

## BREAST-FEEDING AND BOTTLE-FEEDING OF TWINS, TRIPLETS AND HIGHER ORDER MULTIPLE BIRTHS

Yoshie YOKOYAMA<sup>1\*</sup> and Syuichi OOKI<sup>2</sup>

**Objective** This study was performed to determine the rates of breast-feeding and/or bottle-feeding in mothers of twins, triplets and higher order multiple births compared to those in mothers of singletons, and identify factors associated with decision as to breast-feed or bottle-feed.

**Methods** The subjects were 1,529 mothers of twins aged 6 months-6 years and 258 mothers of triplets and higher order multiple births (higher multiples) aged 6 months-6 years (234 mothers of triplets, 20 mothers of quadruplets, 4 mothers of quintuplets). Also, 1,300 subjects were recruited as a control group from mothers of singletons aged 6 months-6 years. Information regarding feeding methods, including exclusive breast-feeding, mixed-feeding and bottle-feeding with formula milk only, and duration of breast-feeding (in months) was collected.

**Results** There were significantly higher rates of bottle-feeding in mothers of twins and higher multiples than in mothers of singletons. Duration of breast-feeding in mothers who chose exclusive breast-feeding or mixed-feeding for twins and higher multiples was significantly shorter than those for the singletons. The feeding methods for the twins or higher multiples were not associated with prematurity or low birth weight. However, after adjusting for each associated factor using logistic regression analysis, the decision to bottle-feed was significantly associated with non-cooperation of the husband in childrearing and degree of anxiety that mothers felt when informed of a multiple pregnancy. The odds ratio indicated that mothers who received no cooperation from the husband for childrearing were 1.83 times more likely to choose bottle-feeding as those who received cooperation. Further, the odds ratio indicated that mothers who felt greater anxiety when informed of a multiple pregnancy were 1.73 times more likely to choose bottle-feeding as those who did not feel much anxiety.

**Conclusion** This study found that establishment and continuation of breast-feeding for twins, triplets and higher order multiple births are much more difficult than for singletons. Further, cooperation of the husband in childrearing and the degree of maternal anxiety when informed of a multiple pregnancy are significant factors affecting the decision to breast-feed or bottle-feed for twins, triplets or higher order multiple births.

**Key words** : twin, triplets, mothers, breast-feeding, bottle-feeding

### I. Introduction

Numerous studies<sup>1~4)</sup> have indicated the importance of breast milk as the ideal nutrient for infants in the first 4-6 months after birth. Breastfed infants have fewer respiratory tract infections, diarrheal illnesses, and atopic skin disorders<sup>3,4)</sup>. Increased mother-infant bonding and an overall decrease in in-

fant morbidity and hospitalization rates have also been reported<sup>5)</sup>.

Approximately 50% of twins<sup>6)</sup> and 96% of triplets<sup>7)</sup> are born as preterm infants with low birth weight. Infants who are born prematurely have greater need for the nutritional, antiinfective and immunologic advantages of breast milk. However, many preterm infants have poor sucking ability even when they are well, and it was reported that the rate of breastfeeding is low<sup>8)</sup>. Furthermore, Ford et al.<sup>9)</sup> reported that even mothers of twins born at term were less likely to breast-feed compared to those experiencing singleton births.

Little research exists documenting the rate of breast-feeding in triplets and higher order multiple

<sup>1\*</sup> Faculty of Health Sciences, Okayama University Medical School, 2-5-1 Shikata-cho, Okayama-city, Okayama 700-8558, Japan  
E-mail: yyoko@md.okayama-u.ac.jp

<sup>2</sup> Department of Health Science, Ishikawa Prefectural Nursing University

births, although it is clearly more difficult for mothers to breast-feed plural infants. Moreover, there has been no study on the rates of breast-feeding and/or bottle-feeding in mothers of twins, triplets and higher multiple births compared to mothers of singletons in Japan. This present study was therefore undertaken to determine rates of breast-feeding and/or bottle-feeding in mothers of twins, triplets and higher order multiple births compared to those in mothers with singletons, and identify factors associated with the decision to breast-feed or bottle-feed.

