune Health Centre/Inter-commune clinics 2

Yes, see doctor in hospital 3

Yes, Private practices 4

See other person

250 How about your baby's appetite

Very good -----1

Good-----2

General -----3

Bad -----4

251 Is your breast milk enough for your baby?

Yes ----1

No -----2 go to 253

Don't know -----3 go to 254

252 If YES, how do you know?

Breast is engorge -----1

Baby is satisfied -----2

Can feel effective sucking -----3

Others:\_\_\_\_\_ -----4

253 If NO, How do you know?

Baby sucks hard and long but is not satisfied -----1

Baby is hungry in an hour after breastfeeding -----2

Others: \_\_\_\_\_

254 If breast milk is not enough, how do you increase it?

Feed more 1

Using suction 2

Physical therapy 3

Mother eat more protein food 4

Drink some traditional herb 5

Take more rest 6

No other method 7

Others

255 How would you describe your baby's temperament? (Open ended)

Placid / easy going 1

Irritable / fussy 2

Baby is always noisy 3

Combination 4

Don't know 5

256 How much does your baby weigh? (taken? Date: (DD/MM/YYYY)

g); When was that weight

257 How much does your baby height? (                      cm); When was that height taken? Date: (DD/MM/YYYY)

258 How do you feel about your baby's weight change since last visit? (Read out options

- Satisfied / pleased 1
- A little concerned 2
- Very worried or concerned 3
- Don't know 4

259 How does the baby's father feel about breast-feeding and bottle-feeding?

- He prefers breast-feeding 1
- He prefers bottle-feeding 2
- He doesn't mind how I feed my baby 3
- Never really discussed the matter with him 4
- Other responses

260 At what age do you plan to stop breast-feeding?

- Between 1- 2 months 1
- Between 2 and 3 months 2
- Between 4 and 6 months 3
- Between 7 and 9 months 4
- Between 9 and 12 months 5
- Over 12 months 6
- When gets 7
- Other responses

261 Which person do you plan to get advise if you stop breast-feeding?

- No necessary to get advise 1
- Hospital staff 2
- Community health worker 3
- My private doctor 4
- Friend 5
- Mother or family relation 6
- Others

If the woman stopped breastfeeding go on and other monters go question 265

262 When did you stop breast-feeding?

Date (DD/MM/YY) or month (     )

263 Why did you decide to stop breast-feeding?

- Baby old enough to not be breast-fed 1
- No enough breastmilk 2

- Nipples problem(crack, sore, reverse) 3
- Breast infection / mastitis 4
- I donot have confidence for breastfeeding 5
- Breastfeeding make me ugly 6
- Baby likes formula 7
- Baby is sick 8
- Mother is sick 9
- Other

264 Do you feel sorry for baby when you stop breastfeeding baby?

- Yes 1
- No 2

265 If you can have another baby, do you like to breastfeed the other child?

- Yes 1
- No 2 go 267

266 if you answer yes, the reason ( )?

267 if you answer no, the reason ( )?

### SECTION 3

301. Do you drink tea during breastfeeding?

- No 1 (go to 304)
- Yes 2

302 If you drink tea during breastfeeding, what kind of tea do you drink?

- Green tea 1
- Black tea 2
- Herb tea 3

303 What is your tea drinking frequency?

- Seldom ----1
- Regular ---- 2 ( glass/day or week)

304 Do you think tea drinking will influence breastfeeding?

- Yes 1 Why ( )
- No 2
- I don't know 3

305 How many day did you stay in hospital before discharge? Ask in the first follow up interview ( ) day

306. Have you experienced any major changes in your life since I spoke to you last time (move house, family member change or sick ...)?

