

Elective Cesarean Section at 37 Weeks Is Associated with the Higher Risk of Neonatal Complications

Jun-ichi Nakashima,¹ Sohsaku Yamanouchi,¹ Shin-ichiro Sekiya,¹
Masato Hirabayashi,¹ Kenji Mine,¹ Atsushi Ohashi,¹ Shoji Tsuji,¹
Atsushi Kasamatsu,² Hideharu Kanzaki,² Daishi Hirano³ and Kazunari Kaneko¹

¹Department of Pediatrics, Kansai Medical University, Hirakata, Osaka, Japan

²Department of Obstetrics and Gynecology, Kansai Medical University, Hirakata, Osaka, Japan

³Department of Pediatrics, The Jikei University School of Medicine, Tokyo, Japan

Elective Cesarean section performed before 39 weeks of gestation may be associated with increased risk of neonatal complications. We retrospectively investigated differences in the neonatal complication rate between 684 newborns delivered by elective Cesarean section at 37 weeks of gestation ($n = 390$) and those delivered by the same procedure at 38 weeks ($n = 294$) between 2006 and 2012 at our hospital in order to ascertain whether adverse outcomes differ between the groups. Newborns delivered at 37 weeks had a significantly higher incidence of neonatal intensive care unit admission ($p = 0.03$), adverse respiratory complications ($p < 0.01$), low birth weight ($p < 0.001$), and hypoglycemia ($p < 0.005$) than those delivered at 38 weeks. Compared with normal weight neonates, low birth weight neonates were more likely to have hypoglycemia ($p < 0.001$). Multivariate logistic regression analysis revealed that an adverse respiratory outcome was independently associated with gestational age ($p < 0.01$; odds ratio [OR], 3.26; 95% confidence interval [CI], 1.36-7.81), while hypoglycemia was independently associated with birth weight ($p < 0.01$; OR, 16.34; 95% CI, 7.72-34.56). Respiratory disorders were significantly associated with gestational age even in normal birth weight newborns without any other complications such as hyperbilirubinemia, hypoglycemia or bacterial infections. In conclusion, the incidence of neonatal complications was higher in newborns delivered at 37 weeks of gestation than in those delivered at 38 weeks via elective Cesarean section. Thus, the procedure should be scheduled at 38 weeks to improve neonatal outcomes.

Keywords: elective Cesarean section; neonatal complications; prematurity; term neonates; timing
Tohoku J. Exp. Med., 2014 August, 233 (4), 243-248. © 2014 Tohoku University Medical Press

Introduction

When vaginal delivery is difficult or delivery needs to be completed as soon as possible, a Cesarean section is performed to remove the fetus surgically through an incision made in the uterine wall. Cesarean section is indicated for maternal and fetal reasons and is divided into elective and emergency procedures. The maternal indications for Cesarean section include obstetric and maternal complications, such as multiple pregnancy, placenta previa, and history of cardiac disease, while fetal indications include in-uterine growth retardation and nonreassuring fetal status. Elective Cesarean section may be indicated in cases of breech presentation and prior history of Cesarean section or uterine surgery, due to increased risk of neonatal brain injury, uterine rupture, or other complications.

The rate of Cesarean sections performed worldwide is

increasing despite the procedure carrying an increased risk of neonatal respiratory complications compared with vaginal delivery. In the United States, the rate increased from 20.7% in 1996 to 31.8% in 2007, while in the Netherlands, it increased from 8.5% in 1993 to 15.1% in 2007 (Hamilton et al. 2006; Robinson et al. 2010; Wilmink et al. 2010; Kamiya 2013). The increase at general hospitals in Japan has also been quite marked, rising from 9.9% in 1987 to 24.1% in 2011. This increasing trend in the rate of Cesarean sections can be attributed to an increase in cases of uterine rupture during vaginal birth after a previous Cesarean section and to more requests for Cesarean deliveries from families concerned about traumatic injury to the neonate during birth (Gregory et al. 1998; Chigbu et al. 2007; Robson et al. 2008; Nakamura et al. 2011).

In terms of the timing of elective Cesarean section, there were previously thought to be no significant differ-

Received February 5, 2014; revised and accepted July 2, 2014. Published online July 30 2014; doi: 10.1620/tjem.233.243.

