A retrospective 11-year analysis of obstetric patients with idiopathic thrombocytopenic purpura

Kathryn E. Webert, Richa Mittal, Christopher Sigouin, Nancy M. Heddle, and John G. Kelton

Numerous studies have examined the outcomes of infants born to mothers with idiopathic thrombocytopenic purpura (ITP). Fewer studies have discussed the morbidity of obstetric patients with ITP. We describe a retrospective study of 92 women with ITP during 119 pregnancies over an 11-year period. Most women had thrombocytopenia during pregnancy. At delivery, women in 98 pregnancies (89%) had platelet counts lower than $150 \times 10^9/L$; most had mild to moderate thrombocytopenia. For many, the pregnancy was uneventful; however, women had moderate to severe bleeding in 25 pregnancies (21.5%). Women in 37 pregnancies (31.1%) required treatment to increase platelet counts. During delivery, 44 women (37.3%) received epidural analgesia without complications, with most having a platelet count between 50 and $149 \times 10^9/L$. Most deliveries (82.4%) were vaginal. Bleeding was uncommon at delivery. Infant platelet counts at birth ranged from 12 to $436 \times 10^9/L$; 25.2% of infants had platelet counts lower than $150 \times 10^9/L$, and 9% had platelet counts lower than $50 \times 10^9/L$. Eighteen infants (14.6%) required treatment for hemostatic impairment. Two fetal deaths occurred. One was caused by hemorrhage. ITP in pregnancy carries a low risk, but mothers and infants may require therapy to raise their platelet counts. (Blood. 2003;102:4306-4311)

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Introduction

Idiopathic thrombocytopenic purpura (ITP) frequently occurs in young women. Consequently, hematologists often treat pregnant women who have a diagnosis or a history of ITP. It is now recognized that, in many patients, the disease is caused by platelet autoantibodies that can cross the placenta and produce thrombocytopenia in some infants. In the past decade, our understanding of ITP in pregnancy has improved; however, in almost all studies, the focus has been on the infant. We now recognize that most of these infants do not have severe thrombocytopenia and that they can be safely delivered vaginally.

There has not been much information about ITP outcomes in obstetric patients, including their hemostatic risk at delivery and the likelihood of needing treatment during pregnancy. For this reason, we reviewed the outcomes of pregnant patients with ITP treated over a period of 11 years in the 2 obstetric units of Hamilton hospitals affiliated with McMaster University. We found that mothers with very low platelet counts can successfully deliver healthy infants and that though maternal and fetal bleeding can occur, such complications are uncommon.

Patients, materials, and methods

A retrospective chart review was performed for all obstetric patients with ITP who were treated and delivered at the 2 hospitals with obstetric services in Hamilton, Ontario, from January 1, 1990, to December 31, 2000. Patients were eligible for the study if they met the inclusion criteria of pregnancy with a diagnosis of ITP or pregnancy with a previous history of ITP. They were considered to have ITP if they had a history of thrombocytopenia for which other causes were excluded. Other causes of thrombocytopenia included sepsis, pregnancy-induced hypertension, disseminated intravascular coagulation, drug-induced thrombocytopenia, and thrombocytopenia associated with autoimmune diseases such as systemic lupus erythematosus, thrombotic thrombocytopenic purpura, hemolytic uremic syndrome, and hereditary forms of thrombocytopenia. For patients whose thrombocytopenia manifested itself in pregnancy, incidental thrombocytopenia of pregnancy was diagnosed if the platelet count was higher than $70 \times 10^9/L$ in an otherwise asymptomatic patient. These patients were excluded from the analysis. Thrombocytopenia complicating a hypertensive disorder of pregnancy was diagnosed if the blood pressure was elevated.

Patient selection

Patients were identified by reviewing hospital records for thrombocytopenia, ITP, or immune thrombocytopenia in association with pregnancy. The following information was extracted from the charts for each eligible patient: age, date of diagnosis of ITP, underlying medical conditions, medication, platelet count before and during pregnancy and at delivery, signs and symptoms of hemostatic impairment during pregnancy, treatments received to raise platelet count during pregnancy or at delivery, gestational age at delivery, type of delivery (vaginal or cesarean section), epidural anesthesia during delivery, estimated blood loss at delivery, blood products transfused, and complications at delivery and in the postpartum period. Information collected for each infant included platelet count at birth, complications at birth, and treatments received.

