
Comparison of Child-rearing Problems Between Mothers with Multiple Children who Conceived after Infertility Treatment and Mothers with Multiple Children who Conceived Spontaneously

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The purpose of this study was to clarify the characteristic child-rearing problems for mothers of multiple children who conceived after infertility treatment as compared to mothers of multiple children who conceived spontaneously. The subjects were 990 mothers of multiple children: 359 who conceived after infertility treatment and 631 who conceived spontaneously. Mothers who conceived after infertility treatment were more delighted when informed of a multiple pregnancy than those who conceived spontaneously. In addition, with respect to anxiety during twin pregnancies, mothers of twins who conceived after infertility treatment showed lower rates of anxiety about nursing the infants and economic concerns than those of twins who conceived spontaneously. However, after delivery, mothers who conceived after infertility treatment showed a higher rate of depressive symptoms than those who conceived spontaneously. After adjusting for each associated factor using logistic regression, the risk of depressive symptoms in mothers who conceived after infertility treatment was significantly associated with disabled multiple children and the methods for alleviating stress. The odds ratio indicated that mothers with at least one disabled child were twice as likely to have depressive symptoms as mothers with no disabled children. Furthermore, the odds ratio indicated that mothers who used no methods for alleviating stress were twice as likely to have depressive symptoms than those who did.

In Japan (Imaizumi, 1994), the UK (Botting et al., 1987; Levene et al., 1992) and the US (Kiely et al., 1992) multiple births have increased recently as a result of infertility treatment. The rate of twins was 6.4 per 1000 births in 1951, increasing to 9.0 in 1997. Triplet and higher multiple births showed more marked increases. The triplet rate increased from 58 per million births in 1951 to 258 in 1997, and the quadruplet rate increased from 0.93 per million births in 1951 to 12.2 in 1997 (Imaizumi, 1994; Imaizumi, 1998).

These multiple gestations increase obstetrical complications for the mother, and prematurity and morbidity for the newborns (Kiely et al., 1992; MacGillivray et al., 1988; Yokoyama et al., 1995). Furthermore, death is much more common in multiple births than in single children, especially in the perinatal period (Botting et al., 1990; Bryan, 1992).

It is indicated that death during pregnancy or around birth gives rise to confused feelings that can affect the bereaved mother's care of a surviving twin (Bryan, 1995; Lewis et al., 1988). If multiple children are in good condition, there are also economic and psychological consequences such as the expense of child-rearing and the considerable stress associated with effectively parenting more than one child at a time (Garel et al., 1992; Garel et al., 1997).

Several studies have reported that infertile women are more positive about multiple gestations than fertile women (Gleicher et al., 1995; Leiblum et al., 1990). In fact, infertile couples readily agree to do almost anything to enhance their probability of achieving a pregnancy (Leiblum et al., 1987).

Despite the increases of multiple births due to infertility treatments, little research exists documenting the child-rearing problems for mothers of multiple children who conceived after infertility treatment compared with mothers of multiple children who conceived spontaneously. The purpose of this study was to clarify the characteristic child-rearing problems for mothers of multiple children who conceived after infertility treatment as compared to mothers of multiple children who conceived spontaneously.

Subjects and Methods

The subjects of this study were 990 mothers of multiple children, who consented to the explained aim of this research. They were recruited from the Kyoto University Twin and Higher Order Multiple Births Registry (Yokoyama et al., 1995; Yokoyama et al., 1995; Yokoyama, 2002). The participants were enrolled from several other sources, such as mothers who responded to newspaper advertisements and magazine articles featuring nursing guidance for families with multiple births, the Japanese Mother's Organization for Twin and Higher Order Multiple Births and referrals from midwives and public health nurses.

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The survey was conducted between June 1998 and December 1999 by means of a mail-out questionnaire. Data on infertility treatment, gestation number, gestational age, and the existence of disabled infants were obtained from records in the Maternal and Child Health Handbook. This handbook was established by the Maternal and Child Health Law in Japan and is provided by the governor after a report of pregnancy. The purpose of this handbook is the maintenance of maternal and child health: medical examinations during pregnancy, the progress of infant growth, periodic medical examinations for the infant, and preventive injections are recorded. 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 are given to approximately 100% of children in Japan. In addition to those data, mothers were also asked to indicate anxiety during multiple pregnancies, cooperation from other family members or relatives for child-rearing, methods for alleviating stress and to evaluate their state of sleep, fatigue, and depressive state.