Correspondence: Kazunari Kaneko, M.D., Department of Pediatrics, Kansai Medical University, 2-5-1 Shin-machi, Hirakata, Osaka 573-1010, Japan.

e-mail: kanekok@hirakata.kmu.ac.jp

ences in neonatal complication rates among newborns delivered at 37, 38, and 39 weeks of gestation. Consequently, most elective Cesarean sections have been scheduled before 39 weeks of gestation (Lilford et al. 1990; Gould et al. 2005). However, recent studies have revealed an increase in the number of cases with neonatal respiratory disorders associated with elective Cesarean Sections performed before 39 weeks of gestation (Hales et al. 1993; Hansen et al. 2008; Tita et al. 2009). A multicenter cohort study in the United States targeting repeat term Cesarean sections found that the incidence of multiple complications was higher in neonates born at 37 or 38 weeks of gestation than in those born at 39 weeks of gestation (Tita et al. 2009).

At our hospital, few patients undergo elective Cesarean sections at or after 39 weeks of gestation because the obstetrician-gynecologists tend to plan elective Cesarean sections earlier than this to avoid emergency surgery, which carries greater risks for both the mother and neonate. They believe that deliveries at or after 39 weeks of gestation or later result in more emergency surgeries due to premature rupture of membranes (PROM) or labor onset. However, elective procedures performed earlier than 39 weeks may show distinct differences in adverse neonatal outcomes between those performed at 37 weeks and those performed at 38

weeks, although the available data on this are scarce in Japan (Chang et al. 2009; Ogasawara et al. 2012).

We conducted this retrospective study to determine differences in the rate and type of neonatal complications between newborns delivered by elective Cesarean section at 37 weeks of gestation and those delivered by the same procedure at 38 weeks of gestation in Japan.

Patients and Methods

A total of 2,240 patients underwent Cesarean section delivery at our hospital between January 2006 and December 2012 (Fig. 1). These included premature newborns delivered before 37 weeks of gestation ($n = 727$), newborns delivered between 37 and 38 weeks of gestation ($n = 1,095$), and newborns delivered at or after 39 weeks of gestation ($n = 418$). Of the 1,095 newborns delivered between 37 and 38 weeks of gestation, 411 were excluded from the study due to the following reasons: Cesarean sections performed for multiple pregnancy; the presence of fetal disorders, intrauterine growth retardation, pregnancy-induced hypertension, diabetes mellitus, gestational diabetes mellitus, placenta previa, low-lying placenta, placental abruption, prolonged labor, nonreassuring fetal status, or other underlying diseases or obstetrical complications; and conversion to emergency Cesarean section due to PROM or labor onset. This left 684 newborns ($n = 390$ at 37 weeks and $n = 294$ at 38 weeks) delivered by elective Cesarean section for inclusion in this study. The study protocol was approved by the institutional review board of the hospital