Definitions of response to therapy were set a priori. A patient was considered to have had a complete response to therapy if her platelet count increased to more than $150 \times 10^9/L$ during or after therapy. A patient was considered to have had a partial response to therapy if her platelet count increased to $100 \times 10^9/L$. A patient was considered to have had no response to therapy if her platelet count was lower than $50 \times 10^9/L$ during her pregnancy or if she had to deliver her child before her platelet count reached $100 \times 10^9/L$.

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increased to $50 \times 10^9/L$ or more but remained lower than $150 \times 10^9/L$ at any time during the administration of therapy. A patient was considered to have had no response to therapy if her platelet count remained lower than $50 \times 10^9/L$ during or after therapy. These definitions of response have been used previously.\(^4\)

### Statistical analysis

Most of the data were not normally distributed; therefore, nonparametric descriptives and tests were used. Wilcoxon 2-sample tests were performed to compare the median platelet counts at delivery of women delivering vaginally and those delivering by cesarean section, the median platelet count at delivery of women receiving treatment compared with women not receiving treatment, and the median platelet count of infants at birth classified according to severity of maternal disease. An association between maternal platelet count at delivery and infant platelet count was investigated using the Spearman correlation coefficient. Statistical significance was set at $P < .05$, and all tests were 2-sided.

### Results

#### Women with ITP

During the study interval, 92 women with ITP delivered 123 children in 119 pregnancies. There were 4 deliveries of twins. Sixty-nine women (75%) delivered on 1 occasion, 19 women (21%) delivered on 2 occasions, and 4 women (4%) delivered on 3 occasions. The median age of the women at delivery was 29 years (interquartile range, 26-32 years). The median gestational age at delivery was 38 weeks (interquartile range, 38 to 40 weeks).

Eighty-three women (69.3%) were known to have ITP based on thrombocytopenia plus a diagnosis of ITP before pregnancy. Thirty-six women (30.3%) were not diagnosed with ITP before pregnancy. Twenty-nine of these previously undiagnosed women had a platelet count less than $70 \times 10^9/L$ during pregnancy, and 7 women had platelet counts between $70 \times 10^9/L$ and $150 \times 10^9/L$. Four of these 7 women had thrombocytopenia in the first or early in the second trimester of pregnancy. The other 3 women acquired thrombocytopenia in the third trimester and were included in the database because of the presence of symptoms and the clinical diagnosis of ITP (1 woman) and because of continued thrombocytopenia after the pregnancy resulting in the diagnosis of ITP (2 women).

#### Pregnancy

**Symptoms of hemostatic impairment.** Information describing symptoms of hemostatic impairment was available for 116 pregnancies. Women were considered to have minor symptoms if easy bruising or purpura occurred during the pregnancy. Moderate symptoms consisted of epistaxis, bleeding after trauma, and mucous membrane bleeding. Severe bleeding was defined as gastrointestinal bleeding, hematuria, or deep tissue bleeding.

Most pregnancies (76; 65.5%), symptoms of hemostatic impairment were not present. For 15 pregnancies (12.9%), the women had mild symptoms. Women in 21 pregnancies (18.1%) had moderate symptoms, and women in 4 pregnancies (3.4%) had severe symptoms. Of the 4 women with severe bleeding, 2 had hematuria, 1 had hematoma formation, and 1 had gastrointestinal bleeding. No woman required hospitalization because of bleeding symptoms. Platelet counts of these women tended to be lower than $100 \times 10^9/L$ at the time of symptoms and ranged from $3 \times 10^9/L$ to $117 \times 10^9/L$.

The frequency of bleeding complications did not differ between the group of women with previous diagnoses of ITP and the women without previous diagnoses of ITP (37.2% vs 31.6%; $P = .55$).

**Therapy.** During pregnancy, most women (82 pregnancies; 68.9%) did not require any therapy to maintain their platelet counts, which ranged from $32 \times 10^9/L$ to $521 \times 10^9/L$. Women with a previous diagnosis of ITP were less likely to have required therapy for ITP during pregnancy (24.4% vs 42.1%; $P = .0472$).

