

Child Maltreatment Among Singletons and Multiple Births in Japan: A Population-Based Study

Yoshie Yokoyama,¹ Terumi Oda,² Noriyo Nagai,² Masako Sugimoto,¹ and Kenji Mizukami²

¹Department of Public Health Nursing, Osaka City University, Osaka, Japan

²Nishinomiya City Public Health Center, Nishinomiya, Japan

Background: The occurrence of multiple births has been recognized as a risk factor for child maltreatment. However, few population-based studies have examined the relationship between multiple births and child maltreatment. This study aimed to evaluate the degree of risk of child maltreatment among singletons and multiple births in Japan and to identify factors associated with increased risk. **Methods:** Using population-based data, we analyzed the database of records on child maltreatment and medical checkups for infants aged 1.5 years filed at Nishinomiya City Public Health Center between April 2007 and March 2011. To protect personal information, the data were transferred to anonymized electronic files for analysis. **Results:** After adjusting by logistic regression for each associated factor and gestation number, multiples themselves were not associated with the risk of child maltreatment. However, compared with singletons, multiples had a significantly higher rate of risk factors for child maltreatment, including low birth weight and neural abnormality. Moreover, compared with mothers of singleton, mothers of twins had a significantly higher rate of poor health, which is a risk factor of child maltreatment. **Conclusion:** Multiples were not associated with the risk of child maltreatment. However, compared with singletons, multiples and their mothers had a significantly higher rate of risk factors of child maltreatment.

■ **Keywords:** child maltreatment, twins, low birth weight, neural abnormality, maternal health condition

The occurrence of multiple births has been recognized as a risk factor of child maltreatment in several studies conducted in the 1980s (Groothuis et al., 1982; Nelson & Martin, 1985; Robarge et al., 1982; Tanimura et al., 1990). However, none of these early studies were population based. Today, it is not completely clear whether multiple births are a risk factor of child maltreatment in Japan since the current situation surrounding families differs from that in the 1980s. For example, in recent years, family size has rapidly decreased, the number of working mothers has increased, and assisted reproductive technology has become widely available (Ooki, 2011).

In an analysis of Japanese data in 2013, Ooki reported that families with multiple births had an elevated risk of fatal child maltreatment (i.e., child death by maltreatment) both per individual and per family unit (Ooki, 2013). However, the data also indicated that cases of fatal child maltreatment were relatively rare among all cases of child maltreatment. Except for fatal child maltreatment, few population-based studies have examined the relationship between multiple births and child maltreatment. Against this background, the purpose of the present study was to evaluate the degree

of risk of child maltreatment among singletons and multiple births in Japan from population-based data and to identify factors associated with increased risk.

Subjects and Methods

In Japan, the Mother and Child Health Law stipulates that all infants should receive medical checkups at ages 3–4 months, 1.5 years, and 3 years. Generally, pediatricians at regional public health centers perform routine medical checkups as a mass examination, and public health nurses are responsible for parent consultations on child rearing at that time. Almost all children in Japan receive these medical checkups. In addition to health checkups, public health nurses

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ADDRESS FOR CORRESPONDENCE: Yoshie Yokoyama, Department of Public Health Nursing, Osaka City University, 1-5-17 Asahi-machi, Abeno-ku, Osaka 545-0051, Japan. E-mail: yyokoyama@nurs.osaka-cu.ac.jp

and other healthcare providers support families when there is concern about possible child maltreatment. Data from these medical checkups and records on child maltreatment are filed at municipal health centers. One of these centers is the Nishinomiya City Public Health Center, and the records gathered by this center were used for analysis in this study. To protect personal information, the data were then anonymously transferred to anonymized electronic files by Nishinomiya City staff. Nishinomiya is located in an urban area composed of a residential community of around 453,000 people with yearly birth numbers of approximately 4,600. Records of child maltreatment are linked to medical checkup data for infants aged 1.5 years. Definitions of child maltreatment and parental guardian are based on the Child Abuse Prevention Law of Japan promulgated in 2000. The types of maltreatment reported include physical abuse, psychological abuse, neglect, and sexual abuse.