## II. Subjects and Methods

The subjects of this study were 1529 mothers of twins aged 6 months–6 years and 258 mothers of triplets and higher order multiple births aged 6 months–6 years (234 mothers of triplets, 20 mothers of quadruplets, 4 mothers of quintuplets), who consented to the aim of this study –the clarification of childrearing issues– and were explained that data would be used only for the aim of this study. They were recruited from the Okayama University Twin and Higher Order Multiple Births Registry<sup>10–12</sup>. Participants were also enrolled from several other sources, including mothers who responded to newspaper advertisements and magazine articles featuring nursing guidance for families with multiple births, the Japanese Mother's Organization for Twins and Higher Order Multiple Births and referrals from midwives and public health nurses. Furthermore, 1300 subjects were recruited as a control group from mothers of singletons aged 6 months–6 years. The control group were recruited through the help of public health nurses<sup>13</sup> and were matched for the distribution of age of the multiple children.

The survey was conducted between June 1998 and March 2001 by means of a mailed questionnaire. Information regarding feeding methods including breast-feeding only, mixed-feeding (mainly breast with some bottle or mainly bottle with some breast) and bottle-feeding with formula milk only, as well as duration of breast-feeding (in months) was collected. The definition used for exclusive breast feeding was that the baby had been given breast milk only<sup>14</sup>.

Moreover, for these births, data on infertility treatment, gestation number, gestational age, birth weight, length of hospital stay after birth and the presence of disabled infants were obtained from records in the Maternal and Child Health Handbook. This latter was established by the Maternal and Child Health Law in Japan and is provided by the governor after a report of pregnancy. Further, it

was established by the Maternal and Child Health Law that all infants receive medical examinations at 1.5 and 3 years of age. These medical examinations thus are given to almost 100 % of children in Japan. In addition, mothers were asked to indicate maternal age at delivery, delight and anxiety felt when they were informed of pregnancy, and cooperation from the husband for childrearing.

With regard to statistical analyses, the independence of qualitative variables was examined using Chi-square analysis. Analysis of variance (ANOVA) was conducted, with maternal age at delivery, birth weight and duration of breast-feeding as dependent, and groups (singleton group, twin group and higher multiple group) as independent variables. Further, logistic regression analysis was used to adjust for each factor associated with bottle-feeding. The SPSS statistical package v10.0 for Windows was used for statistical analyses.

## III. Results

Table 1 summarizes the characteristics of mothers with singletons (singleton group), mothers with twins (twin group), and mothers with triplets or higher order multiple births (higher multiple group). There was a significant difference in the maternal feelings when informed of pregnancy among the 3 groups: 91.9% of the singleton group were very delighted or delighted when informed of their pregnancy, while the rates were 65.6%, 66.9% in the twin group and the higher multiple group, respectively. Moreover, a significant difference in the maternal anxiety when informed of a pregnancy was observed among the 3 groups: 24.9% of the singleton group were very anxious or anxious when informed of pregnancy, while the rates were 57.0%, 66.7% in the twin group and the higher multiple group, respectively.

Table 2 shows the feeding methods in the singleton group, the twin group and the higher multiple group and the duration of breast-feeding of mothers who had children aged 1 year–6 years. There were significantly higher rates of bottle-feeding in the twin group and the higher multiple group than in the singleton group. In mothers who had other children aged 1 year–6 years, the duration of breast-feeding for those who breast-fed exclusively in the twin group and the higher multiple group was significantly shorter than in the singleton group. Moreover, the duration of breast-feeding of mothers who used mixed-feeding in the twin group and the higher multiple group was significantly shorter than in the singleton group.