No-----1

Yes-----2 (specify) ( )

307 Has baby had his/her physical check since last visit?

No 1

Yes 2 Why?( )

308 Have you return to work?

Yes, ----1 What time ( ) Month/day

No ----2 (go to 313)

309 Can you continue breastfeed after back to work?

Yes, I can 1

No, I can't 2 Why not?( )

310 Where are you leaving your baby after returning work if you are still breastfeeding?

Baby comes with me to working place 1

Leave baby in day care 2

Leave baby in the carer's home 3

Leave baby to my parents----- 4

Leave baby to parents-in-law ----- 5

Others: \_\_\_\_\_

311 How many times can you breastfeed during work hour?\_ ( )times

312 Where do you breastfeed baby during work?

Home 1

In public place---2

Isolated room ( in public place or other people's home) ----3

Nursing room-----4

Other place ( )

313 In general, how comfortable do you feel while breastfeeding in front of the following people and places? ASK at 1 AND AT 6 MONTHS

People / places	1 (Not comfortable)	2	3	4	5 (Very comfortable)
female friends and relatives					
male friends					



friends and relatives					
people you don't know?					
Husband					
Public places eating, transport, Park, Shopping centre					

314 How much is your weight? \_\_\_\_\_ ( kg) when it be taken? \_\_\_\_/\_\_\_\_/\_\_\_\_\_

315 Do you smoke?

No-----1

Yes, 2 how much a day on average ? \_\_\_\_\_ ( cigarettes )

316 Does baby's father smoke?

No-----1

Yes, 2 where does he smoke generally?

317 Does other people smoke in front of you?

No 1

Few people 2

Often meet smoking people >2 persons/day 3

318 Do you drink alcohol?

Yes 1, how much a month? \_\_\_\_\_

No 2

319 How would you describe your breastfeeding experience?

Experience	1 (strongly disagree)	2 disagree	3 agree	4strongly agree	5 (Uncertain)
Successful					
work hard					
Enjoyable					

320 Have you been sick since last visit

yes 1 what is health problem( )

no 2

321 Do you take medicine now?

No 1 ( go 401)

Yes 2 the name of medicine( )

322 If yes, Where do you get this medicine ( )

#### SECTION 4

I'm going to read out a few statements that are related to breast-feeding. Please just answer True, False or Don't Know. It really doesn't matter if you don't know. JUST ASK FIRST FOLLOW-UP AND THE LAST FOLLOWUP

401 Feeding more often increases milk supply

True 1

False 2

Don't know 3

402 Babies need to feed more when they are having a growth fast

True 1

False 2

Don't know 3

403 There are lots of women who need to give their babies formula because they can't make enough milk

True 1

False 2

Don't know 3

404 Breast milk nutrition will disappear as soon as stopping breastfeeding?

True 1

False 2

Don't know 3

405 Birth control pills can reduce milk supply

True 1

False 2

Some pill will reduce milk and some not 3

Don't know 4

406 Breastfeeding will change mother's body shape?

True 1

False 2

Don't know 3

- 407 Getting extra rest and relaxation is necessary to ensure a good milk supply  
 True 1  
 False 2  
 Don't know 3
- 408 Feeding formula to a one month old baby will not reduce the amount of milk produced by the mother  
 True 1  
 False 2  
 Don't know 3
- 409 Babies naturally know how to breastfeed correctly  
 True-----1  
 False-----2  
 Don't know-----3
410. Formula-fed babies sleep longer at night  
 True-----1  
 False-----2  
 Don't know-----3
411. Do you think breastfeeding helps mother to lose weight?  
 No -----1  
 Yes -----2  
 Don't know -----3
412. Would you encourage your friends to breastfeeding  
 Yes, definitely-----1  
 Probably-----2  
 Perhaps-----3  
 If she want to-----4  
 No-----5
- 413 If yes, why encourage friend?  
 Better for baby-----1  
 Better for mother-----2  
 Baby could be more quite 3Natural-----4  
 Close relationship with baby-----5  
 Convenience-----6  
 Enjoyment / satisfaction of mother-----7  
 No particular reason-----8  
 Others: \_\_\_\_\_

414. If no, why wouldn't encourage friend?

- Inconvenient-----1
- Lack of enjoyment / satisfaction of mother-----2
- Tied to the house-----3
- Embarrassment-----4
- Too emotionally taxing for mother----5
- Formula is just as good-----6
- Others: \_\_\_\_\_

**Thanks for Your Participation!**

Your next follow up ring will be \_\_\_\_/\_\_\_\_/\_\_\_\_\_(dd/mm/yyyy)

The possible place for interview will be \_\_\_\_\_

The possible telephone number for next contact is \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_

# **APPENDIX II**

## **CONSENT FORM**

# Consent Form

Title of Project: **Factors that Influence Breastfeeding Initiation and Duration in Urban, Suburban and Rural Areas of Zhejiang Province, Peoples Republic of China**

I have been informed of and understand the purpose of the study, and have been given an opportunity to ask questions. I agree to participate in the study as outlined to me. I declare that I preserve my right not to answer any question. I understand that I am free to withdraw from further participation at any time without any negative consequences. I also understand that information gained in this study may be published as grouped statistics..

