

# The Progress of Pregnancy and Labor and the Management to Reduce Neonatal Asphyxia in Primigravidas and Primiparas Aged 35 or Older

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**Abstract:** The study was performed to confirm the progress of pregnancy and labor in relation to maternal age and find the factors related to neonatal asphyxia in primigravidas and primiparas aged 35 or older and determine way of delivery to reduce neonatal asphyxia in older women with such factors. Background: Primigravidas and primiparas aged 35 and older have higher risks compared with younger women. With aging of the mother, maternal mortality rate is higher, incidence of pregnancy complications such as placenta previa, abruption, preterm delivery, low birth weight and hypertension are higher compared with that of younger women. Therefore it is important to manage well such high risk pregnancies. Objects and methods: 272 primigravidas and primiparas over 35 years of age and 491 women less than 35 years were studied.  $\chi^2$  test, T - test and Odds Ratio - test (OR - test) and 95% - confidence interval (95% CI) were applied for analysis. Results: Incidences of severe pregnancy-induced hypertension, a grade 3 placenta, abnormal Nonstress Test (NST), positive Contraction Stress Test (CST), neonatal asphyxia in primigravidas and primiparas aged 35 or older were significantly higher compared with that of younger women and labor time in women over 35 years of age was significantly longer than younger women. And the factors related to neonatal asphyxia in primigravidas and primiparas aged 35 or older were severe pregnancy-induced hypertension, a grade 3 placenta, abnormal NST and positive CST, and rate of neonatal asphyxia could be reduced by 2.1% by cesarean section in older women with such factors.

**Keywords:** Primigravidas, Primiparas, Aged 35 or Older, Neonatal Asphyxia, Cesarean Section, Pregnancy-Induced Hypertension

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## 1. Introduction

The women that are impregnated and delivered for the first time after 35 years of age are called primigravidas and primiparas of advanced age. Obstetrics complications such as pregnancy-induced hypertension, placenta previa, placental abruption and atonic uterine bleeding and the rates of fetal and neonatal asphyxia are higher in women aged 35 and older compared with younger women. The aim of the present study was to confirm the progress of pregnancy and labor in relation to maternal age and find the factors related to neonatal asphyxia in primigravidas and primiparas aged 35 or older and determine management to reduce neonatal asphyxia in older women with such factors.

## 2. Objects and Methods

### 2.1. Objects

A total of 763 primigravidas and primiparas who were hospitalized into the Pyongyang Maternity Hospital between April 2011 and October 2015 were included in the study, 272 of them were women aged 35 and older and 491 of them were women less than 35 years. 763 primigravidas and primiparas were divided into 3 groups; first group was composed of 588 primigravidas and primiparas to confirm the progress of pregnancy and labor in relation to maternal age and find the factors related to neonatal asphyxia in primigravidas and

primiparas aged 35 or older [ first group was divided into four subgroups, that is,  $\leq 24$  years (n=82), 25~29 years (n=281), 30~34 years (n=128),  $\geq 35$  years (n=97) groups ], second group was composed of 100 primigravidas and primiparas of advanced age to determine management to reduce neonatal

asphyxia in older women. Control group was included 75 primigravidas and primiparas of advanced age. Cephalopelvic disproportion, intrauterine fetal death, malpresentation such as breech presentation, transverse lie were excluded in the study.

*Table 1. Composition of groups.*

| Groups        | Cases       | Ages (year) |            |            |             |
|---------------|-------------|-------------|------------|------------|-------------|
|               |             | ~24         | 25~29      | 30~34      | 35~         |
| First group   | 588 (100.0) | 82 (13.9)   | 281 (47.8) | 128 (21.8) | 97 (16.5)   |
| Second group  | 100 (100.0) | -           | -          | -          | 100 (100.0) |
| Control group | 75 (100.0)  | -           | -          | -          | 75 (100.0)  |

( ): %

## 2.2. Methods

1) In order to confirm progress of pregnancy and labor and evaluate fetus and newborn conditions in relation to maternal age, 588 primigravidas and primiparas were subdivided into 2 groups, that is, <35 years group and  $\geq 35$  years group and then  $\geq 35$  years group was compared with <35 years group.

I Pregnancy induced hypertension depending on the severity of the hypertension was divided into absence and presence, present pregnancy induced hypertension was subdivided into mild and severe pregnancy induced hypertension according to the diagnostic criteria of pregnancy induced hypertension.