Women in 37 pregnancies (31.1%) required medical intervention to raise their platelet counts. The decision to treat a woman for thrombocytopenia was made by the attending physician and was based on such factors as platelet count, signs and symptoms of bleeding, and need for invasive interventions. Although practice varied among physicians, the pattern of practice reflected the guidelines published by the American Society of Hematology.\(^5\)

Twenty women were treated with high-dose intravenous immunoglobulin G (IV IgG) on 1 or more occasions; 8 women were treated with corticosteroids on 1 or more occasions; 7 women were treated with corticosteroids and IV IgG; 1 woman was treated with corticosteroids and anti-D; and 1 woman was treated with corticosteroids, IV IgG, and anti-D. The dose and duration of corticosteroids were determined by the treating physician and were variable. In general, the dose of corticosteroids used was 50 mg/d, and the dose of IV Ig used was 1 mg/kg. The durations of corticosteroid and IV IgG use were also variable. Duration and dose of therapy depended on such factors as patient response, patient ability to tolerate the medication, and physician preference.

The response to therapy (complete, partial, no response) is shown in Table 1. When complete and partial responses were both considered, 3 women responded to therapy with corticosteroids, 11 women responded to high-dose IV IgG, 2 women responded to corticosteroids and IV IgG, and the woman who received corticosteroids, IV IgG, and anti-D did not respond. The woman receiving corticosteroids and anti-D responded. On average, 46% of the women treated responded to the treatment with a rise in their platelet counts. Although there was a trend toward a lower platelet count, the median platelet count at delivery of women receiving

### Table 1. Response of obstetric patients with ITP to treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total no. pregnancies</th>
<th>No. in CR</th>
<th>No. in PR</th>
<th>No. with NR</th>
<th>No. with insufficient data to document response</th>
</tr>
</thead>
<tbody>
<tr>
<td>No treatment</td>
<td>82</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>All treatments</td>
<td>37</td>
<td>6</td>
<td>11</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>IV IgG</td>
<td>20</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Corticosteroids and IV IgG</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Corticosteroids, IV IgG, and anti-D</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Corticosteroids and anti-D</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Patients were considered to have complete response (CR) if their platelet counts increased to more than $150 \times 10^9/L$ during or after therapy. Patients were considered to have partial response (PR) if their platelet counts increased to $50 \times 10^9/L$ or higher but lower than $150 \times 10^9/L$ at, during, or after therapy. Patients were considered to have no response (NR) if their platelet count remained lower than $50 \times 10^9/L$ during or after therapy.

NA indicates not applicable.
treatment was not statistically different from that of untreated women (71.5 × 10^9/L [interquartile range, 42.5-100 × 10^9/L] vs 88 × 10^9/L [interquartile range, 63-104 × 10^9/L]; P = .07). The proportion of women documented to have responded to therapy was 52.4% (11 of 21) and 43.8% (7 of 16) for the women with previous diagnoses of ITP and women without previous diagnoses of ITP, respectively. This difference was not statistically significant (P = .60).

**Delivery**

**Platelet count.** Information about the maternal platelet count at delivery was available for 110 pregnancies. Most women had thrombocytopenia at delivery. The median platelet count was 85 × 10^9/L (interquartile range, 61-104 × 10^9/L). Seven women (6.4%) had platelet counts at delivery of less than 20 × 10^9/L, and 10 women (9.1%) had platelet counts at delivery between 20 × 10^9/L and 49 × 10^9/L. Women in 81 pregnancies (73.6%) had platelet counts from 50 × 10^9/L to 149 × 10^9/L, and in 12 pregnancies (10.9%) the women had platelet counts that were higher than 150 × 10^9/L at delivery (Figure 1). The median platelet count at delivery for women with a previous diagnosis of ITP was 94 × 10^9/L (interquartile range, 64-106 × 10^9/L) compared with 69.5 × 10^9/L (interquartile range, 56-88 × 10^9/L) in the group without a previous diagnosis. These differences were statistically significant (P = .003).

All women with platelet counts lower than 20 × 10^9/L at delivery had been followed up for the duration of their pregnancies. Six of the 7 women who had received treatment during pregnancy, including combinations of corticosteroids and IV IgG, but not all responded to the therapies. One woman, whose ITP had been diagnosed before the pregnancy, maintained a normal platelet count during the pregnancy but was found to have a platelet count of 19 × 10^9/L at the time of delivery. She did not receive treatment and had no complications at the time of delivery. The other 6 women with platelet counts lower than 20 × 10^9/L received treatment with corticosteroids and IV IgG. One woman also received platelet transfusions, and one woman received packed red blood cell transfusions. No woman had complications. Of the 10 women with platelet counts between 20 × 10^9/L and 49 × 10^9/L, one woman received treatment with corticosteroids and IV IgG, and 3 women were treated with IV IgG alone. In addition to receiving IV IgG, 2 women also received platelet transfusions. Six women did not receive any kind of treatment.

