

Parental Smoking and Breastfeeding in Xinjiang, PR China: A Cohort Study

Fenglian Xu MSc PhD¹,

Colin Binns MBBS PhD²,

Hong Zhang MNSc³,

Guirong Yang BNSc³,

Yun Zhao MSc PhD²

¹ Medical College of Shihezi University; Shihezi City, Xinjiang-Urygur Autonomous Region, PR China, 832002;

² School of Public Health, Curtin University of Technology, Western Australia, 6845;

³ Number One Affiliated Hospital of Shihezi University, Shihezi City, Xinjiang-Urygur Autonomous Region Xinjiang, PR China, 832000

Corresponding Author:

Prof Colin Binns MBBS MPH PhD
School of Public Health
Curtin University
GPO Box U1987
Perth, Western Australia 6845
c.binns@curtin.edu.au

Keywords

Smoking
Breastfeeding
Breastfeeding duration
China
Cohort Study

Notes on Authors:

Fenglian Xu. Professor of Public Health and Nursing, Medical College of Shihezi University and Research Fellow, National Centre for Perinatal Epidemiology, University of NSW, Sydney Australia.

Colin Binns. Professor of Public Health, Curtin University. Editor of Infant Feeding Guidelines (Australia) and author of 320 papers on infant feeding and public health nutrition.

Hong Zhang Clinical nurse educator in Shihezi

Guirong Yang Clinical nurse educator in Shihezi

Yun Zhao. Senior lecturer in biostatistics in the School of Public health at Curtin University with extensive experience in analysis of breastfeeding studies.

ABSTRACT:

A cohort of 1088 parent and infant pairs in Xinjiang, PR China was recruited to study their infant feeding practices and factors associated with them including paternal smoking. Mothers were contacted in hospital and again at 0.5, 1.5, 2.5, 3.5, 4.5 and 6 months. Survival analysis was used to calculate breastfeeding rates in smoking and non-smoking groups.

The paternal smoking rate in Xinjiang was 64.8%, but the maternal smoking rate was only 1.7%. The 'any breastfeeding' rates before discharge were 92.8% in both groups and 'exclusive breastfeeding' rates 66% and 75% in paternal smoking and non-smoking group respectively. The 'any breastfeeding' rate at six months in paternal smoking group (69%), lower than paternal non-smoking group (77%). A similar trend was observed for 'exclusive breastfeeding' (4% and 11% in paternal smoking and non-smoking groups respectively). The median duration of 'exclusive breastfeeding' in the paternal smoking group was 0.5 (95% CI: 0.4-0.6) month compared to 1.5 (95% CI: 1.2-1.8) months with non-smoking fathers. The results suggest a paternal smoking control program in Xinjiang would improve breastfeeding.

SUMMARY STATEMENT

Smoking by mothers is known to decrease breastfeeding duration. In this study in the far North West of China, Xinjiang Province, smoking by fathers led to lower rates of exclusive breastfeeding and shorter duration of breastfeeding.

Smoking and Breastfeeding in Xinjiang, PR China

Breastfeeding benefits infants by protection against infection and some chronic diseases and it leads to improved cognitive development.^{1,2} The World Health Organization (WHO) recommended 'exclusive breastfeeding' for six months, with introduction of complementary foods and continued breastfeeding thereafter.³ The target for China was to achieve a national 'exclusive breastfeeding' rate at four months of 80% by 2000.⁴

Studies in several cultures have shown that maternal smoking was negatively associated with breastfeeding duration.⁵⁻⁹ Women who smoked during pregnancy were less likely to breastfeed their babies than women who did not smoke.^{10,11} Prenatal maternal tobacco use was significantly associated with failure to exclusively breastfeed at about two weeks of age in Oregon and a similar result was found at three months in a study from Chile.^{10,12} A large study from Sweden (n=16058) found a negative association between maternal smoking and exclusive breastfeeding at four months, but no association was found with smoking of fathers.¹³ But in some studies, the relation between maternal smoking and breastfeeding was not significant. A cohort study in Australia found no significant relation between smoking and breastfeeding rate in aboriginal mothers, although in this study the high rate of maternal smoking (60%) and the relatively small sample (n=450) would have made it difficult to detect an effect.¹⁴ Smoking has also been shown to change infant sleeping patterns.¹⁵ In an early review of smoking and breastfeeding Minchin recommended against smoking cigarettes, but was not able to quantify an effect on breastfeeding duration.¹⁶