Diagnostic criteria of pregnancy induced hypertension;

Hypertension; Blood Pressure (BP) > 140/90mmHg after 20 weeks in previously normotensive women

Proteinuria;  $\geq 300$ mg / 24h, or protein: creatinine ratio  $\geq 0.3$

Thrombocytopenia; Platelets < 100 000/ $\mu$ l

Renal insufficiency; Creatinine > 1.1 mg / dl or doubling of baseline

Liver involvement; Serum transaminase levels (aspartate aminotransferase, alanine aminotransferase) twice normal

Cerebral symptoms; Headache, visual disturbances, convulsions

a. Mild pregnancy induced hypertension; systolic BP is from 140 to 160 mmHg or diastolic BP is from 90 to 110 mmHg, 24-hour urinary protein excretion from 300 mg to 2 000 mg

b. Severe pregnancy induced hypertension; systolic BP  $\geq 160$  mmHg or diastolic BP  $\geq 110$  mmHg, 24-hour urinary protein excretion exceeding 2 000mg.

(or in case any of thrombocytopenia, renal insufficiency, liver involvement and cerebral symptoms is present with high blood pressure)

II Placental grades were estimated with ultrasonic tomography and were divided into 0~3 grades (John, 2008).

III Total time of labor was estimated from the starting point of the pains with 10 minutes interval to the time right after placental expulsion and divided into first, second

and third stages of labor.

IV Fetal distress was divided into presence (abnormal NST, positive CST) and absence (normal NST, negative CST).

Nonstress test was performed for 20 minutes with cardiotocogram and divided into normal and abnormal types. normal nonstress test is two or more accelerations that peak at 15 bpm or more above baseline, each lasting 15 seconds or more, and all occurring within 20 minutes after beginning the test and abnormal nonstress test consisted of a fetal heart rate baseline that oscillated less than 15 bpm, each lasting less than 15 seconds and indicated absent acceleration or less than 2 accelerations for 20 minutes.

Contraction stress test was performed when three contractions are present in 10 minutes with either oxytocin or nipple stimulation and divided into negative (no late or significant variable decelerations) and positive [ late decelerations following 50% or more of contractions (even if the contraction frequency is fewer than three in 10 minutes) ].

V Newborn condition was estimated by 1-minute Apgar score, which was divided into 1~4 points, 5~7 points and 8~10 points and newborn asphyxia was assessed by less than 7 point.

Cesarean delivery women were excluded from estimation of 1-minute Apgar score.

2) In order to find factors related to newborn asphyxia in primigravidas and primiparas aged 35 and older, we analysed the rates of newborn asphyxia according to pregnancy induced hypertension, placental grades, NST, CST and determined factors related to newborn asphyxia with significant parameters in primigravidas and primiparas aged 35 and older.

3) In order to determine way of labor to reduce neonatal asphyxia in older women, groups were divided into labor induction group (52 women), cesarean section group (48 women) and control group (75 women) and the rates of neonatal asphyxia according to the severe pregnancy induced hypertension, a grade 3 placenta, NST and CST which became factors related to neonatal asphyxia were analysed.

Statistical analysis was performed using the chi-square, T-test, odds ratio (OR) and 95% confidence interval (95% CI).

### 3. Results

#### 3.1. The Progress of Pregnancy and Labor and Fetus and Newborn Conditions According to Maternal Age

##### 3.1.1. Severity of Pregnancy Induced Hypertension According to Maternal age

**Table 2.** Severity of pregnancy induced hypertension according to maternal age.

| Ages (year) | Cases       | Pregnancy induced hypertension |                  |            |
|-------------|-------------|--------------------------------|------------------|------------|
|             |             | Absence                        | Presence<br>Mild | Severe     |
| <35         | 491 (100.0) | 373 (76.0)                     | 69 (14.1)        | 49 (9.9)   |
| ≥35         | 97 (100.0)  | 60 (61.9)**                    | 20 (20.6)        | 17 (17.5)* |

( ): %, \*, p<0.05, \*\*, p<0.01 (compared with <35 years group)

Absence of pregnancy induced hypertension was significantly lower in ≥ 35 years group compared with < 35 years group (p<0.01) and severe pregnancy induced