Table 3 shows maternal factors associated with

**Table 1.** Major Characteristics of Subjects in the Singleton Group, Twin Group and Higher Multiple Group

	Singleton group n (%)	Twin group n (%)	Higher multiple group n (%)	$\chi^2$ or F df P
Feeling when they were informed of pregnancy <sup>a</sup>				
Very delighted-delighted	1,176 (92.0)	975 (65.6)	168 (66.9)	$\chi^2 = 301.6, 4, P < 0.001$
Fairly delighted	83 ( 6.4)	250 (16.8)	40 (16.0)	
Not very delighted-not delighted	21 ( 1.6)	262 (17.6)	43 (17.1)	
Anxiety that they felt when they were informed of pregnancy <sup>a</sup>				
Very anxious-anxious	319 (24.9)	855 (57.0)	168 (66.7)	$\chi^2 = 415.6, 4, P < 0.001$
Fairly anxious	471 (36.8)	440 (29.4)	64 (25.4)	
Not very anxious-not anxious	491 (38.3)	204 (13.6)	20 ( 7.9)	
Maternal age at delivery (years) <sup>b</sup>	27.4 ± 3.4	28.9 ± 3.5	29.8 ± 3.3	F = 60.0, 2, P < 0.001
Gestational age (weeks) <sup>a</sup>				
< 32	0 ( 0.0)	84 ( 5.5)	57 (22.1)	$\chi^2 = 797.9, 4, P < 0.001$
32-35	22 ( 1.8)	243 (16.0)	135 (52.3)	
≥ 36	1,215 (98.2)	1,194 (78.5)	66 (25.6)	
Mean birth weight (g) <sup>b</sup>	3,035.7 ± 387.9	2,553.1 ± 423.8	1,745.5 ± 404.9	F = 1,439.0, 2, P < 0.001
Cooperation of husband for childrearing <sup>a</sup>				
Non-cooperative	300 (23.1)	330 (22.0)	48 (19.0)	$\chi^2 = 2.17, 2, n.s.$
Cooperative	997 (76.9)	1,169 (78.0)	204 (81.0)	

<sup>a</sup> Excluding cases where information regarding gestational age, delight and anxiety that mothers felt when they were informed of pregnancy and cooperation of husband for childrearing was incomplete.

df = degree of freedom

<sup>b</sup> Mean ± SD

df = degree of freedom

**Table 2.** Feeding Methods and Duration of Breast-feeding in the Singleton Group, Twin Group and Higher Multiple Group

	Singleton group	Twin group	Higher multiple group	$\chi^2$ or F df P
Feeding method <sup>a</sup>				
Exclusive breast-feeding	389 (31.0%)	80 ( 5.3%)	9 ( 3.6%)	$\chi^2 = 416.7, 4, P < 0.001$
Mixed-feeding	803 (64.0%)	1,173 (78.7%)	188 (75.2%)	
Bottle-feeding only with formula milk	63 ( 5.0%)	238 (16.0%)	53 (21.2%)	
Duration of breast-feeding for children aged 1 year-6 years (months) <sup>b</sup>				
Exclusive breast-feeding	13.3 ± 4.4	9.1 ± 6.9	5.4 ± 6.6	F = 27.7, 2, P < 0.001
Mixed-feeding	7.7 ± 5.4	6.7 ± 5.0	6.0 ± 5.0	F = 11.6, 2, P < 0.001

<sup>a</sup> Excluding cases where information regarding feeding methods was incomplete.

<sup>b</sup> Mean ± SD

df = degree of freedom

breast-feeding and bottle-feeding in the twin group and the higher multiple group. The feeding methods did not significantly differ according to maternal delight when informed of a multiple pregnancy, and infertility treatment. However, a significantly higher proportion of mothers who felt greater anxiety when informed of a multiple pregnancy chose bottle-feed-

ing than their counterpart who chose exclusive breast-feeding or mixed-feeding. Maternal age at delivery in mothers who chose bottle-feeding was significantly older than in mothers who chose exclusive breast-feeding or mixed-feeding. There was a significantly higher rate of mothers who received no cooperation from the husband for childrearing in

**Table 3.** Maternal Factors Associated with Breast-Feeding and Bottle-Feeding in the Twin Group and Higher Multiple Group