We analyzed the records database on child maltreatment and medical checkups for infants aged 1.5 years between April 2007 and March 2011. The database records we examined contained information on gestation number (i.e., singleton, twin, or triplets), gestational age at birth, birth weight, mode of delivery, parity, infant's neural abnormality, breastfeeding at 1.5 years of age, maternal health condition, maternal job status, cooperation from other family members or relatives in child rearing, and advisers for child rearing. Moreover, the records on child maltreatment included information on type of child maltreatment, perpetrator, number of children per family, maltreatment of other children, domestic violence, fatherless family, mother who was abused during her own childhood, and household receiving welfare benefits.

Statistical Analysis

Statistical analysis was performed using SPSS version 22.0 for Windows (Japanese IBM Corporation, Tokyo, Japan). The independence of qualitative variables was examined using chi-square analysis. The significance of differences between mean values was analyzed using ANOVA, where the comparisons were between three groups of gestation number. To reveal factors associated with child maltreatment, forced-entry multiple logistic regression analysis was performed with child maltreatment as the dependent variable; the independent variables were sex, gestation number, gestational age at birth, birth weight, parity, the infant's neural abnormality, breastfeeding at 1.5 years of age, maternal health condition, maternal job status, cooperation from other family members or relatives in child rearing, and advisers on child rearing.

Ethical Considerations

To protect information, these data were transferred anonymously to computerized files by Nishinomiya City staff.

The study protocol was approved by the Ethics Committee of Osaka City University.

Results

Between April 2007 and March 2011, 18,247 infants aged 1.5 years received medical checkups in Nishinomiya. Overall, 17,755 (97.30%) children were singletons, 486 (2.66%) were twins, and 6 (0.03%) were triplets. Table 1 summarizes the characteristics of these three groups of children. There was a significantly higher rate of breastfeeding at 1.5 years of age for singletons than for twins or triplets. Moreover, twins showed a significantly higher rate of suspected neural abnormality at the 1.5-year medical checkup (as determined by pediatricians) than singletons or triplets. Among the neural abnormalities recorded for singletons, 6 infants had cerebral palsy, 92 could not yet walk, 25 had delayed motor development, and 30 had other neural abnormalities. Among neural abnormalities in twins, one infant had cerebral palsy, seven could not yet walk, two had delayed motor development, and one had another neural abnormality.

Table 2 presents the family background. Twin mothers showed a significantly higher rate of poor health than singleton or triplet mothers ($p < .001$).

For child maltreatment, as shown in Table 3, 59 (3.32%) singletons and eight (16.46%) twins had documented physical abuse, psychological abuse, and/or neglect. None had documented sexual abuse. A significantly higher rate of twins had substantiated child maltreatment compared with singletons or triplets ($p < .001$).

The type of child maltreatment and characteristics of perpetrators and victims are shown in Table 4. Biological mothers were the alleged perpetrator in 75.0% of twin cases and 71.2% of singleton cases. Fatherless families occurred in 13.6% of singleton cases and 25.0% of twin cases, and households receiving welfare benefits occurred in 11.9% and 0.0%, respectively.

Table 5 shows the results of logistic regression for child maltreatment with associated factors as independent variables. Poor maternal health was independently associated with a greater risk of child maltreatment; the odds ratio indicated that mothers in poor health were 9.52 times more likely to be alleged perpetrators than mothers who were not. Neural abnormality was also associated with child maltreatment. Here, the odds ratio indicated that children with a suspected neural abnormality were 5.98 times more likely to be abused than those without. Not having an adviser for child rearing was associated with child maltreatment, where mothers who had no adviser for child rearing were 5.50 times more likely to be alleged perpetrators than mothers who had advisers. Moreover, low birth weight (<2,500 g) was associated with child maltreatment, where children with low birth weight were 2.99 times more likely to be abused than those without. In addition, non-cooperation from other family members or relatives for child rearing