While maternal smoking and breastfeeding have been frequently debated in breastfeeding studies, few studies have considered the relationship between paternal smoking and breastfeeding. A study in Shanghai showed that exposure to passive smoking increased the risk of infant's respiratory illness.¹⁷ The risk was further enhanced in infants who were not breastfed.¹⁷ However the relationship between paternal smoking and breastfeeding was not documented in this study.

China is a country with a high male smoking rate and a considerably lower rate of female smoking. A national survey in 1996 showed that smoking rates were 63% in the males and 4% in females in China.¹⁸ The Xinjiang Uygur Autonomous Region is located in the far west of China and has a population of 19.6 million, including 45.7% Uygur, 39.7% Han, 7.0% Kazakh and at least ten smaller ethnic groups. The birth rate was 16 per thousand and death rate 5.1 per thousand in 2004.

Breastfeeding initiation rates in Xinjiang Province are high, 92% at discharge, but there are differences between the different ethnic groups¹⁹⁻²¹. We have not been able to locate any previously studies on breastfeeding from Xinjiang or on maternal or paternal smoking and breastfeeding in China. The objective of this study was to explore the relationship between paternal smoking and breastfeeding rates and to provide data for implement breastfeeding promotion program.

Methodology

A longitudinal cohort study of infant feeding practices was undertaken in the Xinjiang Uygur Autonomous Region, PR China. Mothers who delivered babies during 2003 and 2004 were contacted while in hospital and were invited to participate in the study. After discharge, mothers were contacted in person or by telephone at approximately monthly intervals (at 0.5, 1.5, 2.5, 3.5, 4.5 and 6 months respectively) using a structured questionnaire to obtain details of infant feeding practices.

A total of 1256 mothers were randomly recruited in five hospitals or institutes located in urban areas (Shihezi People's Hospital, Shihezi Maternal and Child Health Care Institute, Urumqi Maternal and Child Health Care Institute) and rural areas (Chabuchaer Maternal and Child Health Care Institute and Yumin County Hospital). Almost all mothers (1219 or 97%) agreed to participate and 1088 (87%) fathers completed the father's questionnaires about breastfeeding. Urumqi is the capital city of Xinjiang where the Uygur ethnic group is in the majority, while Shihezi is a predominantly Han ethnic area. Chabuchaer and Yumin counties have a larger concentration of Kazakh people and other minorities.

The majority of participants, including the minority groups, could speak and read Chinese (Mandarin). The questionnaire was originally prepared in Mandarin, and was also translated into the Uyghur language, which can be understood by Kazakh mothers. For those who could not read Chinese, trained nurses, who were fluent in the ethnic languages, were available to help them complete the questionnaires. For all minority mothers, follow-up calls and visits were made in their own ethnic languages by nurses from their own ethnic group.

The questionnaires were based on those used extensively in breastfeeding cohort studies in Australia, Vietnam and Kenya.²²⁻²⁵ The questionnaires were designed to identify the feeding method and to collect information on factors associated with breastfeeding. The questionnaires included standard questions on parental smoking habits based on the Australian National Health Survey.²⁶ After translation the questionnaires were tested in focus groups to ensure cultural appropriateness.

The project was approved by Xinjiang local research authorities (Shihezi University, Urumqi Science Research Committee) and the Human Research Ethics Committee of Curtin University, Australia. Mothers who agreed to participate in the study signed the consent page in front of the questionnaire and were informed of their rights to withdraw from the follow-up process at anytime without prejudice. All of the personal data collected were kept confidential.