**Analgesia.** Information about the analgesia at delivery was available for 118 pregnancies. For 42 pregnancies (37.2%) an epidural was placed. Within this group, one woman had a platelet count lower than 50 × 10^9/L, 6 women had platelet counts between 50 × 10^9/L and 75 × 10^9/L, 19 women had platelet counts between 76 × 10^9/L and 100 × 10^9/L, 8 women had platelet counts between 101 × 10^9/L and 150 × 10^9/L, and 8 women had platelet counts higher than 150 × 10^9/L. No patient had complications related to the placement of an epidural catheter.

**Type of delivery.** Type of delivery was recorded for 119 pregnancies. Ninety-eight deliveries (82.4%) were vaginal, and 21 (17.6%) were by cesarean section. The median platelet count of the women who delivered vaginally was 88 × 10^9/L (interquartile range, 63-105 × 10^9/L), and the median platelet count of the women who delivered by cesarean section was 75 × 10^9/L (interquartile range, 54-100 × 10^9/L). Statistically, there was no significant difference between the median platelet counts (P = .16).

Of the 17 women with platelet counts lower than 50 × 10^9/L, 4 delivered by cesarean section. One woman with a platelet count of 24 × 10^9/L received platelet transfusions with no other therapy and had no complications. The second woman had a platelet count of 3 × 10^9/L, which was treated with IV IgG and prednisone, did not receive a platelet transfusion, and had no complications. The third woman had a platelet count of 39 × 10^9/L, received neither treatment nor transfusions, and had no complications. The fourth woman had a platelet count of 39 × 10^9/L, received a platelet transfusion, and was thought to have had increased blood loss at the time of delivery.

**Blood product use.** Overall, 6 women (5%) received platelet transfusions. Three women had platelet counts lower than 50 × 10^9/L at the time of transfusion. Two women (1.7%) received transfusions of packed red blood cells, but in neither woman was there documentation of excessive blood loss, and it is not clear why the blood was administered.

**Hemorrhagic complications.** Although 15.5% of the women who had platelet counts lower than 50 × 10^9/L at delivery, hemorrhagic complications were uncommon and were not related to the degree of thrombocytopenia. Four patients were reported to have had blood loss of at least 1 L. The platelet counts of these women ranged from 54 × 10^9/L to 321 × 10^9/L. Two of these patients received platelet transfusions at the time of delivery, and no patient required transfusion of red blood cells.

Information about postpartum delivery complications was available for 74 of the pregnancies. Two of the women had postpartum bleeding, but it was unlikely that it was related to ITP. Both experienced prolonged postpartum bleeding; however, neither woman required treatment with blood products. One woman had a platelet count of 119 × 10^9/L and delivered vaginally. The other had a platelet count of 39 × 10^9/L and delivered by cesarean section.

**Infants**

**Platelet counts at birth.** Platelet counts measured at the time of birth were available for 109 babies. The median birth platelet count was 217 × 10^9/L (interquartile range, 142-282 × 10^9/L), and 31 babies (25.2%) had platelet counts lower than 150 × 10^9/L. The distribution of platelet counts was as follows: 6 (5.5%) babies had platelet counts lower than 20 × 10^9/L; 5 (4.6%) babies had platelet counts from 20 × 10^9/L to 49 × 10^9/L; 20 (18.3%) babies had platelet counts from 50 × 10^9/L to 149 × 10^9/L; and 78 babies (71.6%) had platelet counts higher than 150 × 10^9/L (Figure 1). There was no relationship between maternal platelet count at delivery and infant platelet count at birth (Spearman correlation coefficient, 0.02; P = .81) (Figure 2). Furthermore, infant platelet counts at birth were compared between 2 groups and were
classified according to maternal platelet count during pregnancy and at delivery. Group 1 (n = 41) consisted of women who had severe thrombocytopenia (platelet count lower than 50 x 10^9/L) at any time during pregnancy or at time of delivery, and group 2 (n = 67) consisted of women who did not have serious thrombocytopenia during pregnancy or at delivery. Figure 3 demonstrates the distribution of infant platelet counts at birth according to the severity of maternal disease. When the median platelet count at birth of infants born to mothers in group 1 was compared to that of infants born to mothers in group 2, the difference was not statistically significant (192 x 10^9/L [interquartile range, 121-261 x 10^9/L] vs 157 x 10^9/L [interquartile range, 157-285 x 10^9/L]; P = .29). Eight infants born to mothers in group 1 and 8 infants born to mothers in group 2 had platelet counts lower than 100 x 10^9/L.