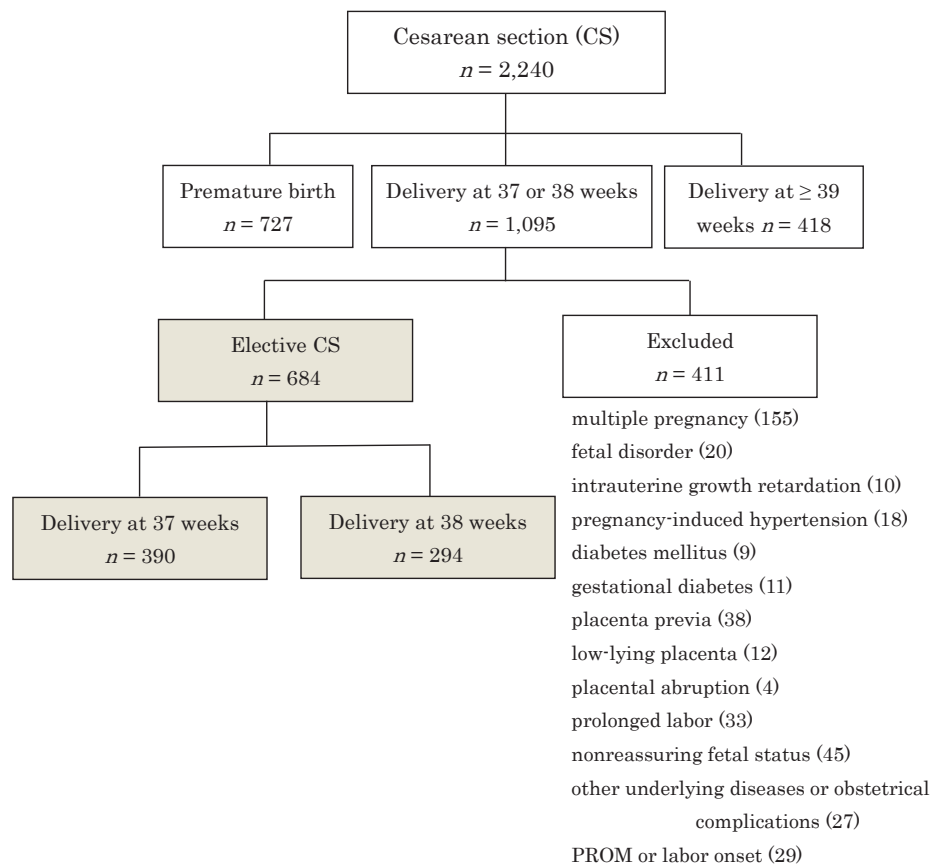


Fig. 1. Schematic diagram of the study group population.

Of the 1,095 neonates born between 37 and 38 weeks of gestation, 684 were delivered by elective Cesarean section. Gray boxes denote the enrolled subjects. A total of 411 cases were excluded from the study.

where the work was performed.

The demographic characteristics of the subjects were retrospectively investigated using medical and delivery records. The maternal factors examined were age at delivery, nullipara rate, breech presentation, previous Cesarean section, and history of uterine surgery; the neonatal factors were neonatal morbidity due to prematurity, including low birth weight (< 2,500 g at birth), 5-min Apgar score, neonatal intensive care unit (NICU) admission, hyperbilirubinemia, respiratory disorders, hypoglycemia, and bacterial infection (with or without proven sepsis).

Apgar scores were evaluated by an obstetrician-gynecologist, pediatrician, or midwife. Admission of newborns to the NICU was decided by a neonatologist. Newborns were defined as having hyperbilirubinemia if they required phototherapy. The diagnosis of respiratory complications was based on clinical signs (e.g., tachypnea, retractions, grunting, and cyanosis) and radiographic findings. Assisted ventilation included nasal continuous positive airway pressure. Low birth weight neonates (< 2,500 g) and neonates admitted to the NICU had their blood sugar levels measured, and those with levels < 40 mg/dL were determined to be hypoglycemic. Bacterial infection was defined as the need for antibiotics and an associated serum C-reactive protein level of ≥ 0.25 mg/dL. Blood samples were also collected for culture.

Statistical analysis was performed using the Mann-Whitney *U* test and the Chi-squared test to examine continuous and categorical variables, respectively. Logistic regression analysis was performed using hyperbilirubinemia, respiratory complications, hypoglycemia, and infection as dependent variables and gestational age, sex, birth weight, and the 5-min Apgar score as independent variables. A *p*-value < 0.05 was considered significant. The study was approved by the Institutional Review Board of the hospital (no. H140627).

Results

Table 1 provides the demographic data of the mothers and newborns. In terms of maternal factors, the 37-week group consisted mostly of mothers over 35 years of age and

showed a significant difference in mean age compared with the 38-week group. No significant differences were noted in the rate of primipara births or the rate of indication for elective Cesarean sections. In terms of neonatal factors, low birth weight was significantly more common in newborns delivered at 37 weeks of gestation than in those delivered at 38 weeks, while no significant differences were observed in the number of newborns who were small for gestational age. In addition, no significant differences existed in the male to female ratio between the groups.

Analysis of adverse neonatal outcomes revealed that a significantly higher rate of NICU admission, low birth weight, respiratory complications, and hypoglycemia in newborns delivered at 37 weeks of gestation than in those delivered at 38 weeks, as shown in Table 2. In all newborns with respiratory complications, transient tachypnea of the neonate (TTN) was diagnosed based on chest radiographic findings and the need for oxygen supply. Of note, respiratory distress assessed by the need for assisted ventilation was more severe among newborns with TTN who were delivered at 37 weeks of gestation.