##### 3.1.3. Time of Labor According to Maternal Age

**Table 4.** Time of labor according to maternal age.

| Ages (year) | Cases | Time of labor ( $\bar{X} \pm SE$ , min) |                       |                      |                     |
|-------------|-------|---|-----------------------|----------------------|---------------------|
|             |       | First stage of labor                    | Second stage of labor | Third stage of labor | Total time of labor |
| 35>         | 442   | 596.1±5.7                               | 51.9±0.7              | 9.7±0.2              | 657.7±5.7           |
| 35≤         | 75    | 639.7±11.7**                            | 60.5±2.4***           | 11.2±0.4***          | 711.4±11.5***       |

\*\*, p<0.01, \*\*\*, p<0.001 (compared with <35 years group)

The times of first, second and third stages of labor and total time of labor in ≥ 35 years group were significantly longer compared with <35 years group (p<0.01, p<0.001).

##### 3.1.4. Fetal Distress According to Maternal Age

**Table 5.** Fetal distress according to maternal age.

| Ages (year) | Cases       | Fetal distress |            |
|-------------|-------------|----------------|------------|
|             |             | Absence        | Presence   |
| 35>         | 491 (100.0) | 460 (93.7)     | 31 (6.3)   |
| 35≤         | 97 (100.0)  | 84 (86.6)*     | 13 (13.4)* |

( ): %, \*, p<0.05, (compared with <35 years group)

Absence of fetal distress were significantly lower in ≥ 35 years group compared to 35 years group (p<0.05) and presence of fetal distress were significantly higher in ≥ 35 years group compared with <35 years group (p<0.05).

##### 3.1.5. 1-Minute Apgar Score of Newborn According to Maternal Age

**Table 6.** 1-minute Apgar score of newborn according to maternal age.

| Ages (year) | Cases       | Apgar score |            |             |
|-------------|-------------|-------------|------------|-------------|
|             |             | 1~4         | 5~7        | 8~10        |
| 35>         | 442 (100.0) | 7 (1.6)     | 28 (6.3)   | 407 (92.1)  |
| 35≤         | 75 (100.0)  | 3 (4.0)     | 11 (14.7)* | 61 (81.3)** |

( ): %, \*, p<0.05, \*\*, p<0.01 (compared with <35 years group)

hypertension were significantly higher in ≥ 35 years group compared with <35 years group (p<0.05).

##### 3.1.2. Placental Grades According to Maternal Age

**Table 3.** Placental grades according to maternal age.

| Ages (year) | Cases       | Placental grades (degree) |            |            |            |
|-------------|-------------|---------------------------|------------|------------|------------|
|             |             | 0                         | 1          | 2          | 3          |
| 35>         | 491 (100.0) | 5 (1.0)                   | 236 (48.1) | 202 (41.1) | 48 (9.8)   |
| 35≤         | 97 (100.0)  | 2 (2.1)                   | 35 (36.1)* | 42 (43.3)  | 18 (18.5)* |

( ): %, \*, p<0.05, (compared with <35 years group)

A grade 3 placenta was significantly higher in ≥ 35 years group compared with <35 years group (p<0.05) and a grade 1 placenta was significantly lower in ≥ 35 years group compared with <35 years group (p<0.05). And grades 0 and 2 placenta were higher in ≥ 35 years group compared with < 35 years group but there were no significant difference between two groups.

5~7 points rates of 1-minute Apgar score of newborn were significantly higher in ≥ 35 years group compared to <35 years group (p<0.05) and ≥8 points rates were significantly lower in ≥ 35 years group compared with < 35 years group (p<0.01). 1~4 points rates of 1-minute Apgar score of newborn were higher in ≥35 years group than <35 years group but there were no significant difference between two groups.

#### 3.2. The Factors Related to Newborn Asphyxia in Primigravidas and Primiparas Aged 35 and Older

##### 3.2.1. Pregnancy Induced Hypertension and Neonatal Asphyxia

**Table 7.** Pregnancy induced hypertension and neonatal asphyxia (n=97).

| Neonatal asphyxia | Cases | Pregnancy induced hypertension |          | OR   | 95% CI      |
|-------------------|-------|--------------------------------|----------|------|-------------|
|                   |       | Positive                       | Negative |      |             |
| Positive          | 20    | 12                             | 8        | 3.12 | 1.13 ~ 8.60 |
| Negative          | 77    | 25                             | 52       |      |             |

OR between pregnancy induced hypertension and neonatal asphyxia was 3.12 (95% CI 1.13 ~ 8.60) and pregnancy induced hypertension was significant factor related to newborn asphyxia.