During the duration of the study, 23 women delivered more than once. Information about the infants’ platelet counts at birth for both deliveries is available for 19 women. Infants’ platelet counts at birth in the first and second pregnancies were highly correlated (Spearman correlation coefficient, 0.54; P = .022).

**Platelet counts at nadir.** A platelet count measured at the nadir, or the lowest platelet count was available for 115 babies and occurred in the first 2 weeks after birth. The median nadir platelet count was 183 x 10^9/L (interquartile range, 115-250 x 10^9/L). Forty-two infants (36.5%) had platelet counts lower than 150 x 10^9/L. The distribution of platelet counts was as follows: 8 babies (7.0%) had platelet counts lower than 20 x 10^9/L; 11 babies (9.6%) had platelet counts from 20 x 10^9/L to 49 x 10^9/L; 23 babies (20.0%) had platelet counts between 50 x 10^9/L and 149 x 10^9/L; and 73 babies (63.5%) had platelet counts higher than 150 x 10^9/L. There was no relationship between the maternal platelet count at delivery and the infant platelet count at nadir (Spearman correlation coefficient, 0.01; P = .91). Infant platelet counts at nadir were also compared between 2 groups, classified according to maternal platelet count during pregnancy and at delivery. Group 1 (n = 41) consisted of mothers who had severe thrombocytopenia (platelet count lower than 50 x 10^9/L) at any time during pregnancy or at delivery, and group 2 (n = 67) consisted of women who did not have severe thrombocytopenia during pregnancy or at delivery. When the median platelet count at birth for infants born to mothers in group 1 was compared with that of infants born to mothers in group 2, the difference was not statistically significant (142 x 10^9/L [interquartile range, 76-250 x 10^9/L] vs 143 x 10^9/L [interquartile range, 143-255 x 10^9/L]; P = .075).

During the study, 23 women delivered more than once. Information about infant platelet count at birth for each delivery is available for 19 women. Infant platelet counts at birth in the first and second pregnancies were highly correlated (Spearman correlation coefficient, 0.54; P = .022).

**Treatment.** Eighteen infants (14.6%) were treated for thrombocytopenia. The decision to treat an infant for thrombocytopenia was made by the attending pediatrician and was based on such factors as platelet count, signs and symptoms of bleeding, and the need for invasive interventions. All infants were treated with high-dose IV IgG, corticosteroids, or platelet transfusions, with some infants requiring multiple treatments. Nine of the infants received platelet transfusions, 15 were treated with IV IgG, and 4 were treated with corticosteroids. The platelet counts of infants receiving treatment ranged from 5 x 10^9/L to 44 x 10^9/L, and the median platelet count was 31 x 10^9/L (interquartile range, 16-36 x 10^9/L).

**Hemorrhagic complications.** Mild complications, such as bruising and petechiae, were common in the newborns; however, more serious complications were rare and occurred in only one newborn, in whom a right subependymal hemorrhage was diagnosed on day 9 of life. This infant was born at 29 weeks of a twin gestation. Platelet count at birth was 149 x 10^9/L, with a nadir of 135 x 10^9/L on the second day of life. The mother’s platelet count at delivery was 88 x 10^9/L. During the pregnancy, she had mild thrombocytopenia and platelet counts ranging from 83 to 143 x 10^9/L. Neither the mother nor the infant received therapy to increase the platelet count. Each twin had respiratory distress syndrome and apnea of prematurity that required ventilatory support. Given the fact that the infant was not documented to have had thrombocytopenia, it is unlikely that the hemorrhage was related to maternal ITP. During the study period, it was common practice to perform surveillance cranial ultrasound on infants who had severe thrombocytopenia.