The perceived degree of lack of sleep was rated using a 5-grade scale of 5 (*severe lack of sleep*), 4 (*moderate lack of sleep*), 3 (*mild lack of sleep*), 2 (*slight lack of sleep*), and 1 (*no lack of sleep*). The mothers' fatigue was evaluated according to the fatigue symptom index (Yokoyama et al., 1997) and 5-grade self-rating scales of (physical and mental) fatigue. The fatigue symptom index assesses general fatigue (11 items) and cumulative fatigue (6 items) as shown in Appendix A. The score in each of the fatigue symptom index categories was computed as the percentage of items that the subjects checked. Cronbach's alpha reliability coefficients for the scores were .78 for general fatigue and .78 for cumulative fatigue. Physical and mental fatigue was scored using the 5-grade rating scale of 5 (*very tired*), 4 (*tired*), 3 (*fairly tired*), 2 (*not very tired*), and 1 (*not tired*). As seen in Appendix B, the questionnaire items for major depressive episodes from the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994)* were used to assess the depressive states. The depressive symptoms were defined based on whether the depressed mood and at least one of the other 7 symptoms (loss of interest or pleasure in usual activities, poor appetite or significant weight loss or overeating, loss of energy or fatigue, insomnia or hypersomnia, feeling of worthlessness, complaints or evidence of diminished ability to think or concentrate, or recurrent thoughts of death) were each present nearly every day for a period of at least two weeks.

In regards to statistical analyses, the differences in the mean values were examined using the *t* test, and the independence of qualitative variables was examined using Chi-square analysis. Further, logistic regression was used to adjust for each factor associated with the disabled multiple children, and the depressive symptoms of mothers who had conceived after infertility treatment. The SPSS statistical package was used for statistical analyses.

Results

There were 359 mothers of multiple children who had conceived after infertility treatment (infertility treatment

group) and 631 mothers of multiple children who had conceived spontaneously (non-infertility treatment group) in this study. Treatments in the infertility treatment group consisted of 239 ovarian stimulations, 76 in vitro fertilizations (IVF) or gamete intra-fallopian transfers (GIFT), 25 artificial inseminations by husband (AIH), and 4 others. Fifteen mothers did not identify the type of infertility treatment.

Table 1 summarizes the characteristics of the non-infertility treatment group and the infertility treatment group. The gestation number was significantly higher in the infertility treatment group than in the non-infertility treatment group, and the rate of disabled children was significantly higher in the infertility treatment group than in the non-infertility treatment group. The disabled children in the non-infertility treatment group were cerebral palsy in 22 infants, auditory disorders in 3, visual disorders in 8, internal disorders in 10, mental retardation in 4, crippled limbs including transformation in 11 and others in 4. The disabled children in the infertility treatment group were cerebral palsy in 19 infants, auditory disorders in 3, visual disorders in 6, internal disorders in 8, mental retardation in 3, crippled limbs including transformation in 12 and others in 11.

The mean gestational age at birth of twins in the non-infertility treatment group was 36.6 ± 2.57 weeks, and in the infertility treatment group, it was 36.4 ± 2.49 weeks. The mean gestational age at birth of triplets in the non-infertility treatment group was 33.9 ± 2.51 weeks, and in the infertility treatment group, it was 33.8 ± 2.61 weeks. The gestational age at birth of twins and triplets did not significantly differ by the infertility treatment. The mean gestational age at birth of quadruplets and quintuplets in the infertility treatment group was 30.8 ± 2.92 weeks and 28.5 ± 0.71 weeks, respectively.

Table 2 shows the maternal feelings when informed of multiple pregnancies of mothers in the non-infertility treatment group and in the infertility treatment group. A significant difference was observed between the 2 groups ($p < .001$): 9.4% of the infertility treatment group were not very delighted or not delighted when informed of a multiple pregnancy, while the rate in the non-infertility treatment group was 18.4%.