TABLE 1
Main Characteristics of Singletons, Twins, and Triplets

		Singletons <i>n</i> = 17,755	Twins <i>n</i> = 486	Triplets <i>n</i> = 6	<i>p</i> value
Sex	Male	9,138 (51.5%)	244 (50.2%)	3 (50.0%)	<i>ns</i>
	Female	8,617 (48.5%)	242 (49.8%)	3 (50.0%)	
Gestational age (weeks)	≤32	84 (0.5%)	26 (7.0%)	3 (50.0%)	<i>p</i> < .001
	33–36	289 (1.7%)	148 (39.8%)	3 (50.0%)	
	≥37	17,045 (97.9%)	198 (53.2%)	0 (0.0%)	
	Mean ± standard deviation	39.3 ± 1.53	36.1 ± 2.03	31.9 ± 1.25	
	Range	24–44	24–40	30–33	
Birth weight (g)	<1,500	79 (0.4%)	22 (4.5%)	4 (66.7%)	<i>p</i> < .001
	1,500–2000	117 (0.7%)	100 (20.6%)	2 (33.3%)	
	2,000–2500	1,120 (6.3%)	247 (50.8%)	0 (0.0%)	
	≥2,500	16,435 (92.6%)	117 (24.1%)	0 (0.0%)	
	Mean ± standard deviation	3,032.9 ± 404.2	2,235.6 ± 402.8	1,398.3 ± 281.5	
Mode of delivery	Vaginal delivery	14,973 (84.3%)	124 (25.5%)	0 (0.0%)	<i>p</i> < .001
	Cesarean section	2,782 (15.7%)	362 (74.5%)	6 (100.0%)	
Parity	Multipara	9,094 (51.2%)	174 (35.8%)	0 (0.0%)	<i>p</i> < .001
	Nulliparous	8,661 (48.8%)	312 (64.2%)	6 (100.0%)	
Breastfeeding at 1.5 years of age	No	13,782 (77.6%)	448 (92.2%)	6 (100.0%)	<i>p</i> < .001
	Yes	3,973 (22.4%)	38 (7.8%)	0 (0.0%)	
Abnormality of infant's nervous system	Not suspected	17,602 (99.1%)	475 (97.7%)	6 (100.0%)	<i>p</i> = .005
	Suspected	153 (0.9%)	11 (2.3%)	0 (0.0%)	
Weight at 1.5 years		10.5 ± 1.07	10.1 ± 0.96	9.90 ± 0.88	<i>p</i> < .05

TABLE 2
Background of Families

		Singletons <i>n</i> (%)	Twins <i>n</i> (%)	Triplets <i>n</i> (%)	<i>p</i> value
Maternal health condition	Good	9,383 (54.6)	197 (41.2)	4 (66.7)	<i>p</i> < .001
	Normal	7,364 (42.9)	259 (54.2)	2 (33.3)	
	Poor	429 (2.5)	22 (4.6)	0 (0.0)	
Maternal job	No job	13,029 (73.4)	352 (72.4)	6 (100.0)	<i>ns</i>
	Full-time job	2,710 (15.3)	84 (17.3)	0 (0.0)	
	Part-time job	1,465 (8.3)	28 (5.8)	0 (0.0)	
	Child-care leave	551 (3.1)	24 (4.5)	0 (0.0)	
Cooperation from other family members or relatives with childrearing	Non-cooperative	652 (3.7)	26 (5.3)	0 (0.0)	<i>ns</i>
	Cooperative	17,103 (96.3)	460 (94.7)	6 (100.0)	
Advisers for childrearing	No	224 (1.3)	6 (1.2)	0 (0.0)	<i>ns</i>
	Yes	17,531 (98.7)	480 (98.8)	6 (100.0)	

TABLE 3
Rate of Child Maltreatment

	No. of subjects	Maltreatment <i>n</i> (%)	
Singletons	17,755	59 (3.32)	<i>p</i> < .001
Twins	486	8 (16.46)	
Triplets	6	0 (0.0)	

and maternal job status was associated with child maltreatment. Breastfeeding was associated with a lower risk of child maltreatment, where children who were breastfed until 1.5 years of age were 0.36 times less likely to be abused than those who were not. Child maltreatment was not associated with sex, multiple births, gestational age at birth, or parity.