All data analyses were carried out using the Statistical Package for Social Science (SPSS), release 14.0 (SPSS Inc., Chicago, IL, USA). Crosstabs was used to describe smoking rates and Chi-Square Test or Fisher's Exact Test was used to compare the smoking rates in different demographic groups. Survival analysis was performed on data from women who were breastfeeding at the time of discharge from hospital. A life table model was used to calculate breastfeeding rates and a Kaplan-Meier model was used to calculate median of 'exclusive breastfeeding' in both smoking and non-smoking groups and assess their differences. Cox regression analysis was undertaken to explore factors affecting breastfeeding duration and the hazard risk (HR) refers to the risk of cessation of breastfeeding.

The definitions used in this paper are:

‘Any breastfeeding’: The child has received breastmilk (direct from the breast or expressed) with or without other drink, formula or other infant food.²⁷⁻²⁹

‘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.^{27, 29, 30}

Results:

Father’s smoking rates in the different demographic groups are detailed in Table 1. The overall paternal smoking rate was 64.8% in Xinjiang and the maternal smoking rate, 1.7%. There were no significant differences in the smoking rates between the ethnic groups ($p>0.05$).

Alcohol drinkers had higher smoking rates than non-drinking groups ($p<0.01$). In the different occupational groups, the smoking rates of farmer’s were lower than other groups ($p<0.05$). Fathers who had 10-12 years education were more likely to smoke ($p<0.01$) than those with less education. There were no significant differences of smoking rates in ethnicity, family annual income, paternal age, birthweight and delivery methods.

The ‘any breastfeeding’ rates in the paternal smoking and non-smoking groups are shown in Table 2. The ‘any breastfeeding’ rates before discharge were 92.8% in both groups. The ‘any breastfeeding’ rates at six months were 77% in the paternal smoking group and 69% in the non-smoking group.

Using life table analysis, the ‘any breastfeeding’ rates in paternal smoking group were significantly lower than non-smoking group (statistic=6.68, $p<0.01$). (See Figure 1). The ‘exclusive breastfeeding’ rates in smoking and non-smoking groups are shown in Table 3. In the paternal smoking group, the ‘exclusive breastfeeding’ rate was 66% before discharge and 4% at six months compared to 75% and 11% respectively in the non-smoking group. Using Life Table analysis, the ‘exclusive breastfeeding’ rates in paternal smoking group were lower than the non-smoking group ($p<0.01$).

By Kaplan-Meier analysis, the median survival time of 'exclusive breastfeeding' in the paternal smoking group was 0.5 (95% CI: 0.4-0.6) month and for the non-smoking group was 1.5 (95% CI: 1.2-1.8) months. The 'exclusive breastfeeding' duration in paternal smoking group was shorter than non-smoking group (Log Rank, statistic=23.96, $p<0.01$). Details are shown in Figure 1.

The hazard ratios of four factors entered into the Cox model are shown in Table 4. The hazard ratio of paternal smoking was 1.74 in the 'any breastfeeding' group and 1.23 in the 'exclusive breastfeeding' group compared to the non-smoking group. Table 4 also shows that paternal smoking decreased the duration of 'any breastfeeding' and 'exclusive breastfeeding'.

Discussion

In the longitudinal ALSPAC study from the United Kingdom, maternal smoking not only increased the risk of baby's respiratory illness and sudden infant death syndrome,³¹ but also decreased breastfeeding duration.¹¹ In the present study the maternal smoking rate was lower in Xinjiang mothers than other places or countries.^{14, 18, 32, 33} This is good for breastfeeding and for infant health. It is a challenge for health promotion in Xinjiang Province to resist the promotion of cigarettes to young women that has happened in other regions of China and in other Asian countries.

However in contrast to the mothers, the father's in Xinjiang had a very high smoking rate at 65%. This is a major challenge for the public health authorities in this region. The fathers who smoke expose their families to the effects of side stream smoke and in this study the proportion of infants being breastfed was reduced by about 10% at all ages. This is a significant health and economic impost on the infants in the study. The decreased breastfeeding rates in paternal smoking families in our study is similar in magnitude to that reported in studies of maternal smoking and breastfeeding.^{34, 35}

The physiological mechanism for paternal smoking decreasing the duration of breastfeeding is unknown and requires further studies. The effect of maternal smoking on breastfeeding performance could be due to chemical suppression of lactation, but there is not consensus about the mechanism and further studies are

needed.³⁶ Whatever the actual mechanism, the public health there is no doubt about the public health objective required, which should be to reduce smoking.