Table 3 shows the anxiety during a twin pregnancy in mothers of twins in the non-infertility treatment group and the infertility treatment group. There was no significant difference in anxiety about the health of the fetuses between mothers in the non-infertility treatment group and those in the infertility treatment group. However, there were higher rates of anxiety about nursing infants, economic concerns after delivery in mothers in the non-infertility treatment group than in those in the infertility treatment group.

Table 4 shows the anxiety during a multiple pregnancy in mothers of twins and mothers of higher multiples (triplets, quadruplets, and quintuplets) in the infertility treatment group. There was no significant difference in anxiety about nursing infants between the mothers of twins and those of higher multiples. However, there were higher rates of anxiety about the health of the fetuses, economic

Table 1

Major Characteristics of Subjects in Families with Multiple Births

	Non-infertility treatment group N = 631	Infertility treatment group N = 359	χ^2 or <i>t</i>	<i>df</i>	<i>p</i>
Maternal age at delivery					
Mean \pm <i>SD</i>	28.4 \pm 3.67	30.2 \pm 3.53	<i>t</i> = 7.55	987	<i>p</i> < .001
Range	19–40	20–43			
Maternal age now					
Mean \pm <i>SD</i>	31.3 \pm 3.97	32.7 \pm 3.77	<i>t</i> = 5.17	984	<i>p</i> < .001
Range	20–49	22–48			
Age of multiple births					
Mean \pm <i>SD</i>	2.52 \pm 2.02	2.04 \pm 1.89	<i>t</i> = 3.70	988	<i>p</i> < .001
Range	0–15	0–15			
Gestation number					
Twin	603 (95.6)	225 (62.7)	χ^2 = 183.0	3	<i>p</i> < .001
Triplet	28 (4.4)	119 (33.1)			
Quadruplet	0 (0.0)	13 (3.6)			
Quintuplet	0 (0.0)	2 (0.6)			
Disabled children ^a					
No disabled children in the set	557(91.6)	289(84.3)	χ^2 = 14.3	3	<i>p</i> < .01
One disabled child in the set	41(6.7)	48(14.0)			
Two disabled children in the set	9(1.5)	6(1.7)			
Three disabled children in the set	1(0.2)	0(0.0)			
Cooperation from other family members or relatives for childrearing ^a					
Cooperative	514(81.7)	320(90.1)	χ^2 = 12.4	1	<i>p</i> < 0.001
Non-cooperative	115(18.3)	35(9.9)			
Methods for alleviating stress ^a					
Used	425(68.3)	223(64.5)	χ^2 = 1.51	1	<i>ns</i>
Not used	197(31.7)	123(35.5)			

Note: ^a Excluding cases where information regarding disabled children, cooperation from family members in childrearing, and methods for alleviating stress was unknown.
df = degree of freedom, *ns* = not significant

Table 2

Feeling when they Were Informed of Multiple Pregnancies in the Non-infertility Treatment Group and Infertility Treatment Group

	Non-infertility treatment group	Infertility treatment group	χ^2	<i>df</i>	<i>p</i>
Feeling when they were informed of multiple pregnancy ^a					
Very delighted–delighted	399(64.1)	269(76.4)	χ^2 = 14.1	2	<i>p</i> < .001
Fairly delighted	109(17.5)	50(14.2)			
Not very delighted–not delighted	114(18.4)	33(9.4)			
Anxiety that they felt when they were informed of multiple pregnancy ^a					
Very anxious–anxious	376(60.0)	200(56.5)	χ^2 = 0.03	2	<i>ns</i>
Fairly anxious	174(27.8)	112(31.6)			
Not very anxious–not anxious	77(12.2)	42(11.9)			

Note: ^a Excluding cases where information regarding delight and anxiety that they felt when they were informed of multiple pregnancy was unknown.
df = degree of freedom, *ns* = not significant

concerns after delivery in the mothers of higher multiples than in those of twins.