Discussion

In this study, incidence rates of child maltreatment determined at medical checkups at 1.5 years of age were 3.32 per 1,000 children for singletons and 16.46 per 1,000 children for twins. According to a report by the Ministry of

Health, Labor and Welfare (2010), the number of individuals receiving support services for child maltreatment in 206 child consultation centers throughout Japan was 56,384 in 2010, of which 11,033 involved children under three years of age. The incidence rate of child maltreatment was roughly estimated to be 2.76 (i.e., 56,384/20,440,000) per 1,000 children under the age of 18 and 3.47 (i.e., 11,033/3,178,049) per 1,000 children under the age of three in the same year. Thus, the incidence rate of child maltreatment in singletons reported in the present study was similar to that of children under the age of three reported by the Ministry.

According to Ooki (2013), families with multiple births show an increased risk of fatal child maltreatment (i.e., child death due to maltreatment) in Japan. On the other hand, the relative risk for multiples per individual was not largely different from the relative risk for low birth weight. In the present study, after adjusting by logistic regression for each associated factor and gestation number, multiples themselves were not associated with the risk of child maltreatment. Concerning infant factors, logistic regression revealed that low birth weight and neural abnormality showed

TABLE 4
Type of Child Maltreatment and Characteristics of Perpetrator/Victim

	Singletons <i>n</i> (%)	Twins <i>n</i> (%)
Type of child maltreatment*		
Emotional abuse	23 (39.0)	1 (12.5)
Physical abuse	23 (39.0)	8 (100.0)
Neglect	26 (44.8)	0 (0.0)
Perpetrator		
Biological mother	42 (71.2)	6 (75.0)
Biological father	9 (15.3)	2 (25.0)
Step-father or parent's boyfriend	2 (3.4)	0 (0.0)
Biological father and mother	6 (10.2)	0 (0.0)
Gender of victim		
Male	33 (55.9)	7 (87.5)
Female	26 (44.1)	1 (12.5)
Number of children in one family		
≤2	40 (67.8)	6 (75.0)
3	13 (22.0)	2 (25.0)
4	2 (3.4)	0 (0.0)
≥5	4 (6.8)	0 (0.0)
Maltreatment of other children		
No	1 (2.4)	0 (0.0)
Yes	35 (83.3)	8 (100.0)
Unknown	6 (14.3)	0 (0.0)
Domestic violence		
No	34 (72.3)	6 (75.0)
Yes	13 (27.7)	2 (25.0)
Fatherless family		
No	51 (86.4)	6 (75.0)
Yes	8 (13.6)	2 (25.0)
Mother who was abused during her childhood		
No	57 (96.6)	8 (100.0)
Yes	2 (3.4)	0 (0.0)
Household receiving welfare benefits		
No	52 (88.1)	8 (100.0)
Yes	7 (11.9)	0 (0.0)

Note: *Includes plural type of maltreatment in a case.

increased risks for child maltreatment. Multiples had many risk factors, including low birth weight, prematurity, birth defects, and disabilities. Indeed, approximately 80% of the multiples in this study were preterm infants with low birth weight. In addition, a significantly higher rate of twins was suspected to have neural abnormality by pediatricians in medical checkups compared with singletons.