	Bottle-feeding n (%)	Exclusive breast-feeding or mixed-feeding n (%)	$\chi^2$ df <i>P</i>
Maternal age at delivery <sup>a</sup>			
<20	0 ( 0.0)	4 ( 0.3)	11.6, 1, <i>P</i> <0.01
20-29	148(51.0)	877(58.7)	
30-39	139(47.9)	611(40.9)	
≥40	3( 1.1)	2( 0.1)	
Feeling when they were informed of multiple pregnancy <sup>a</sup>			
Very delighted-fairly delighted	224(79.2)	1,209(83.1)	2.54, 1, n.s.
Not very delighted-not delighted	59(20.8)	246(16.9)	
Anxiety that they felt when they were informed of multiple pregnancy <sup>a</sup>			
Very anxious-fairly anxious	259(91.2)	1,268(86.4)	4.83, 1, <i>P</i> <0.05
Not very anxious-not anxious	25( 8.8)	199(13.6)	
Cooperation of husband for childrearing <sup>a</sup>			
Non-cooperative	88(31.0)	290(19.8)	17.7, 1, <i>P</i> <0.001
Cooperative	196(69.0)	1,177(80.2)	
Infertility treatment <sup>a</sup>			
Non-infertility treatment	112(60.9)	496(64.0)	6.24, 1, n.s.
Infertility treatment	72(39.1)	279(36.0)	

<sup>a</sup> Excluding cases where information regarding maternal age at delivery, delight and anxiety that mothers felt when they were informed of multiple pregnancy, cooperation of husband for childrearing and infertility treatment was incomplete. df= degree of freedom

**Table 4.** Infant Factors Associated with Breast-Feeding and Bottle-Feeding in the Twin Group and Higher Multiple Group

	Bottle-feeding n (%)	Exclusive breast-feeding and mixed-feeding n (%)	t or $\chi^2$ df <i>P</i>
Gestational age (weeks) <sup>a</sup>			
<32	22( 7.6)	119( 8.0)	$\chi^2=0.85$ , 1, n.s.
32-35	63(21.6)	315(21.2)	
≥36	206(70.8)	1,054(70.8)	
Length of hospital stay (days) <sup>b</sup>	22.1±20.2	23.7±27.4	t=0.94, 1,718, n.s.
Low birth weight <sup>a</sup>			
No low birth weight newborn in the set	48(22.6)	204(21.3)	$\chi^2=0.17$ , 1, n.s.
At least one low birth weight newborn in the set	164(77.4)	752(78.7)	
Very low birth weight <sup>a</sup>			
No very low birth weight newborn in the set	190(89.6)	820(85.8)	$\chi^2=2.33$ , 1, n.s.
At least one very low birth weight newborn in the set	22(10.4)	136(14.2)	
Disabled children <sup>a</sup>			
No disabled children in the set	242(86.1)	1,257(90.7)	$\chi^2=4.99$ , 1, <i>P</i> <0.05
At least one disabled child in the set	39(13.9)	129( 9.3)	

<sup>a</sup> Excluding cases where information regarding gestational age, low birth weight, very low birth weight, and disabled children was incomplete.

<sup>b</sup> Mean ± SD

df= degree of freedom

**Table 5.** Results of Logistic Regression Analysis on Bottle-feeding in the Twin Group and Higher multiple Group and Associated Factors

Independent variables	Odds ratio	95% confidence interval
Gestation number		
Twins	1.00	
Triplets or more	1.19	0.84-1.71
Anxiety that they felt when they were informed of multiple pregnancy <sup>1)</sup>		
Not very anxious-not anxious	1.00	
Very anxious-fairly anxious	1.73*	1.10-2.72
Maternal age at delivery		
30 >	1.00	
30 ≤	1.37	1.06-1.79
Cooperation of husband for childrearing		
Cooperative	1.00	
Non-cooperative	1.85**	1.38-2.48
Disabled children		
No disabled children in the set	1.00	
At least one disabled child in the set	1.47	0.99-2.19

\*  $P < 0.05$ , \*\*  $P < 0.01$

mothers who chose bottle-feeding than in those who chose exclusive breast-feeding or mixed-feeding.