Full name of participant: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## **APPENDIX III**

# **LETTER OF INVITATION**

## **Letter of Invitation**

### Factors that Influence Breastfeeding Initiation and Duration in Urban, Suburban and Rural Areas of Zhejiang Province, Peoples Republic of China

Dear Mother

I am a staff of this hospital. I am helping Dr. Qiu, Liqian, who is the executive director of Dept. of Women Health, Zhejiang Women Hospital, currently is PhD student in Curtin University Australia, to do breastfeeding research in Zhejiang Province. We are studying the ways that mothers feed their babies here in Zhejiang. The information that we received will be used to help us understand the needs of young babies and their mothers and will be used to develop health promotion programs. All the information that we collect will be kept completely confidential. None of the answers to any of the questions that you give will be shown to anyone else.

I would like you are interested in our study. It will take you 10-20 minutes each month to answer some questions related your new baby feeding during the first half year. You are totally free to reject or withdraw at any time without negative outcomes for your health care and medical treatment. Your assistance will support our study, and finally help other mothers and their babies.

Much thanks for your kindly support. We appreciate your assistance.



# **APPENDIX IV**

## **ETHNIC**

Completed applications, including one original and two copies should be submitted to:

The Secretary, Human Research Ethics Committee  
Office of Research & Development, Curtin University of Technology  
GPO Box U1987, PERTH WA 6845

**PRIVACY STATEMENT**

Any information collected from you by the University will be handled in accordance with the University's policy on maintaining the confidentiality and privacy of information.

"Instructions for Applicants" are on the last page, however please note specifically that:

- Some projects, particularly undergraduate projects, may qualify for submission of an alternative application form titled Application for Approval of Research with Minimal Risk (Ethical Requirements) (Form C) – see Application for details.
- Applications for an extension of ethics approval can be made using a Form B.

**SECTION 1**

Project title	Factors that Influence Breastfeeding Initiation and Duration in Urban, Suburban and Rural Areas of Zhejiang Province, Peoples Republic of China.		
Principal investigator	Dr Liqian Qiu	Student ID <i>(if applicable)</i>	12946015
School/area/organisation	School of Public Health, Curtin University, Bentley		
Mailing Address (if not C/- School)	School of Public Health		
Contact phone number(s)	9266 2952	EMAIL	Liqian.qiu@student.curtin.edu.au
Co-investigator(s)			
Project supervisor	Prof Colin Binns		

Project or application  
Type

1.  **STUDENT please specify**

(i) Doctoral (eg, PhD)

(iii) Master's by Coursework

(ii) Master's by Research

(iv) Honours or undergraduate

*If (i) or (ii) above,*

Have you submitted an application for Candidacy?

YES

NO

2.  **STAFF**

3.  **EXTERNAL**

**CHECKLIST** *If you answer YES to any of the questions below, you will be required to submit an application for ethics approval. Even if all questions are answered NO, your school or division may still require that an ethics application be submitted.*

