ORIGINAL ARTICLE

Incidence of eclampsia in Japanese women

Kazushi Watanabe¹, Yoshikatsu Suzuki², Tamao Yamamoto³

¹Department of Obstetrics and Gynecology, Aichi Medical University School of Medicine,  
²Department of Obstetrics and Gynecology, Nagoya City West Medical Center,  
³Department of Pharmacology, Nagoya City University

Aim: The aim of this study was to assess the rate of eclampsia in Japanese women and to determine differences in the pathogenesis of eclampsia between women with pregnancy induced hypertension (PIH) but without severe proteinuria showing rapid changes in high blood pressure during delivery and women with PIH and severe proteinuria from early stages of pregnancy.

Methods: We used the perinatal database of the Japan Society of Obstetrics and Gynecology to access 330,399 deliveries after 22 weeks of gestation across 125 centers of the perinatal network between 2005 and 2009. A total of 246 women with eclampsia were identified. The main outcome measures used were incidence, maternal age, body mass index (BMI), parity, gestational age at delivery, and mortality rate. We compared gestational age at incidence between women with PIH but without severe proteinuria (HT group) and women with PIH and severe proteinuria (PE group). Data were analyzed using Welch’s t-test or the Mann-Whitney U-test.

Results: We identified a total of 246 cases of eclampsia which corresponded to an incidence of 7.4/10,000 deliveries with a mean age of onset of 30.7 ± 5.8 years. The proportion of primiparous women was 81.3%, and the mean gestational age at delivery was 36.7 ± 4.0 weeks. Four maternal deaths were identified in the PE group. The gestational age at incidence was significantly higher in the HT group compared to the PE group (36.8 ± 4.9 weeks for the HT group vs. 34.3 ± 4.9 weeks for the PE group, t = 3.3443, P = 0.0009).

Conclusions: The present study identified potential differences in the pathogenesis of eclampsia between HT and PE groups, due to the fact that the PE group was observed throughout pregnancy, while observation of individuals in the HT group increased after 34 weeks of gestation.

Introduction

Eclampsia is one of many severe complications that can occur during preeclampsia,¹⁻⁴ and includes the aforementioned symptoms in addition to generalized seizures and/or coma in the absence of other neurologic conditions.⁵,⁶ The rate of eclampsia varies worldwide, with the highest rate occurring in Nigeria (9/100 deliveries) and the lowest rate in the United Kingdom (2.7/10,000 deliveries).⁷,⁸ Although the rate of severe preeclampsia-eclampsia and the number of maternal deaths due to hypertension during pregnancy have fallen steadily over the past years in developing countries, there is still a significant perinatal mortality and morbidity associated with these conditions. Even in countries with a low maternal mortality rate, a substantial proportion of such deaths are due to preeclampsia-eclampsia.⁹⁻¹¹ A recent review of all reported pregnancy-related deaths in the United States during 1979–1992 identified 4,024 deaths.⁴ Of these, 790 deaths were attributable to preeclampsia-eclampsia (19.6%), with 49% related to eclampsia. Women with eclampsia also have an increased risk of severe complications such as placental abruption, thrombocytopenia, disseminated intravascular coagulation, pulmonary edema, and aspiration pneumonia. Therefore, preeclampsia and eclampsia continue to be major worldwide public health concerns.

Maternal and perinatal mortality rates have fallen steadily over the past years in Japan. However, the rate of preeclampsia-eclampsia, which contributes to maternal and perinatal mortality, remains high. There are few reports assessing the rate and pathogenesis of eclampsia in Japan. The aim of this study was to assess the rate of eclampsia in Japan and to determine differences in the pathogenesis of eclampsia between women with pregnancy induced hypertension (PIH) who do not have...
severe proteinuria showing sudden changes in high blood pressure during delivery and women with PIH as well as severe proteinuria from early stage of pregnancy.

**Materials and methods**

**Study population**

Under a cooperative agreement with secondary and tertiary hospitals in Japan, a perinatal database was assembled in 2001 by the Japan Society of Obstetrics and Gynecology (JSOG). The database ensures patient anonymity by providing unlinked information. In 2009, 76,113 deliveries (75,431 live births and 682 stillbirths after 22 weeks of gestation) were entered into the database from 131 hospitals, which accounted for 7.1% of all deliveries in Japan. The database also provides demographic information, complications during pregnancy, mode of delivery, perinatal outcome, and reproductive, medical, and obstetrical history. PIH is defined on the basis of the diagnostic criteria for Japan Society for the Study of Hypertension in Pregnancy guidelines.2) The onset of convulsions in women with PIH which cannot be attributed to other causes is defined as eclampsia. The seizures associated with eclampsia are generalized and may appear before, during, or after labor. Preeclampsia are subclassified by the extent of blood pressure and proteinuria. Mild preeclampsia is defined as hypertension with mild proteinuria (≥ 300 mg/24 hours without exceeding 2.0 g/24 hours or 3+ dipstick). Severe preeclampsia is defined as hypertension with severe proteinuria (exceeds 2.0 g/24 hours or 3+ dipstick). It is impossible to classify between mild preeclampsia and gestational hypertension in this study. There is limitation to this study, which used the perinatal database. In the present study, PIH was separated into the following two groups: PIH women without severe proteinuria (HT group) and PIH women with severe proteinuria (PE group). We also demonstrated the distribution of gestational age at the time of the eclamptic episode (antepartum and intrapartum fits) or delivery (postpartum fits).