Maternal mental disorders are known risk factors for child maltreatment (Brown et al., 1998; Chaffin et al., 1996; Dinwiddie & Bucholz, 1993; Kotch et al., 1999). Windham et al. (2004) reported that severe physical assault of children was significantly associated with maternal depression. Moreover, mothers of twins are more likely to experience depression than mothers of singletons (Thorpe et al., 1991). Although data on maternal depression was lacking in this study, biological mothers were the alleged perpetrators in 70% of child maltreatment cases, and poor maternal health was a significant factor. In addition, twin mothers had a significantly higher rate of poor health than singleton or triplet mothers. One specific feature related to families with twins is that the rearing of two children of the same age at the same time has been found to overburden parents — especially the mother — physically, mentally, and socially (Bryan et al., 1997; Denton, 2005). In families with twins, the physical overburden of child rearing in general rather than factors specific to multiples might be one of the risk factors of child maltreatment.

In a 15-year cohort study, Strathearn et al. (2009) reported a nearly fourfold increase in the risk for maternal neglect for non-breastfed children compared with children who were breastfed for four months. Levine et al. (2007) reported that increases in peripheral oxytocin level during pregnancy were associated with increased maternal — fetal attachment. Breastfeeding may enhance maternal responsiveness by stimulating oxytocin release, which is associated with reduced anxiety and elevated mood (Heinrichs et al., 2001). In the present study, breastfeeding was associated with a lower risk of child maltreatment. Breastfeeding might therefore play a protective role in helping to prevent maternal maltreatment. In our previous population-based study, the rate of exclusive breastfeeding among twins or triplets aged from three to six months was considerably lower than that of same-age singletons (4.1% among twins or triplets vs. 44.7% among singletons). Studies indicate that establishing breastfeeding after multiple births is

TABLE 5
Result of Logistic Regression on Child Maltreatment and Associated Factors

		Odds ratio	95% confidence interval	<i>p</i> value
Maternal health condition	Good or normal	1.00		
	Poor	9.52	5.04–17.97	<i>p</i> < .001
Abnormality of infant's nervous system	Not suspected	1.00		
	Suspected	5.98	2.00–17.88	<i>p</i> = .001
Advisers for childrearing	Yes	1.00		
	No	5.50	2.18–13.87	<i>p</i> < .001
Birth weight (g)	>2,500	1.00		
	<2,500	2.99	1.44–6.20	<i>p</i> = .003
Cooperation from other family members or relatives with childrearing	Non-cooperative	1.00		
	Cooperative	2.36	1.03–5.39	<i>p</i> = .042
Maternal job status	No job	1.00		
	Full-time job	2.40	0.83–6.92	<i>ns</i>
	Part-time job	3.92	1.02–15.04	<i>p</i> = .046
	Childcare leave	0.96	0.30–3.14	<i>ns</i>
Breastfeeding at 1.5 years of age	No	1.00		
	Yes	0.36	0.16–0.86	<i>p</i> = .021

extremely difficult (Ford et al., 1994; Yokoyama et al., 2006) and consequently we recommend that a program to establish breastfeeding for multiple births should be developed to help prevent maternal maltreatment.

Several studies have also indicated that lack of social support is associated with risk of child maltreatment (Garbarino & Sherman, 1980; Straus, 1980; Whipple & Webster-Statton, 1991). Similarly, in the present study, mothers with no childrearing advisors as well as mothers experiencing non-cooperation from other family members or relatives were more likely to be perpetrators of child maltreatment. Therefore, health providers should provide appropriate support for these groups of mothers.

Data on parental age and maternal psychological problems (maternal depression, mental disorder, or child-rearing anxiety) were lacking in this study. These factors may be associated with child maltreatment (Brown et al., 1998; Chaffin et al., 1996; Dinwiddie & Bucholz, 1993; Kotch et al., 1999; Luke & Brown, 2007) and should be investigated in future studies.

In conclusion, using population-based data, this study showed that multiples were not associated with the risk of child maltreatment. However, compared with singletons, multiples had a significantly higher rate of risk factors for child maltreatment, including low birth weight and neural abnormality. Moreover, compared with singleton mothers, twin mothers had a significantly higher rate of poor health, a risk factor of child maltreatment. Healthcare providers should be cognizant that multiple births can place considerable stress on a family and should provide appropriate support and intervention, beginning with recognizing that mothers with multiple pregnancies are potentially a high-risk group.

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