**Does your research involve -**

*(please circle)*

1	Any novel procedure in the therapy or management of patients in a clinical setting?	NO
2	Any form of physically invasive procedure on patients such as blood collection, exercise regimens or physical examination, and which is not part of their clinical management?	NO
3	Any form of physically invasive procedure on volunteer participants such as body fluid collection (eg blood, urine, semen), exercise regimens or physical examination?	NO
4	The administration of any form of drug, medicine (other than in the course of standard medical procedure) or placebo?	NO
5	Physical pain, beyond mild discomfort?	NO
6	Obtaining and storage of blood, body fluid or tissue samples from the participants?	NO
7	The participation of minors (under 18 years), other than in the observation of normal school activity?	NO
8	Participants who are in a dependent situation, such as students or residents of an institution (such as a hospital, nursing home or prison or patients highly dependent on medical care), other than those who are being observed in their normal environment where such observation is considered innocuous?	NO
9	Participants who may be unable to give or incapable of giving informed consent?	NO
10	The participation of Aboriginal or Torres Strait Islanders, or other peoples from identifiable cultural, ethnic or minority groups?	NO
11	Acquisition of data about organisations or individuals through any form of database and in which those organisations or individuals are directly or indirectly identifiable?	NO
12	Use of questionnaire or interviews which may be linked either directly (eg through recording of names) or indirectly (eg through a cross-linked code) to the individual?	YES
13	Use of questionnaire, interview, or procedure irrespective of the recording of the individual's identity, which might be reasonably expected to cause discomfort, embarrassment, or psychological or spiritual harm to the participants?	NO
14	Processes that potentially exclude and/or disadvantage a person or group, such as the collection of information which may expose the person/group to discrimination or misrepresentation?	NO
15	Collection or disclosure of personal information by a Commonwealth, State or Territory agency that might involve a breach of an Information Privacy Principle (as defined by the Commonwealth Privacy Act 1988 and the Australian Standard)?	NO
16	Collection or disclosure of personal information by a private sector organisation [that might involve a breach of a National Privacy Principle (as defined by the Commonwealth Privacy Act 1988)]?	NO
17	Payments or inducements, other than reasonable recompense, to participants for their participation?	NO
18	Deception of the participants including concealment and covert observation?	NO
19	Disclosure of the response outside the research which could place the participants at risk of criminal prosecution or civil liability or be damaging to their financial standing, employability, professional or personal relationships?	NO
20	Any other ethical issue of the study which has not been addressed in this Checklist?	NO

Supervisor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

(i) If project type is staff or external please provide details

(ii) What is the estimated completion date of the project?

2006/7

(iii) Has an application been made for a research grant for this project? If YES, please state the name of the granting body and the status of the application.

YES  NO

(iv) Has this project been approved by the Curtin Human Research Ethics Committee previously? If YES, please quote the approval number.

YES  NO   
HR\_\_\_\_\_

(v) Is this project part of a larger study? If YES, please provide details.

YES  NO

(vi) Is this project part of a multi-centre research project? If YES, please provide details of the other centres and the approval status of the study at each centre.

YES  NO

(vii) Has this project been submitted or is it likely to be submitted to any other ethics committee? If YES, please supply details including approval dates and approval number. *Attach a copy of all relevant approvals.*

YES  NO

No. But this project will be very similar to previously approved breastfeeding projects and will use similar questionnaires.

(viii) Does this proposal involve: -

- Minors i.e., under the age of 18 (chapter 4)?
- persons with an intellectual or mental impairment (chapter 5)?
- persons highly dependent on medical care (chapter 6)?
- persons in dependent or unequal relationships (chapter 7)?
- Collectivities (such as other specified racial groups) (chapter 8)?
- Aboriginal and Torres Strait Islander peoples (chapter 9)?
- ionising radiation (X-rays, fluoroscopy or radioisotopes) (chapter 10)?\*
- assisted reproduction technology (chapter 11)?
- clinical trials (chapter 12)?
- innovative therapy or intervention (chapter 13)?
- epidemiological research (chapter 14)?

*Please answer ALL questions with a tick*

YES	POSSIBLY	NO
		X
		X
		X
		X
		X
		X
		X
		X
		X
		X
		X

- use of human tissue samples (chapter 15)?
- human genetic research (chapter 16)?

		X
		X

*\*For research involving ionising radiation, microwaves, lasers or ultraviolet light, researchers must submit a separate application to the Radiation Safety Officer, for consideration of approval by the Radiation Safety Committee. Research cannot commence without such approval.*

Research involving any of the categories listed above is subject to compliance with the provisions of the NH&MRC *National Statement on Ethical Conduct in Research Involving Humans*. Please refer to the relevant chapters for details.

(ix) Please indicate the chapters you have consulted.

(x) Does your research comply with the provisions therein?