Table 5 shows the state of sleep, fatigue, and depression in the mothers in each group. There were no significant differences in the duration of sleep, perceived degree of lack of sleep, fatigue symptom index, and five-grade rating scale of fatigue between mothers in the non-infertility treatment group and those in the infertility treatment group. However, there was a significantly higher rate of depressive symptoms in mothers in the infertility treatment group than in those in the non-infertility group (*p* < .05).

Table 6 shows the results of logistic regression on the disabled multiple children with associated factors as independent variables. Lowering of gestational age was independently associated with a greater risk of disabled children: the odds ratio indicated that infants whose gestational age was < 32 weeks were 7 times more likely to be disabled than infants whose gestational age was \geq 32 weeks.

Table 7 shows the results of logistic regression on the depressive symptoms of mothers in the infertility treatment group with associated factors as independent variables. Disabled children were associated with the risk of depressive

Table 3

Anxiety During Twin Pregnancy in the Non-infertility Treatment Group and Infertility Treatment Group

	Mothers of twins in Non-fertility treatment group <i>N</i> (%)	Mothers of twins in Infertility treatment group <i>N</i> (%)	χ^2	<i>df</i>	<i>p</i>
Anxiety for health of fetuses ^a					
Applicable	477(80.3)	181(83.4)	$\chi^2 = 1.00$	1	<i>ns</i>
Not applicable	117(19.7)	36(16.6)			
Anxiety for nursing infants ^a					
Applicable	340(57.2)	110(50.7)	$\chi^2 = 4.04$	1	<i>p</i> < .05
Not applicable	254(42.8)	107(49.3)			
Economic anxiety after delivery ^a					
Applicable	216(36.4)	54(24.9)	$\chi^2 = 9.43$	1	<i>p</i> < .01
Not Applicable	378(63.6)	163(75.1)			

Note: ^a Excluding cases where information regarding contents of anxiety was unknown.
df = degree of freedom, *ns* = not significant

Table 4

Anxiety During Multiple Pregnancy in Mothers of Twins and Mothers of Higher Multiples in the Infertility Treatment Group

	Mothers of twins <i>N</i> (%)	Mothers of higher multiples <i>N</i> (%)	χ^2	<i>df</i>	<i>p</i>
Anxiety for health of fetuses ^a					
Applicable	181(83.4)	122(93.1)	$\chi^2 = 6.85$	1	<i>p</i> < .01
Not Applicable	36(16.6)	9(6.9)			
Anxiety for nursing infants ^a					
Applicable	107(49.3)	66(50.4)	$\chi^2 = 0.38$	1	<i>ns</i>
Not Applicable	110(50.7)	65(49.6)			
Economic anxiety after delivery ^a					
Applicable	54(24.9)	46(35.1)	$\chi^2 = 4.17$	1	<i>p</i> < .05
Not Applicable	163(75.1)	85(64.9)			

Note: ^a Excluding cases where information regarding contents of anxiety was unknown.
df = degree of freedom, *ns* = not significant

Table 5

State of Sleep, Fatigue, and Depressive State in Mothers in the Non-infertility Treatment Group and Infertility Treatment Group

	Non-infertility treatment group	Infertility treatment group	χ^2 or <i>t</i>	<i>df</i>	<i>p</i>
Duration of sleep ^a	6.65 ± 1.16	6.62 ± 2.35	<i>t</i> = 0.31	980	<i>ns</i>
Frequency of sleeping breaks during the night ^b					
< 2	405(66.8)	209(60.1)	$\chi^2 = 4.42$	1	<i>p</i> < 0.05
2 and over	201(33.2)	139(39.9)			
Perceived degree of lack of sleep ^a	2.80 ± 1.07	2.94 ± 1.09	<i>t</i> = 1.91	976	<i>ns</i>
Fatigue Symptoms Index ^a					
Cumulative fatigue	48.0 ± 34.6	50.7 ± 35.3	<i>t</i> = 1.13	983	<i>ns</i>
General fatigue	16.0 ± 16.6	16.2 ± 18.1	<i>t</i> = 0.12	983	<i>ns</i>
Five-grade rating scale of fatigue ^a					
Physical fatigue	3.34 ± 0.92	3.41 ± 0.93	<i>t</i> = 1.14	987	<i>ns</i>
Mental fatigue	3.19 ± 1.00	3.26 ± 1.04	<i>t</i> = 1.05	986	<i>ns</i>
Depressive states ^b					
Without Depression	555 (89.4)	292 (83.9)	$\chi^2 = 6.05$	1	<i>p</i> < 0.05
Depressive symptoms	66 (10.6)	56 (16.1)			