In contrast, there was no significant difference between the groups in regard to 5-min Apgar score or the incidence of hyperbilirubinemia or bacterial infection. Bacterial infection was occult bacteremia in all detected cases. Among them, none of the newborns had positive blood cultures or required antibiotic administration for longer than 48 h after birth. Their mothers showed no signs of infection.

As shown in Table 3, multivariate logistic regression analysis revealed that respiratory complications and hypoglycemia were independently associated with gestational age and low birth weight, respectively.

To confirm the significant association of respiratory

Table 1. Subject demographics.

Characteristic	Gestational week when elective Cesarean section was performed		<i>p</i> value
	37 weeks (<i>n</i> = 390)	38 weeks (<i>n</i> = 294)	
<i>Mothers</i>			
*Age at delivery (years)	35 [31-37]	34 [31-37]	0.183
No. aged ≥ 35 years (%)	197 (50.5)	124 (42.2)	0.031
No. of nullipara (%)	98 (25.1)	67 (22.8)	0.479
No. of breech presentations (%)	88 (22.5)	62 (21.0)	0.644
No. of previous Cesarean sections (%)	273 (70.0)	210 (71.5)	0.684
No. with a history of uterine surgery (%)	29 (7.5)	22 (7.5)	0.981
<i>Newborns</i>			
*Birth weight (g)	2,810 [2,580-3,024]	2,910 [2,720-3,100]	< 0.001
No. with low birth weight (%)	70 (17.9)	24 (8.2)	< 0.001
No. small for gestational age (%)	13 (4.4)	15 (5.1)	0.247
No. of males (%)	179 (45.9)	128 (43.5)	0.539
*Apgar score at 5 min	9 [9-10]	10 [9-10]	0.131

*Data are presented as median values with the 25th and 75th percentiles in square brackets.

Table 2. Adverse neonatal outcomes according to gestational age.

Neonatal parameter	Gestational week when elective Cesarean section was performed		
	37 weeks (n = 390)	38 weeks (n = 294)	p value
*Apgar score at 5 min [range]	9 [9-10]	10 [9-10]	0.131
No. requiring NICU admission (%)	32 (8.2%)	12 (4.1%)	0.030
No. with low birth weight (%)	70 (17.9%)	24 (8.2%)	< 0.001
No. with hyperbilirubinemia (%)	42 (10.8%)	26 (8.8%)	0.400
No. with respiratory complications (%)	26 (6.7%)	7 (2.4%)	0.010
No. receiving oxygen for ≥ 24 h of age (%)	15 (3.8%)	5 (1.8%)	0.099
No. needing assisted ventilation (%)	20 (5.1%)	4 (1.4%)	0.008
No. with hypoglycemia (%)	30 (7.7%)	8 (2.7%)	0.005
No. with bacterial infection (%)	3 (0.8%)	3 (1.0%)	0.730
No. with sepsis (%)	0 (0%)	0 (0%)	1.000

NICU, neonatal intensive care unit.

*Data are presented as median values with the 25th and 75th percentiles in square brackets.

Table 3. Predictors of neonatal morbidity by multivariate logistic regression.

	Parameter	P	OR (95% CI)
Hyperbilirubinemia	GA, 37 or 38 weeks	0.28	1.35 (0.79-2.31)
	Sex, male vs. female	0.40	0.81 (0.49-1.33)
	Birth weight, < 2,500 g vs. $\geq 2,500$ g	0.58	0.80 (0.37-1.75)
	Apgar score at 5 min, < 7 vs. ≥ 7	0.43	0.72 (0.32-1.62)
Respiratory complications	GA, 37 or 38 weeks	< 0.01	3.26 (1.36-7.81)
	Sex, male vs. female	0.53	0.80 (0.39-1.61)
	Birth weight, < 2,500 g vs. $\geq 2,500$ g	0.29	0.52 (0.15-1.76)
	Apgar score at 5 min, < 7 vs. ≥ 7	0.56	0.56 (0.27-2.03)
Hypoglycemia	GA, 37 or 38 weeks	0.61	2.27 (0.96-5.34)
	Sex, male vs. female	0.53	1.00 (0.47-2.12)
	Birth weight, < 2,500 g vs. $\geq 2,500$ g	< 0.01	16.34 (7.72-34.56)
	Apgar score at 5 min, < 7 vs. ≥ 7	0.14	0.39 (0.11-1.38)
Bacterial infection	GA, 37 or 38 weeks	0.33	0.37 (0.05-2.75)
	Sex, male vs. female	0.29	0.40 (0.07-2.22)
	Birth weight, < 2,500 g vs. $\geq 2,500$ g	0.64	1.69 (0.19-15.40)
	Apgar score at 5 min, < 7 vs. ≥ 7	0.13	5.19 (0.63-42.95)