YES  NO

(xi) Provide a brief description of the participants/collectivities involved. How will participants be recruited? *Researchers who would like permission to have access to the personal details of staff or students of Curtin for the purposes of directly inviting them to participate in a research study (e.g. contact details) will require both the approval of (i) the Human Research Ethics Committee and (ii) the General Manager, Student and Staff Services, in that order.*

Participants will be recruited from mothers delivering at hospitals in Zhejiang Province PR China. Mothers will be given information about the project and be invited to participate. Mothers who decline to participate will not be discriminated against in any way in the provision of continuing care

(xii) Will personal (identified) data be obtained from a Commonwealth Agency? If YES, please specify, e.g. Department of Foreign Affairs. (see Section 1.1 of the *Guidelines under Section 95 of the Privacy Act 1988*, “The use of the Guidelines”)?

YES  NO

(xiii) Will **health** information data be collected from an **organisation in the private sector** (i.e. not from a Commonwealth or State government agency)? e.g. use of patient information from a private hospital. If YES, please specify the organisation and type of data, and answer questions (a) – (d) below. (see *Guidelines under Section 95A of the Privacy Act 1988*, page 5; pages 11-17 and pages 35 – 44 the ‘National Privacy Principles (NPPs)’)

YES  NO   
(if No, go to Section 2 “Protocol” below)

Organisation from which health information data will be collected:

The number or records involved:

Description of data to be collected:

- 
- a. Does the data include information that identifies the individual(s) involved?  
*if yes, go to (b)*    **YES**  **NO**
- b. Could the research be conducted using de-identified information?  
*if no, go to (c)*    **YES**  **NO**
- c. Is the use or disclosure a directly related secondary purpose within the reasonable  
expectations of the individual?  
*if no, go to (d)*    **YES**  **NO**
- d. Is it proposed to undertake the research, with the consent of the individual(s)  
involved?  
*If no, then Section 95A Guidelines will be applied. Refer to Guidelines A.1 to A.3*    **YES**  **NO**

## SECTION 2 – PROTOCOL

The main concern of the Human Research Ethics Committee in evaluating proposals is to establish conformity with the NHMRC *National Statement on Ethical Conduct in Research Involving Humans*. Researchers must comply with the provisions of the National Statement. Chapters 1 *Principles of Ethical Conduct* and 18 *Privacy of Information* are essential reading for all applicants prior to completion of the following questions. **All questions must be answered.** Applicants are required to provide a brief summary **in the spaces provided**. This will assist in expediting the review process. Non-compliance with this request will result in the application being returned to the applicant.

- 1. Briefly describe (in point form and in less than 100 words) your proposed procedure including: recruitment of subjects, experimental design and/or procedure and analysis of data.** *An essential condition of the ethical acceptability of research is the determination that the scientific quality of a proposal are such that the objectives of the proposal can reasonably be expected to be achieved.*

Mothers will be recruited into the project after delivery in several hospitals in urban, suburban and rural Zhejiang Province.  
Informed written consent will be obtained  
A baseline questionnaire will be completed while in hospital  
Follow-up questionnaires will be administered by telephone or in person at 2, 6, 10, 14, 18 and 24 weeks  
Information will be obtained on infant feeding at each point of time.  
The factors influencing the initiation and duration of breastfeeding are assessed using logistic regression models accounting for significant difference.

- 2. Provide detail that demonstrates the research is being conducted or supervised only by persons or teams with experience, qualifications and technical competence appropriate to the research.**

Dr Qiu is a specialist obstetrician and is Executive Director, Dept. of Women's Health, Women's Hospital, School of Medicine, Zhejiang University. She will be using the data for her PhD at Curtin University.

Prof Binns has extensive experience in epidemiologic research, including three previously approved projects in PR China.

- 3. Provide sufficient procedural/experimental detail to enable the Committee to judge whether any risks to which the participants may be exposed are warranted by the possible benefits/outcomes of the study. How will the researcher deal with situations in which participants are identified to be at risk?**

Your answer must demonstrate that the welfare, rights, beliefs, perceptions, customs and cultural heritage of the participants are observed; the risks of harm or discomfort to participants is minimised; and that respect for the dignity and well being of the participants takes precedence over the expected benefits

Breastfeeding brings considerable benefits to all infants. However breastfeeding rates are under threat in PR China due to changes in lifestyle and the promotion of infant formula.