### 3.2.2. Severity of Pregnancy Induced Hypertension and Neonatal Asphyxia

**Table 8.** Severity of pregnancy induced hypertension and neonatal asphyxia (n=97).

| Neonatal asphyxia | Cases | Severity of hypertension |        | OR   | 95% CI       |
|-------------------|-------|--------------------------|--------|------|--------------|
|                   |       | Mild                     | Severe |      |              |
| Positive          | 12    | 9                        | 3      | 6.38 | 1.35 ~ 30.14 |
| Negative          | 25    | 8                        | 17     |      |              |

OR between severity of pregnancy induced hypertension and neonatal asphyxia was 6.38 (95% CI 1.35 ~ 30.14) and severe pregnancy induced hypertension was significant factor related to newborn asphyxia.

### 3.2.3. Placental Grades and Neonatal Asphyxia

OR between placental grades and neonatal asphyxia was 4.44 (95% CI 1.31 ~ 15.07) and a grade 3 placenta was significant factor related to newborn asphyxia.

**Table 9.** Placental grades and neonatal asphyxia (n=97).

| Neonatal asphyxia | Cases | Placental grade (degree) |           | OR   | 95% CI       |
|-------------------|-------|--------------------------|-----------|------|--------------|
|                   |       | Grade 3                  | Grade 0~2 |      |              |
| Positive          | 14    | 6                        | 8         | 4.44 | 1.31 ~ 15.07 |
| Negative          | 83    | 12                       | 71        |      |              |

### 3.2.4. NST, CST and Neonatal Asphyxia

**Table 10.** NST, CST and neonatal asphyxia (n=97).

| Neonatal asphyxia | Cases | NST, CST                   |                          | OR     | 95% CI         |
|-------------------|-------|----------------------------|--------------------------|--------|----------------|
|                   |       | abnormal NST, positive CST | normal NST, negative CST |        |                |
| Positive          | 14    | 11                         | 3                        | 148.50 | 22.28 ~ 989.72 |
| Negative          | 83    | 2                          | 81                       |        |                |

OR between NST, CST and neonatal asphyxia was 148.50 (95% CI 22.28 ~ 989.72) and NST, CST was significant factor related to newborn asphyxia.

## 3.3. Determination of the Way of Delivery to Reduce Neonatal Asphyxia in Primigravidas and Primiparas Aged 35 or Older Who Have the Factors Related to Neonatal Asphyxia

### 3.3.1. Prevalence Rates of Neonatal Asphyxia According to Severity of Pregnancy Induced Hypertension in Case of Labor Induction and Cesarean Section

**Table 11.** Prevalence rates of neonatal asphyxia according to severity of pregnancy induced hypertension in case of labor induction and cesarean section.

| Groups                 | All   |                       | Pregnancy induced hypertension |                       |       |                       |        |                       |
|------------------------|-------|-----------------------|--------------------------------|-----------------------|-------|-----------------------|--------|-----------------------|
|                        |       |                       | Absence                        |                       | Mild  |                       | Severe |                       |
|                        | Cases | Neonatal asphyxia (%) | Cases                          | Neonatal asphyxia (%) | Cases | Neonatal asphyxia (%) | Cases  | Neonatal asphyxia (%) |
| Labor induction group  | 52    | 6 (11.5)              | 33                             | 1 (3.0)               | 10    | 1 (10.0)              | 9      | 4 (44.4)              |
| Cesarean section group | 48    | 1 (2.1)*              | 30                             | -                     | 9     | -                     | 9      | 1 (11.1)*             |
| Control group          | 75    | 11 (14.7)             | 47                             | 2 (4.3)               | 15    | 2 (13.3)              | 13     | 7 (53.8)              |

( ): %, \*, p<0.05 (compared with control group)

Prevalence rates of neonatal asphyxia in cesarean section group in case of severe pregnancy induced hypertension were significantly lower compared with control group (p<0.05).