Several limitations need to be considered when interpreting the results of this study. The data on smoking was self-reported and in common with most epidemiological studies no other objective measures were used. As follow-up in this study was terminated at six months, the median duration of 'any breastfeeding' could not be determined. However the survival rates at six months still show the differences in smoking and non-smoking groups.

Conclusion

The 'any breastfeeding' rate at six months in the paternal smoking group (69%) was lower than in the paternal non-smoking group (77%). A similar trend was found for 'exclusive breastfeeding' (4% and 11% in paternal smoking and non-smoking groups respectively). Paternal smoking increased the risk of discontinuing 'any breastfeeding' (HR=1.74, 95% CI=1.07-2.83) and exclusive breastfeeding (HR=1.23, 95% CI=1.03-1.47). The results suggest a paternal smoking education program in Xinjiang could have beneficial effects on breastfeeding rates.

Acknowledgements

We gratefully acknowledge the willing assistance given by the mothers in our study, the hospital staff and nursing students. Without this assistance the study would not have been possible.

Competing Interests

The authors have no competing interests to declare

Funding

The study was funded by Shihezi and Curtin Universities.

References

1. NHMRC. *Food for Health: Dietary Guidelines For Children And Adolescents In Australia*; 2003.
2. World Bank. "Repositioning nutrition as central to development: A strategy for large-scale action." *The World Bank Report: p167*. Washington: World Bank; 2006.
3. World Health Organization. *The optimal duration of exclusive breastfeeding: Report of an expert consultation* Mar 2001. WHO/NHD/01.09.
4. Niu X, Zhao Y, Liu Q. Education outline of Chinese Children's Development Plan in 1990's. *Central Broadcasting and Television University Publication*. 1993.
5. Scott JA, Binns CW. Factors associated with the initiation and duration of breastfeeding: a review of the literature. *Breastfeed Rev*. Mar 1999;7(1):5-16.
6. Liu J, Rosenberg KD, Sandoval AP. Breastfeeding duration and perinatal cigarette smoking in a population-based cohort. *Am J Public Health*. Feb 2006;96(2):309-314.
7. Amir LH, Donath SM. Does maternal smoking have a negative physiological effect on breastfeeding? The epidemiological evidence. *Breastfeed Rev*. Jul 2003;11(2):19-29.
8. Horta BL, Victora CG, Menezes AM, Barros FC. Environmental tobacco smoke and breastfeeding duration. *Am J Epidemiol*. Jul 15 1997;146(2):128-133.
9. Giglia R, Binns CW, Alfonso H. Maternal cigarette smoking and breastfeeding duration. *Acta Paediatr*. Nov 2006;95(11):1370-1374.
10. Letson GW, Rosenberg KD, Wu L. Association between smoking during pregnancy and breastfeeding at about 2 weeks of age. *J Hum Lact*. Nov 2002;18(4):368-372.
11. Donath SM, Amir LH. The relationship between maternal smoking and breastfeeding duration after adjustment for maternal infant feeding intention. *Acta Paediatr*. Nov 2004;93(11):1514-1518.
12. Barria RM, Santander G, Victoriano T. Factors associated with exclusive breastfeeding at 3 months postpartum in Valdivia, Chile. *J Hum Lact*. Nov 2008;24(4):439-445.
13. Huus K, Ludvigsson JF, Enskar K, Ludvigsson J. Exclusive breastfeeding of Swedish children and its possible influence on the development of obesity: a prospective cohort study. *BMC Pediatr*. 2008;8:42.
14. Gilchrist D, Woods B, Binns CW, Scott JA, Gracey M, Smith H. Aboriginal mothers, breastfeeding and smoking. *Aust N Z J Public Health*. Jun 2004;28(3):225-228.
15. Mennella JA, Yourshaw LM, Morgan LK. Breastfeeding and smoking: short-term effects on infant feeding and sleep. *Pediatrics*. Sep 2007;120(3):497-502.
16. Minchin MK. Smoking and breastfeeding: an overview. *J Hum Lact*. Dec 1991;7(4):183-188.
17. Jin C, Rossignol AM. Effects of passive smoking on respiratory illness from birth to age eighteen months, in Shanghai, People's Republic of China. *J Pediatr*. Oct 1993;123(4):553-558.
18. Yang G, Fan L, Tan J, et al. Smoking in China: findings of the 1996 National Prevalence Survey. *Jama*. Oct 6 1999;282(13):1247-1253.
19. Xu F, Binns C, Nazi G, Shi L, Zhao Y, Lee A. A comparison of breastfeeding among Han, Uygur and other ethnic groups in Xinjiang, PR China. *BMC Public Health*. 2006;6:196.