Table 4 shows infant factors associated with breast-feeding and bottle-feeding in the twin group and the higher multiple group. The feeding methods did not significantly differ according to gestational age, length of hospital stay after birth, low birth weight (<2500 g) and very low birth weight (<1500 g). However, there was a significantly higher rate for mothers who had at least one disabled child in mothers who chose bottle-feeding than in those who chose exclusive breast-feeding or mixed-feeding.

Table 5 shows the results of logistic regression analysis of bottle-feeding with associated factors as independent variables. Non-cooperation of the husband for childrearing was independently associated with a risk of bottle-feeding: the odds ratio indicated that mothers who received no cooperation from the husband for childrearing were 1.83 times more likely to choose bottle-feeding than those who experienced cooperation. Furthermore, anxiety that mothers felt when informed of a multiple pregnancy was associated with a risk of bottle-feeding: the odds ratio indicated that mothers who felt greater anxiety were 1.73 times more likely to choose bottle-feeding as those who did not feel great anxiety or anxiety.

#### IV. Discussion

The documented benefits of breast-feeding compared with artificial feeding are numerous. The advantages include nutritional, immunological and psychological effects, as well as protection from disease, for infants<sup>15-17)</sup>. In this study, the rates of exclusive breast-feeding among mothers of twins and triplets or higher order multiple births were lower than among those with singleton babies: 5.4 % for twins and 3.6% for triplets or higher order multiple births. These rates are similar to the 4.9% for mothers of twins or triplets reported in Poland<sup>16)</sup>. Further, the duration of breast-feeding among the mothers of twins, triplets or higher order multiple births was shorter than that for singletons. In addition, this study revealed that feeding methods for twins, triplets or higher order multiple births were not associated with prematurity or low birth weight. These results suggest that irrespective of prematurity or low birth weight, establishment and continuation of breast-feeding after multiple births is difficult.

Concerning factors associated with the decision to breast-feed or bottle-feed for twins, triplets and higher order multiple births, this study showed that cooperation of the husband for childrearing was the most significant factor. Several studies<sup>17,18)</sup> have indicated mothers to be influenced by the father's attitude towards breast-feeding or bottle-feeding. Accordingly, the father should be involved in discussions regarding the type of feeding that the twins, triplets or higher order multiple births will receive, and be provided with the information that mothers who receive no cooperation from their husbands for childrearing are more likely to choose bottle-feeding with formula milk only.

Foster et al.<sup>19)</sup> found that pregnant women intending to breastfeed had higher levels of maternal fetal attachment. In this study, the women who felt greater anxiety when informed of a multiple pregnancy were more likely to choose bottle-feeding with formula milk only, although maternal delight when informed of a multiple pregnancy was not associated with the feeding decision. Further, this study revealed that mothers with twins, triplets or higher order multiple births felt greater anxiety when informed of a multiple pregnancy than those of singletons, and approximately 60% of mothers with twins, and 70% of mothers with triplets or more, were very anxious or anxious when so informed. These results indicated that women pregnant with twins and triplets need special support in order to lower their anxiety.

Ford and Lablook<sup>20)</sup> indicated that congenital problems can shorten the duration of breastfeeding. In the earlier present study, there was a higher rate

of mothers who had at least one disabled multiple child in mothers who chose bottle-feeding. Thus, there is a possibility that disabilities in children influence infant feeding. While several studies<sup>9,21)</sup> provided evidence that mothers of singletons who breastfed were older, maternal age at delivery was not a factor associated with the decision to breast-feed or bottle-feed for multiple births in our subjects.

Data on cigarette smoking of mothers, quantity of maternal lactation and the use of a dummy were lacking in this study, and it has been suggested that these factors are associated with the initiation and duration of breastfeeding<sup>9,22)</sup>. Other studies<sup>9,23)</sup> have attempted to assess the rate of breast-feeding at discharge and establish a program to initiate breast-feeding. These factors and other aspects will be investigated in the future.

#### Acknowledgments

This research was partially supported by Ministry of Education, Science, Sports and Culture, Grant-in-Aid for Scientific Research (B), 2004-2007.