GA, gestational age.

complications with gestational age, further analysis was performed only in normal birth weight newborns without any complications except respiratory complications. When the distribution of gestational age was compared between newborns with respiratory complications alone (i.e. not with low birth weight or hypoglycemia) and newborns with no complications, the former group had a significantly shorter length of gestation (Table 4).

Discussion

We report here novel data showing that the timing of elective Cesarean section (37 vs. 38 weeks of gestation)

can result in distinct differences in neonatal risk: newborns delivered at 37 weeks of gestation had a higher rate of NICU admission, low birth weight, respiratory complications, and hypoglycemia compared to newborns delivered at 38 weeks of gestation. Although it is already known that delivery by Cesarean section performed earlier than 39 weeks of gestation increases the risks of several neonatal complications (Tita et al. 2009; Nir et al. 2012), we demonstrated here that the risk of neonatal complications differs between newborns delivered at 37 weeks of gestation and those delivered at 38 weeks. Our findings support the postulation that neurological development may be delayed in

Table 4. Distribution of gestational age in normal birth weight newborns with respiratory complications alone and those with no complications.

	Respiratory complications alone	No complications	<i>p</i> value
*No. of patients	27	551	
Length of gestation	37 w 5 d [37 w 3 d-37 w 6 d]	37 w 6 d [37 w 4 d-38 w 2 d]	0.047

w, weeks; d, days.

*Patients for this analysis were born with normal birth weight, no hyperbilirubinemia, no hypoglycemia and no bacterial infections.

Data are presented as median values with the 25th and 75th percentiles in square brackets.

newborns delivered before 38 weeks of gestation (Kinney 2006).

The increased risk of neonatal complications such as low birth weight, respiratory complications, and hypoglycemia among newborns delivered at 37 weeks of gestation compared to those delivered at 38 weeks can be attributed to functional prematurity: insufficient surfactant production results in the onset of respiratory complications (Madar et al. 1999), and low birth weight and small for gestational age neonates are also more likely to develop hypoglycemia (Anderson et al. 1993; Harris et al. 2012). As a result, the increased incidence of respiratory complications and hypoglycemia has led to an increased number of NICU admissions, which has escalated medical costs.

A shorter length of gestation is associated with an increased risk of low birth weight, which in turn is associated with an increased risk of hypoglycemia. Respiratory disorders can also manifest as a sign of hypoglycemia. These facts suggest potential confounding effects of hypoglycemia and low birth weight in evaluating the relationship between respiratory disorders and gestational age. Consequently, we compared normal birth weight newborns with respiratory disorders alone (without hypoglycemia, hyperbilirubinemia or bacterial infections) with those with no complications and found a significant association between respiratory disorders and gestational age (Table 4). Based on these findings, we conclude that elective Cesarean sections should be scheduled at 38 weeks or later of gestation.

The guidelines published by the American College of Obstetricians and Gynecologists (2007) recommend that repeat elective Cesarean sections should be performed at or after 39 weeks of gestation to prevent neonatal respiratory complications. However, the rate of elective Cesarean sections performed between 37 and 38 weeks of gestation is still as high as 35.8-56.7% (Tita et al. 2009; Nir et al. 2012), with the highest rate reported in Japan, at 91.8% (Chang et al. 2009). Thus, despite the established guidelines and the scarcity of data on different neonatal complication rates between newborns delivered at 37 weeks and those delivered at 38 weeks, it appears that a large proportion of elective Cesarean sections are performed before 39 weeks in many countries. At our institution, 684 of 710 neonates (96.3%) born before 39 weeks of gestation during the study

period were delivered by elective Cesarean section. The reasons our obstetrician-gynecologists gave for planning elective Cesarean sections between 37 and 38 weeks of gestation were that scheduling Cesarean sections late in pregnancy (39 weeks of gestation) may lead to an increased rate of emergency Cesarean sections due to PROM or labor onset, thereby increasing the risks for both the mother and newborn (Gould et al. 2005), and that the neonatal mortality rate is 1.7-fold greater with emergency Cesarean section than with elective Cesarean section (Lilford et al. 1990).