20. Xu F, Binns C, Wu J, Yihan R, Zhao Y, Lee A. Infant feeding practices in Xinjiang Uygur Autonomous Region, People's Republic of China. *Public Health Nutr.* Feb 2007;10(2):198-202.
21. Xu F, Liu X, Binns CW, Xiao C, Wu J, Lee AH. A decade of change in breastfeeding in China's far north-west. *Int Breastfeed J.* Nov 24 2006;1(1):22.
22. Scott JA, Landers MC, Hughes RM, Binns CW. Factors associated with breastfeeding at discharge and duration of breastfeeding. *J Paediatr Child Health.* Jun 2001;37(3):254-261.
23. Scott JA, Aitkin I, Binns CW, Aroni RA. Factors associated with the duration of breastfeeding amongst women in Perth, Australia. *Acta Paediatr.* Apr 1999;88(4):416-421.
24. Duong DV, Binns CW, Lee AH. Breast-feeding initiation and exclusive breast-feeding in rural Vietnam. *Public Health Nutr.* Sep 2004;7(6):795-799.
25. Lakati A, Binns C, Stevenson M. The effect of work status on exclusive breastfeeding in Nairobi. *Asia Pac J Public Health.* 2002;14(2):85-90.
26. Australian Bureau of Statistics. *National health survey questionnaire 1989 - 1990.* Canberra: Australian Bureau of Statistics;; 1991.
27. Binns CW. Encourage and support breastfeeding. *Journal of the Home Economics Institute of Australia.* 2004;11(1):28-38.
28. Labbok M, Krasovec K. Toward consistency in breastfeeding definitions. *Stud Fam Plann.* Jul-Aug 1990;21(4):226-230.
29. Binns CW, Scott J. Breastfeeding: reasons for starting, reasons for stopping and problems along the way. *Breastfeed Rev.* 2002;10(2):13-19.
30. Binns C, Graham K. *Project report of the Perth Infant Feeding Study Mark II (2002-2004).* Perth: Curtin University of Technology; 2005.
31. Sundell H. Why does maternal smoke exposure increase the risk of sudden infant death syndrome? *Acta Paediatrica.* 2001;90:718-720.
32. Haug K, Irgens LM, Baste V, Markestad T, Skjaerven R, Schreuder P. Secular trends in breastfeeding and parental smoking. *Acta Paediatr.* Oct 1998;87(10):1023-1027.
33. Kaneita Y, Yokoyama E, Miyake T, et al. Epidemiological study on passive smoking among Japanese infants and smoking behavior of their respective parents: a nationwide cross-sectional survey. *Prev Med.* Mar 2006;42(3):210-217.
34. Slama K, Gremy I. [What are the epidemiological data concerning parental smoking and breastfeeding?]. *J Gynecol Obstet Biol Reprod (Paris).* Apr 2005;34 Spec No 1:3S67-73.
35. Fontaine B. [Smoking and breastfeeding: how can we help mothers stop smoking?]. *J Gynecol Obstet Biol Reprod (Paris).* Apr 2005;34 Spec No 1:3S209-212.
36. Amir LH. Maternal smoking and reduced duration of breastfeeding: a review of possible mechanisms. *Early Hum Dev.* Aug 2001;64(1):45-67.