**Statistical analysis**

Excel Toukei statistical software was used for statistical analyses. Data are expressed as mean ± standard deviation (SD). Distributions within groups were compared using Welch’s t-test or the Mann-Whitney U test. P values < 0.05 were considered significant.

**Results**

A total of 246 cases of eclampsia were registered in the perinatal database during 2005 and 2009. The incidence of eclampsia was 7.4/10,000 from a total of 330,399 deliveries (Table 1). The mean patient age was 30.7 ± 5.8 years, and the mean body mass index (BMI) and mean gestational age at delivery was 21.3 ± 5.8 kg/m² and 36.7 ± 4.0 weeks, respectively. In addition, 81.3% of all eclamptic women were primiparous. Four maternal deaths were identified, accounting for 1.6% of women with eclampsia (Table 1).

The mean gestational age at the time of the eclamptic episode was significantly higher in the HT group (36.8 ± 10.9 weeks, t = 3.3443, P = 0.0009) compared to the PE group (34.3 ± 4.9 weeks; Figure 1). The distribution of gestational age at the time of the eclamptic episode differed significantly between the PE and HT groups (Z = 3.0982, P = 0.0019; Figure 1). All four maternal deaths were identified in the PE group (Figure 1).

**Discussion**

At present, there are few reports that have assessed the incidence of eclampsia in Japan. In the present study, we determined the rate of eclampsia in Japan using the perinatal database assembled by the JSOG. We identified a rate of 7.4/10,000 deliveries, which is similar to what has been reported for developed countries. Roughly 80% of eclamptic women were primiparous, which highlights

### Table 1. Incidence rates of eclampsia

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Pregnancies</td>
<td>56,671</td>
<td>63,899</td>
<td>63,634</td>
<td>70,082</td>
<td>76,113</td>
<td>330,399</td>
</tr>
<tr>
<td>Number of Eclampsia</td>
<td>33 (0.06%)</td>
<td>60 (0.09%)</td>
<td>43 (0.07%)</td>
<td>50 (0.07%)</td>
<td>60 (0.07%)</td>
<td>246 (0.07%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>29.9 ± 5.3</td>
<td>30.3 ± 5.6</td>
<td>30.9 ± 5.3</td>
<td>30.4 ± 5.2</td>
<td>31.9 ± 5.9</td>
<td>30.7 ± 5.8</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.9 ± 2.5</td>
<td>—</td>
<td>21.2 ± 3.1</td>
<td>20.8 ± 4.2</td>
<td>22.0 ± 6.2</td>
<td>21.3 ± 4.5</td>
</tr>
<tr>
<td>Proportion of primiparity (%)</td>
<td>81.8</td>
<td>81.7</td>
<td>81.4</td>
<td>84.0</td>
<td>78.3</td>
<td>81.3</td>
</tr>
<tr>
<td>Gestational age at delivery (weeks)</td>
<td>36.0 ± 4.5</td>
<td>36.0 ± 5.1</td>
<td>36.7 ± 3.1</td>
<td>37.6 ± 3.3</td>
<td>37.0 ± 3.7</td>
<td>36.7 ± 4.0</td>
</tr>
<tr>
<td>Maternal death</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Proportion of maternal death for eclampsia (%)</td>
<td>0</td>
<td>3.3</td>
<td>0</td>
<td>2.0</td>
<td>1.7</td>
<td>1.6</td>
</tr>
</tbody>
</table>
primiparity as an important risk factor for eclampsia, as previously reported.\(^{12}\) We found that mean gestational age at delivery was 36 weeks, and that many cases of eclampsia occur in late pregnancy. The proportion of maternal deaths due to eclampsia was 1.6%, which is lower than that reported for developing countries,\(^{6,13–15}\) but similar to that of developed countries.\(^{16–19}\)

There are two types of onset of eclampsia in the clinical setting. The first type is PIH with severe proteinuria occurring at a relatively early stage during pregnancy (PE group). The second type includes women who develop eclampsia and mostly show an elevated blood pressure at delivery without any prior symptoms of hypertension and proteinuria (HT group). To clarify the difference between the two causes of eclampsia, we felt it was necessary to classify all patients into two onset groups. The mean gestational age at the time of the eclamptic episode was significantly higher for the HT group compared to the PE group. The distribution of gestational age at the time of the eclamptic episode differed significantly between PE and HT groups, indicating that different pathologies may exist across the two groups. In the PE group, eclampsia occurs throughout the entire pregnancy and generally results from preeclampsia. In the present study, all four maternal deaths occurred within the PE group, and patient age for all four cases was > 30 years (31, 36, 37, and 39 years). In addition, all cases involved cerebral hemorrhage and edema, although the exact details were unclear. Ghulmiyyah et al. reported that the death risk from eclampsia was higher for women over the age of 30 and those who lacked prenatal care.\(^{20}\) In contrast, eclampsia increases rapidly after 34 weeks of gestation in the HT group and accounts for the majority of the cases. Therefore, preeclampsia is a high risk factor for eclampsia that must be adequately managed. However, sudden changes in high blood pressure during delivery are also important and must be properly monitored.

In this report, we used the perinatal database of the JSOG to determine the rate of eclampsia in Japan. In addition, we used the information in the database to determine the pathogenesis of eclampsia between two onset groups. However, the cause of changes in blood pressure at the onset of eclampsia remains unclear. Future clinical studies are needed to identify trends in blood pressure among individuals with eclampsia.

**Acknowledgments**

We thank Shigeru Saito, Shoji Satoh and Nobuya Unno for providing access to the perinatal database of the Japan Society for Obstetrics and Gynecology.

**Conflict of interest**

None.

**References**


Incidence of eclampsia