Note: ^a Mean ± *SD*

^b Excluding cases where information regarding frequency of sleeping breaks during the night and depressive states was unknown.
df = degree of freedom, *ns* = not significant

Table 6
Results of Logistic Regression on Disabled Multiple Children and Associated Factors

Independent variables	Odds ratio	95% confidence interval
Gestation number		
Twin	1.00	
Triplet and more	1.43	0.80–2.57
Infertility treatment		
Not used	1.00	
Used	1.53	0.92–2.54
Maternal age at delivery		
< 35	1.00	
≥ 35	1.66	0.78–3.53
Gestational age		
≥ 32	1.00	
< 32	7.17***	4.11–12.50

Note: *** $p < .001$

Table 7
Results of Logistic Regression on Depressive Symptoms of Mothers and Associated Factors

Independent variables	Odds ratio	95% confidence interval
Gestation number		
Twin	1.00	
Triplet and more	0.63	0.31–1.30
Disabled children		
No disabled children in the set	1.00	
At least one disabled child in the set	2.27*	1.02–5.04
Cooperation from other family members or relatives for childrearing		
Cooperative	1.00	
Non-cooperative	1.03	0.38–2.79
Methods for alleviating stress		
Used	1.00	
Not used	2.40**	1.26–4.56
Age of multiple births		
3 and over	1.00	
< 3	1.05	0.51–2.15

Note: * $p < .05$, ** $p < 0.01$

symptoms: the odds ratio indicated that mothers with at least one disabled child were twice as likely to have depressive symptoms than mothers with no disabled children. Furthermore, the methods for alleviating stress were associated with a risk of depressive symptoms: the odds ratio indicated that mothers who used no methods for alleviating stress were twice as likely to have depressive symptoms than those who did.

Discussion

Leiblum et al. (1990) reported that infertile women found a multiple gestation pregnancy more acceptable than fertile women. In this study, mothers who conceived after infertility treatment were more delighted when informed of a multiple

pregnancy than those who conceived spontaneously. In addition, with respect to anxiety during multiple pregnancies, mothers of twins who conceived after infertility treatment showed lower rates of anxiety about nursing the infants and economic concerns after delivery than those of twins who conceived spontaneously. These results are consistent with those reported by Leiblum et al. (1990).

However, after delivery, mothers who conceived after infertility treatment showed a higher rate of depressive symptoms than those who conceived spontaneously. Bryan (1992) reported that it was not easy for mothers of twins to treat their twin babies equally and to give them the same amount of time and attention. Several studies have indicated that the majority of mothers of twins and triplets experienced emotional distress or depression, thus it was highly probable that the risk of depression increased with the number of children born at the same time (Garel et al., 1992; Garel et al., 1997; Thorpe et al., 1991). In spite of the fact that both sets of mothers had multiple children, this result revealed that mothers who conceived after infertility treatment had a higher risk of depression than those who conceived spontaneously.

Meanwhile, differing factors in child-rearing were observed in mothers who conceived after infertility treatment and mothers who conceived spontaneously. As a result of infertility problems, mothers who conceived after infertility treatment were older than those who conceived spontaneously. Moreover, mothers who conceived after infertility treatment had higher rates of triplets or higher order multiple births. Goshen-Gottstein (1980) reported that mothers of "supertwins" tended to be more likely to express the negative side of their ambivalence towards the children than the mothers of twins. In this study, mothers of triplets and higher order multiple births who conceived after infertility treatment showed higher rates of anxiety about the health of the fetuses and economic concerns during multiple pregnancies than those of twins who conceived after infertility treatment. Thus, higher rates of triplets or higher order multiple births might affect the emotional distress of mothers who conceived after infertility treatment.