Only a few studies have analyzed the rate of emergency Cesarean section in relation to estimated gestational age. Ogasawara et al. (2012) have found no significant difference in the rate of emergency Cesarean section between women scheduled to undergo elective Cesarean section at 37 weeks and 38 weeks of gestation (11.3% and 10.2%, respectively; $P = 0.388$). Thus, no significant difference was noted in the rate of conversion to emergency Cesarean section between a group originally scheduled for Cesarean section at 37 weeks of gestation and that scheduled for Cesarean section at 38 weeks of gestation (Ogasawara et al. 2012). On the other hand, Chang et al. (2009) noted a significantly higher rate of emergency Cesarean section among those scheduled to undergo surgery at 39 weeks of gestation (40%) than those scheduled to undergo surgery at 37 or 38 weeks of gestation (11.8% and 19.5%, respectively). This finding was confirmed in our hospital: elective Cesarean section was changed to emergency Cesarean section because of PROM or labor onset in 2.7% of cases originally scheduled at 37 weeks (11/401 patients), in 3.3% of cases originally scheduled at 38 weeks (10/304 patients), and in 7.4% of cases originally scheduled at 39 weeks (2/27 patients), with no significant differences between the groups.

This study has several limitations. First, the sample size was too small to compare newborns delivered at 37 and 38 weeks of gestation by elective Cesarean section with those delivered at 39 and 40 weeks of gestation. Second, blood sugar levels were repeatedly measured in newborns with an increased risk of hypoglycemia, such as low birth weight neonates, neonates admitted to the NICU, and exceptionally large neonates, which may have biased our results. Nonetheless, this study clearly indicated that, compared with elective Cesarean section performed at 38 weeks

of gestation, that performed at 37 weeks of gestation (accounting for 55% of elective Cesarean sections performed at our institution) increased the risk of neonatal comorbidities (due to prematurity characterized by low birth weight) such as respiratory complications and hypoglycemia. The number of low birth weight neonates and the incidence of hypoglycemia were higher when Cesarean section was performed at 37 weeks of gestation.

In conclusion, elective Cesarean section performed earlier than 38 weeks of gestation should be avoided to minimize neonatal risks and complications. This approach will also reduce the medical expenses associated with NICU admissions and avoid separating mothers from their newborns.

Acknowledgments

This study was supported by the Mami Mizutani Foundation.

Conflict of Interest

The authors declare no conflict of interest.