### 3.3.2. Prevalence Rates of Neonatal Asphyxia According to Placental Grades in Case of Labor Induction and Cesarean Section

**Table 12.** Prevalence rates of neonatal asphyxia according to placental grades in case of labor induction and cesarean section.

| Groups                 | All   |                       | Placental grades (degree) |                       |       |                       |       |                       |       |                       |
|------------------------|-------|-----------------------|---------------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|
|                        |       |                       | 0                         |                       | 1     |                       | 2     |                       | 3     |                       |
|                        | Cases | Neonatal asphyxia (%) | Cases                     | Neonatal asphyxia (%) | Cases | Neonatal asphyxia (%) | Cases | Neonatal asphyxia (%) | Cases | Neonatal asphyxia (%) |
| Labor induction group  | 52    | 6 (11.5)              | 1                         | -                     | 20    | 1 (5.0)               | 22    | 1 (4.5)               | 9     | 4 (44.4)              |
| Cesarean section group | 48    | 1 (2.1)*              | 1                         | -                     | 17    | -                     | 21    | -                     | 9     | 1 (11.1)*             |
| Control group          | 75    | 11 (14.7)             | 2                         | -                     | 27    | 1 (3.7)               | 33    | 3 (9.1)               | 13    | 7 (53.8)              |

( ): %, \*, p<0.05 (compared with control group)

Prevalence rates of neonatal asphyxia in cesarean section group in case of a grade 3 placenta were significantly lower compared with control group (p<0.05).

### 3.3.3. Prevalence Rates of Neonatal Asphyxia According to NST and CST in Case of Labor Induction and Cesarean Section

**Table 13.** Prevalence rates of neonatal asphyxia according to NST and CST in case of labor induction and cesarean section.

| Groups                 | All   |                       | NST, CST                 |                       |                            |                       |
|------------------------|-------|-----------------------|--------------------------|-----------------------|----------------------------|-----------------------|
|                        |       |                       | Normal NST, negative CST |                       | Abnormal NST, positive CST |                       |
|                        | Cases | Neonatal asphyxia (%) | Cases                    | Neonatal asphyxia (%) | Cases                      | Neonatal asphyxia (%) |
| Labor induction group  | 52    | 6 (11.5)              | 44                       | 1 (2.3)               | 8                          | 5 (62.5)              |
| Cesarean section group | 48    | 1 (2.1)*              | 40                       | -                     | 8                          | 1 (12.5)**#           |
| Control group          | 75    | 11 (14.7)             | 64                       | 3 (4.7)               | 11                         | 8 (72.7)              |

( ): %, \*,  $p < 0.05$ , \*\*,  $p < 0.01$  (compared with control group), #;  $p < 0.05$  (compared with labor induction group)

Prevalence rates of neonatal asphyxia in cesarean section group in case of abnormal NST and positive CST were significantly lower compared with control group and labor induction group ( $p < 0.01$ ,  $p < 0.05$ ).

## 4. Discussion

Some studies (Kanungo, 2011; Cunningham, 2014) showed that after age 35, there were an increased risk for obstetrical complications as well as perinatal morbidity and mortality. We think that the reasons for the high rate of abnormal progress of the pregnancy and labor in older women are related to the decline of ovarian function and degrading changes of placental blood vessels.

Our research results showed prevalence rates of severe pregnancy induced hypertension, a grade 3 placenta, abnormal NST, positive CST and neonatal asphyxia were higher and the time of labor was longer in primigravidas and primiparas aged 35 or older compared with women less than 35 years of age. Abnormalities mentioned above in primigravidas and primiparas aged 35 or older may lead to neonatal asphyxia in most cases. Therefore we found the factors related to neonatal asphyxia in older women and determined way of labor to reduce neonatal asphyxia in older women with such factors. The factors related to neonatal asphyxia in primigravidas and primiparas aged 35 or older were severe pregnancy induced hypertension, a grade 3 placenta, abnormal NST and positive CST, and prevalence of rates of neonatal asphyxia were reduced by 2.1% by cesarean section in older women with such factors.

## 5. Conclusion

Incidences of severe pregnancy induced hypertension, a grade 3 placenta, abnormal NST, positive CST, neonatal asphyxia are significantly higher in primigravidas and primiparas aged 35 or older compared with that of younger women and labor time in women over 35 years of age is significantly longer than younger women.

The factors related to neonatal asphyxia in primigravidas and primiparas aged 35 or older are severe pregnancy induced hypertension, a grade 3 placenta, abnormal NST and positive

CST.

Rates of neonatal asphyxia can be reduced by 2.1% by cesarean section in older women with such factors.

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