The questionnaires used will collect information on infant feeding and attitudes to breastfeeding. The questionnaires will be given an identifying number before the information is coded and entered into SPSS. The questionnaires will be kept in locked storage for seven years. Only aggregated statistical data will be used for publications and reports.



**4. Describe how participants will consent to participate in the study, and how they are informed of their rights.**

Attach copies of the Participant Information Sheet and Consent Form intended for use. Approval cannot be granted until these documents have been submitted. *Your answer should demonstrate that the provisions of Section 1.7-1.12 of the National Statement have been satisfied.*

Mothers will be given a consent form, which includes and explanation of the project. As some mothers are likely to be illiterate, the form will be read to all eligible participants to avoid embarrassment. Signed consent will be obtained before mothers can enter the study.

**5. Describe the extent to which issues of privacy are to be addressed in relation to the collection of data from individuals or groups, and the extent to which the collection intrudes upon the personal affairs of the individual or group. Refer to the National Privacy Principles (see the NHMRC Guidelines under Section 95A of the Privacy Act 1988). Your response should specifically address:-**

- a. Justification if identified or potentially identifiable information is to be used rather than de-identified information
- b. Justification if consent is not being sought to use personal information.
- c. The specific uses to which the personal information used during the study will be applied.
- d. The proposed method of publication of results of the research

Identifiable questionnaires will be used only until the follow up questionnaires have been collected. When data is entered into the computer only an ID number will be used. The identity key will be kept in a locked office at Curtin. All original questionnaires will be kept in a locked office at Hangzhou for seven years.

**6. Provide details of the storage and security arrangements for personal information that will be collected within the study to ensure confidentiality.**

*Where personal information about research participants or a collectivity is collected, stored, accessed, used, or disposed of, a researcher must strive to ensure that the privacy, confidentiality and cultural sensitivities of the participants and/or the collectivity are to be fulfilled.*

*Refer to the Joint NHMRC/AVCC Statement and Guidelines on Research Practice, Section 2 'Data Storage and Retention' Your response should address: -*

- a. The estimated time of retention of the personal information
- b. The identity of the custodian(s) of the personal information used during the research
- c. Security standards to be applied to the personal information
- d. List of personnel with access to the personal information
- e. Standards that will be applied to protect personal information disclosed by a Commonwealth agency or private sector organisation (if applicable)
- f. The media or forms of the data that are to be stored. For example, electronic data on floppy disc, hard copies, cassette tapes, field samples, photographs, video tape, etc.

- a. Data will be retained for seven years
- b. The data custodians will be Dr Qiu and Prof Binns
- c. All data on computers will be de-identified. All questionnaires will be kept in locked offices
- d. Dr Qiu, Prof Binns
- e. N/A
- f. Questionnaires will be kept in their original form. Computer records will be de-identified.

**7. Provide a description of any survey instruments/questionnaires intended for use in the study, including questions/material intended for interviews/workshops and semi-structured interviews. All such material must be submitted for approval. If the instrument has not been designed at the time of application, then a brief description of the anticipated nature of the questions must be provided. Instruments that are widely recognised as being standard in the field should be identified as such, or be available for viewing upon request. Final approval will be dependent on the satisfactory submission of all instruments.**

Questionnaires will be as similar as possible to the Perth Infant Feeding Study which has HREC approval.

**8. Attach a detailed description of the project using the headings below.**

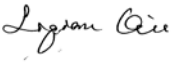
- Aims/objectives of the study
- Background
- Significance/Justification of the study
- Methods (including - data to be collected and source of data; target population; study period; participant recruitment procedures, instruments)
- References

**Do not attach copies of grant applications**

*Recommended length = maximum 10 pages (one and a half line spacing), excluding references. Research students may alternatively attach a copy of their candidacy research proposal. Pages must be numbered. Applicants are reminded to use non-specialist language.*

**SIGNATURES**

Principal Investigator




Date

06/30/2004

Project Supervisor



Date



Head of School (*only where investigator is a student*)



Date



## INSTRUCTIONS FOR APPLICANTS

- a Completed applications, including **one original and two copies** should be submitted to:

**The Secretary, Human Research Ethics Committee, C/- Office of Research & Development  
Curtin University of Technology, GPO Box U1987, PERTH WA 6845**

\* Applications for undergraduate projects may be submitted direct to the Committee Member or Ethics Coordinator in the relevant School/Division for Fast-track approval – see *Application Procedures and Guidelines*

- b Prospective applicants should refer to the *Application Procedures and Guidelines*, and the *Checklist* (page 2 of this application) to determine if an application is required. An application must be submitted if any of the *Checklist* questions are answered ‘yes’.
- c Applications should be word processed/typewritten. This application form can be downloaded from the Research & Development website:  
<http://research.curtin.edu.au/ethics/hrec.html>
- d Applicants MUST refer to the NHMRC *National Statement on Ethical Conduct in Research Involving Humans* before submitting an application. This document can be accessed from the following website:  
<http://www.health.gov.au/nhmrc/publications/synopses/e35syn.htm>
- e Applicants are advised to consult the *Joint NHMRC/AVCC Statement and Guidelines on Research Practice*, Section 2 “Data Storage and Retention”  
<http://www.health.gov.au/nhmrc/research/general/nhmrcavc.htm>
- f If data is obtained from a Commonwealth agency, applicants must consult the NHMRC *Guidelines under Section 95 of the Privacy Act 1988*, Section 2 “Procedures to be followed by researchers”  
<http://www.health.gov.au/nhmrc/publications/synopses/e26syn.htm>
- g If health data is obtained from an organisation in the private sector, applicants must consult the NHMRC *Guidelines under Section 95A of the Privacy Act 1988*, page 5; pages 11-17  
<http://www.health.gov.au/nhmrc/publications/synopses/e43syn.htm>
- h Applications MUST include all relevant attachments eg *Participant Information Form* and *Consent Form*; advertisements; letters of invitation; survey instruments (or if not yet developed, the proposed content of the instrument), list of questions for interviews; details of ethical approval from other Institutional Ethics Committees as applicable; and description of project as requested in Q8. These items are ESSENTIAL and must be submitted for consideration before approval will be granted.

MINUTE

<b>To</b>	Dr Liqian Qiu School of Public Health
<b>From</b>	Max Page, Executive Officer, Human Research Ethics Committee
<b>Subject</b>	Protocol Approval <b>HR 88/2004</b>
<b>Date</b>	1 July 2004
<b>Copy</b>	Prof Colin Binns, Public Health* Graduate Studies Officer, Division of Health Sciences

Office of Research and Development

**Human Research Ethics Committee**

TELEPHONE 9266 2784

FACSIMILE 9266 3793

EMAIL s.darley@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled *"Factors that influence breastfeeding initiation and duration in urban, suburban and rural areas of Zhejiang Province, Peoples Republic of China"*.

Your application has been reviewed by members of the HREC reviewing panel who have recommended that your application be granted **provisional approval**, subject to further information/clarification of the points raised below. When the provisions have been met to the satisfaction of the reviewers, you will be authorised to commence your research. Approval for this project will be referred to the HREC for ratification at its next meeting to be held on 17/08/2004. In the event the HREC does not ratify the recommendation, or would like further information, you will be notified.

1. From the wording of the patient information sheet, it appears that person(s) other than the chief investigator will administer the questionnaires, yet the issues of maintenance of patient confidentiality and standardisation of administration of questionnaire have not been mentioned in this proposal. Please clarify this issue.
2. The questionnaire requires significant reworking and rewording. I feel reworking the questionnaire would produce more meaningful data for analysis within the scope required for PhD thesis. Quantification of answers lacking in a number of questions where this is relevant and a quantitative basis rather than purely qualitative would seem more appropriate and lend itself to greater analysis and discussion of results obtained.
3. Please confirm that disposal of data collected (after seven years) will be in accordance with National Health and Medical Research Council guidelines.