Concerning factors associated with the increased risk of depressive symptoms, this study showed a tendency for mothers with disabled children who conceived after infertility treatment to have a higher risk of depressive symptoms compared with those without disabled children who conceived after infertility treatment. This indicated that the risk of depressive symptoms in mothers was associated with disabilities in multiple children. It was reported that family support for stroke patients significantly improved the quality of life for carers (Mant et al., 2000). Accordingly, mothers with disabled multiple children should be systematically provided with public services including a family support organizer, home help, access to day care centers and counseling for mothers.

The prevalence of cerebral palsy was 0.7% and 2.7% in twin and triplet pregnancies, respectively (Pettersson et al., 1993), thus the risk of disabilities in triplets was considerably high compared with twins. This study showed a tendency for disabled children to have a lower gestational age at birth than children without disabilities,

and the mean gestational age at birth in triplets (33 weeks) was lower than that in twins (36 weeks). The discrepancy in the rates of producing at least one child with a disability reported here (15.7% in the infertility treatment group, 8.4% in the non-infertility treatment group) might be due to the diverse distribution of gestation age between mothers who conceived after infertility treatment and those who conceived spontaneously. Considering the medical and psychological risks associated with triplet and higher order multiple births, the prevention of triplet and more pregnancies due to infertility treatments is recommended.

Garel et al. (1992) reported that mothers who received support from their husbands developed fewer depressive symptoms and problems than those who received no support. On the other hand, in this study, cooperation from other family members or relatives in child-rearing was not associated with the depressive state of the mothers, although there was a higher rate of cooperation from other family members or relatives in mothers who conceived after infertility treatment than in those who conceived spontaneously. However, this study showed that mothers without depressive symptoms who conceived after infertility treatment were more likely to use methods for alleviating stress. Mothers with disabled multiple children should be supported in order to allow time to alleviate stress.

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Appendix A

Items of Fatigue Symptom Index

General Fatigue

1. My movements are not coordinated and I often drop things.
2. Sometimes, I feel I don't have enough energy.
3. I often feel dizzy.
4. I have recently felt tired all over.
5. I have lumbago.
6. I have pain in my joints.
7. My eyesight is sometimes dim.
8. I have eyestrain.
9. I often have a stiff neck.
10. I can not sleep well and frequently dream.
11. Recently, my movements have become slow and labored.

Cumulative fatigue

1. I often feel fatigue when I get up in the morning.
2. I don't have time to pull myself together.
3. I can't recover from my fatigue.
4. I feel I have to work too hard to take care of my family.
5. I often want to lie down due to fatigue.
6. I am very tired due to providing daily care.

Appendix B

Items of Questionnaire According to Major Depressive Episode of DSM-IV

1. depressed

- (1) I have felt blue for most of the day.
(How long has your mood continued?)
- (2) I feel that I am a bother to my friends.

2. loss of interest or pleasure in usual activities

- (3) I am no longer interested in my favorite activities.
- (4) I do not enjoy doing anything.

3. poor appetite or significant weight loss or overeating

- (5) Recently, I have had a poor appetite.
- (6) Recently, I have become thin.
- (7) I have eaten too much.

4. loss of energy or fatigue

- (8) I feel it is troublesome to move.
- (9) I don't have the energy to do anything.
- (10) I tire easily.
- (11) I am somehow spiritless.
- (12) I feel serious fatigue.

5. insomnia or hypersomnia

- (13) I often cannot sleep at night.
- (14) Recently, I have been wakeful.
- (15) Recently, I have been very sleepy every day.

6. feeling of worthlessness

- (16) I dislike myself very much.
- (17) I am inferior to others.

7. complaints or evidence of diminished ability to think or concentrate

- (18) I quickly lose patience.
- (19) I cannot become interested in reading or writing.
- (20) I have no desire to think things through.
- (21) I cannot concentrate or I lose my power of concentration.

8. recurrent thoughts of death

- (22) I am not happy to be alive.
- (23) I feel despair (feeling of hopelessness).

Depressive symptoms:

Depressed mood (1) and at least one of the following symptoms (2–8) have each been present nearly every day for a period of at least 2 weeks.