#### References

- 1) Lucas A, Morley R, Cole TJ, et al. Breast milk and subsequent intelligence. *Lancet* 1992; 339: 261-64.
- 2) Goldman AS. The immune system of human milk. Antimicrobial, anti-inflammatory and immunodulative properties. *Pediatr Infect Dis J* 1993; 12: 664-72.
- 3) Howie RW, Forsyth JS, Ogston SA, et al. Protective effect of breast-feeding against infection, *BMJ* 1990; 300: 11-16.
- 4) Wright AZ, Holberg GJ, Martinez FD, et al. Breast-feeding and lower respiratory tract illness in the first year of life. *BMJ* 1989; 299: 946-949.
- 5) Dewey KG, Heining MJ, Nommsen-Rivers LA. Differences in morbidity between breast-fed and formula fed infants. *J Pediatr* 1995; 126: 696-702.
- 6) Ooki S, Asaka A. Physical growth of Japanese twins, *Acta Genet Med Gemellol* 1993; 42: 275-287.
- 7) Yokoyama Y, Yamashiro M, Ooki S. Birth weight and height characteristics of triplets. *Jpn J Public Health* 2003; 50: 216-224.
- 8) Furman L, Minich NM, Hack M. Breastfeeding of very low birth weight infants. *J Hum Lact* 1998; 14: 29-34.
- 9) Ford RPK, Mitchell EA, Scragg R, et al. Factors adversely associated with breast feeding in New Zealand. *J Paediatr Child Health* 1994; 30: 483-489.
- 10) Yokoyama Y, Shimizu T & Hayakawa K. Prevalence of cerebral spalsy in twins, triplets and quadruplets. *Int J Epidemiol* 1995; 24: 943-948.
- 11) Yokoyama Y. Fundal height as a predictor of early preterm triplet delivery. *Twin Res* 2002; 5: 71-74.
- 12) Yokoyama Y. Comparison of child-rearing problems between mothers who conceived after infertility treatment and mothers with multiple children who conceived spontaneously. *Twin Res* 2003; 6: 89-96.
- 13) Yokoyama Y, Nakahara Y, Matsubara S, et al. Comparison of child-rearing problems and necessary community welfare and health services between mothers with twins or triplets of mothers with singleton children. *Jpn J Public Health* 2004; 51: 94-102.
- 14) Labbok M, Krasovec K. Towards consistency in breastfeeding definitions. *Stud Fam Plann* 1991; 21: 226-30.
- 15) Emery JL, Scholey S, Taylor EM. Decline in breastfeeding. *Arch Dis Child* 1990; 65: 369-72.
- 16) Czeszynska MB, Kowalik K. Multiple pregnancy: Factors contributing to early infant's breast-feeding—Own experience. *Acta Genet Med Gemellol* 1998; 47: 191-196.
- 17) Arora S, McJnkin C, Wehrer J, Kuhn P. Major factors influencing breastfeeding rates: Mother's perception of father's attitude and milk supply. *Pediatrics* 2000; 106: 1-5.
- 18) Kessler LA, Gielen AC, Diener-West M, et al. The effect of a woman's significant other on her breastfeeding decision. *J Hum Lact* 1995; 11: 103-109.
- 19) Forster SF, Slade P, Wilson K. Body image, maternal fetal attachment, and breast feeding. *J Psychosomatic Res* 1996; 41: 181-184.
- 20) Ford K, Labbok M. Who is breast-feeding? Implications of associated social and biomedical variables for research on the consequences of method of infant feeding. *Am J Clin Nutr* 1990; 52: 451-456.
- 21) Piper S, Parks PL. Predicting the duration of lactation: evidence from a national survey. *Birth* 1996; 23: 7-12.
- 22) Victora CG, Tomasi E, Olinto MT, et al. Use of pacifiers and breastfeeding duration. *Lancet* 1993; 341: 404-406.
- 23) Liang R, Gunn AJ, Gunn TR. Can preterm twins breast feed successfully?. *New Zea Med J* 1997; 110: 209-12.

---

(Received June 23, 2004; Accepted September 14, 2004)