Please forward your response to the Secretary, HREC, C/- Office of Research & Development as soon as possible. Provisional approval of this project is for a period of twelve months **1/07/2004 to 30/06/2005**. The provisional approval number for your project is **HR 88/2004**. *Please quote this number in any future correspondence.*

*Applicants should note that it is the policy of the HREC to conduct random audits on a certain percentage of projects that have been approved. These audits may be conducted at any time following the commencement of the project. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report including information on follow up of participants.*

When the project has finished or if at any time during the twelve months changes/amendments occur, or if a serious or unexpected adverse event occurs, the attached FORM B is to be completed and returned to Mrs Sinéad Darley, (Secretary, HREC) C/- Office of Research & Development as soon as possible.



**APPENDIX V**

**COPYRIGHT AND CONTRIBUTION  
FORMS**

**Paper 1**

Written statement of co-author

To Whom It May Concern

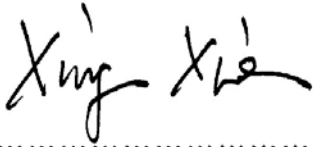
I, Prof Xing Xie, Prof Lee AH, Binns CW contributed to the design and writing the paper entitled

**Infants' first feeds in Hangzhou, PR China.** Asia Pacific Journal of Clinic Nutrition.

2007; 16 (Suppl):458-461

Undertaken with Liqian Qiu

Signed



.....  
.....  
Prof. Xing Xie

Signed



Liqian Qiu

Signed

**Prof. Colin Binns**

Signed

**Prof. Andy Lee**



**Paper 2**

Written statement of co-author

To Whom It May Concern

I, Prof. Xing Xie, Dr. Yun Zhao, Prof . Colin Binns, Prof . Andy Lee, contributed to the design and writing the paper entitled

**A cohort study of infant feeding practices in city, suburban and rural areas in Zhejiang Province, PR China.** International Breastfeeding Journal. 2008 Mar 3;3:4

Undertaken with Liqian Qiu

Signed



.....  
.....

Prof. Xing Xie

Signed



Liqian Qiu

Signed

**Prof. Colin Binns**

Signed

**Prof. Andy Lee**

Signed

**Dr. Y Zhao**

**Paper 3**

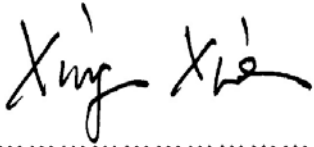
Written statement of co-author

To Whom It May Concern

I, Prof. Xing Xie, Dr. Yun Zhao, Prof. Colin Binns, Prof. Andy Lee, contributed to the design and writing the paper entitled **Initiation of breastfeeding and prevalence of exclusive breastfeeding at hospital in urban, suburban and rural areas of Zhejiang China.** International Breastfeeding Journal. 2009 Jan 4;1

Undertaken with Liqian Qiu

Signed



.....  
.....  
Prof. Xing Xie

Signed



Liqian Qiu

Signed

**Prof. Colin Binns**

Signed

**Prof. Andy Lee**

Signed

**Dr. Y Zhao**

**Paper 4**

Written statement of co-author

To Whom It May Concern

I, Prof. Xing Xie, Dr. Yun Zhao, Prof. Colin Binns, Prof. Andy Lee, contributed to the design and writing the paper entitled

**Breastfeeding following caesarean section in Zhejiang Province: public health implications.** Asia Pacific Journal of Public Health; 2008, Supplement, 220-227.

Undertaken with Liqian Qiu

Signed



.....  
.....

Prof. Xing Xie

Signed



Liqian Qiu

Signed

**Prof. Colin Binns**

Signed

**Prof. Andy Lee**

Signed

**Dr. Y Zhao**

**Paper 5**

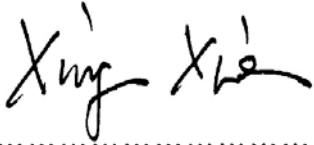
Written statement of co-author

To Whom It May Concern

I, Prof. Lee AH, Prof. Binns CW, Prof. Xing Xie, Dr. Yun Zhao, contributed to the design and writing the paper entitled  
**Combating the Melamine disaster in China by improving breastfeeding duration: A cohort study of infant feeding practices in Zhejiang Province, PR China**

Under review

Signed



.....  
.....  
Prof. Xing Xie

Signed



Liqian Qiu

Signed

**Prof. Colin Binns**

Signed

**Prof. Andy Lee**

Signed

**Dr. Y Zhao**