References

- American College of Obstetricians and Gynecologists (2007) ACOG Committee Opinion No. 394, December 2007. Cesarean delivery on maternal request. *Obstet. Gynecol.*, **110**, 1501.
- Anderson, S., Shakya, K.N., Shrestha, L.N. & Costello, A.M. (1993) Hypoglycaemia: a common problem among uncomplicated newborn infants in Nepal. *J. Trop. Pediatr.*, **39**, 273-277.
- Chang, Y.S., Ishida, T., Ushioda, N., Ushioda, M., Nakai, Y., Nakamura, T. & Shimoya, K. (2009) Timing of elective Cesarean delivery at term and neonatal respiratory outcomes. *Modern Trends in Obstetrics & Gynecology*, **58**, 157-159 (in Japanese).
- Chigbu, C.O., Ezeome, I.V. & Iloabachie, G.C. (2007) Cesarean section on request in a developing country. *Int. J. Gynaecol. Obstet.*, **96**, 54-56.
- Gould, J.B., Qin, C. & Chavez, G. (2005) Time of birth and the risk of neonatal death. *Obstet. Gynecol.*, **106**, 352-358.
- Gregory, K.D., Curtin, S.C., Taffel, S.M. & Notzon, F.C. (1998) Changes in indications for cesarean delivery: United States, 1985 and 1994. *Am. J. Public Health*, **88**, 1384-1387.
- Hales, K.A., Morgan, M.A. & Thurnau, G.R. (1993) Influence of labor and route of delivery on the frequency of respiratory morbidity in term neonates. *Int. J. Gynaecol. Obstet.*, **43**, 35-40.
- Hamilton, B.E., Martin, J.A. & Ventura, S.J. (2006) Births: preliminary data for 2005. *Natl. Vital Stat. Rep.*, **55**, 1-18.
- Hansen, A.K., Wisborg, K., Uldbjerg, N. & Henriksen, T.B. (2008) Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study. *BMJ*, **336**, 85-87.
- Harris, D.L., Weston, P.J. & Harding, J.E. (2012) Incidence of neonatal hypoglycemia in babies identified as at risk. *J. Pediatr.*, **161**, 787-791.
- Kamiya, K. (2013) Number of Childbirths and Cesarean Operations by Institution, 1984-2008. In *Maternal and child health statistics of Japan*, edited by Mothers' & Children's Health & Welfare Association. Mothers' & Children's Health Organization, Tokyo, p. 127 (in Japanese).
- Kinney, H.C. (2006) The near-term (late preterm) human brain and risk for periventricular leukomalacia: a review. *Semin. Perinatol.*, **30**, 81-88.
- Lilford, R.J., van Coeverden de Groot, H.A., Moore, P.J. & Bingham, P. (1990) The relative risks of caesarean section (intrapartum and elective) and vaginal delivery: a detailed analysis to exclude the effects of medical disorders and other acute pre-existing physiological disturbances. *Br. J. Obstet. Gynaecol.*, **97**, 883-892.
- Madar, J., Richmond, S. & Hey, E. (1999) Surfactant-deficient respiratory distress after elective delivery at 'term'. *Acta Paediatr.*, **88**, 1244-1248.
- Nakamura, M., Miyamoto, S. & Andoh, A. (2011) Review of 614 deliveries of women with previous cesarean delivery from 2005 to 2009. *Journal of Japan Society of Perinatal and Neonatal Medicine*, **47**, 882-887 (in Japanese).
- Nir, V., Nadir, E. & Feldman, M. (2012) Late better than early elective term Cesarean section. *Acta Paediatr.*, **101**, 1054-1057.
- Ogasawara, A., Murakoshi, T., Tanaka, K., Shinno, T., Matsushita, M., Matsumoto, M., Naruse, H., Nakayama, S. & Torii, Y. (2012) Neonatal respiratory morbidity: a comparison of elective cesarean delivery performed at 37 weeks and 38 weeks gestation. *Journal of Japan Society of Perinatal and Neonatal Medicine*, **48**, 682-686 (in Japanese).
- Robinson, C.J., Villers, M.S., Johnson, D.D. & Simpson, K.N. (2010) Timing of elective repeat cesarean delivery at term and neonatal outcomes: a cost analysis. *Am. J. Obstet. Gynecol.*, **202**, 632; e1-6.
- Robson, S., Carey, A., Mishra, R. & Dear, K. (2008) Elective caesarean delivery at maternal request: a preliminary study of motivations influencing women's decision-making. *Aust. NZ J. Obstet. Gynaecol.*, **48**, 415-420.
- Tita, A.T., Landon, M.B., Spong, C.Y., Lai, Y., Leveno, K.J., Varner, M.W., Moawad, A.H., Caritis, S.N., Meis, P.J., Wapner, R.J., Sorokin, Y., Miodovnik, M., Carpenter, M., Peaceman, A.M., O'Sullivan, M.J., et al. (2009) Timing of elective repeat cesarean delivery at term and neonatal outcomes. *N. Engl. J. Med.*, **360**, 111-120.
- Wilmink, F.A., Hukkelhoven, C.W., Lunshof, S., Mol, B.W., van der Post, J.A. & Papatsonis, D.N. (2010) Neonatal outcome following elective cesarean section beyond 37 weeks of gestation: a 7-year retrospective analysis of a national registry. *Am. J. Obstet. Gynecol.*, **202**, 250; e1-8.