**Figure 3. Distribution of infant platelet counts at birth according to the severity of maternal disease.** Women were divided into 2 groups. Group 1 consisted of women with platelet counts lower than 50 x 10^9/L at any time during pregnancy or at delivery. Group 2 consisted of women with platelet counts 50 x 10^9/L or higher during pregnancy or at delivery. The insert in this figure is an explanation of a box plot. The outer edges of the “boxes” in the box plot represent the first and third quartiles, and the median platelet count is drawn as a line within the box. Lines extending from the box represent the largest and smallest observed scores within 1.5 interquartile ranges. The graph demonstrates that the distribution of infant platelet counts at birth born to mothers in the 2 groups were not statistically significant.
There were 2 fetal deaths in the study interval. One mother had a past history of ITP, and she consistently had platelet counts higher than $100 \times 10^9$/L during the pregnancy. Her fetus was stillborn at 39 weeks and was macerated without any evidence of hemorrhage. The other death was a stillbirth at 27 weeks; evidence showed extensive hemorrhage throughout the body and brain. The mother had a 4-year history of ITP and had previously undergone splenectomy but continued to have moderately severe ITP with easy bruising and petechiae. Throughout the pregnancy, she had severe thrombocytopenia with platelet counts generally lower than $50 \times 10^9$/L (Figure 4). She was treated with IV IgG and had received a treatment 1 week before delivery of the stillbirth. At delivery, her platelet count increased to $321 \times 10^9$/L. Extensive genetic and serologic investigation of this patient did not demonstrate any fetal-maternal incompatibility consistent with alloimmune neonatal thrombocytopenia.

**Discussion**

In the past 10 years, there has been a shift in our thinking about ITP in pregnancy. Early case reports suggested that ITP in pregnancy carried high morbidity for mother and infant. It was often suggested that mothers with ITP avoid pregnancy or deliver by cesarean section. In the past, studies were often based on the compilation of small case reports; therefore, they had a potential for worst-case reporting bias. Recent studies have presented a more optimistic view of the impact of ITP, particularly on infants born to mothers with ITP.

For example, our analysis of the prospective and retrospective studies of the past decade, which included 1243 infants born after 1235 pregnancies, indicated that severe neonatal thrombocytopenia (infant platelet count less than $20 \times 10^9$/L) occurred in 4% of ITP pregnancies and that moderate neonatal thrombocytopenia (infant platelet count less than $50 \times 10^9$/L) occurred in 9%.

It is now generally agreed that therapy for pregnant mothers with ITP is similar to that for nonpregnant patients. Treatment is recommended when the platelet count is unacceptably low or when the patient has symptoms, such as petechiae or mucosal bleeding. Many physicians recommend treating the pregnant women with corticosteroids, intravenous immunoglobulins, or both.

Another possible weakness of the study is the potential for misdiagnosis. Women were considered to have ITP if they had a history of ITP or if they had thrombocytopenia for which other causes, including sepsis, pregnancy-induced hypertension, disseminated intravascular coagulation, drug-induced thrombocytopenia, thrombocytopenia associated with autoimmune diseases (systemic lupus erythematosus, thrombotic thrombocytopenic purpura, hemolytic-uremic syndrome, and hereditary forms of thrombocytopenia), were excluded. If a woman had thrombocytopenia for the first time in pregnancy, incidental thrombocytopenia of pregnancy was diagnosed if the platelet count was higher than $70 \times 10^9$/L. However, it is possible that a few women who actually had incidental thrombocytopenia of pregnancy were included in error.

Most women (88%) in our study were thrombocytopenic at delivery; however, serious morbidity to the mother from the disease itself or from treatment was uncommon. Seven women (6.4%) had delivery platelet counts that were lower than $20 \times 10^9$/L, and 10 (9.1%) had platelet counts between $20 \times 10^9$/L and $49 \times 10^9$/L. Nonetheless, these women and their babies had good outcomes. Of these women, one woman with a platelet count lower than $20 \times 10^9$/L and 3 women with platelet counts between $20 \times 10^9$/L and $49 \times 10^9$/L had cesarean deliveries, and the rest had vaginal deliveries.

During pregnancy, almost 32% of the women required treatment to raise their platelet counts. High-dose IV IgG, corticosteroids, or both were used most frequently. On average, 46% of these women responded to the treatment with an increase in platelet count. Hence, almost one third of women with ITP will require therapy during pregnancy.

Bleeding symptoms during pregnancy were uncommon; 18% of women had moderate and 3.4% had severe symptoms. Bleeding at
delivery also was uncommon. Four patients had blood loss greater than 1 L, and the platelet counts of these women ranged from 54 × 10^9/L to 321 × 10^9/L. None of the 17 women whose platelet counts were lower than 50 × 10^9/L had serious bleeding at the time of delivery. However, one woman, whose platelet count was 39 × 10^9/L and delivered by cesarean section, did experience postpartum bleeding but did not require any treatment. It was not certain whether the postpartum bleeding was related to the thrombocytopenia.

Our study also provides information about anagiesia at the time of delivery. In this study, 37% of the women received epidural analgesia, and most of these women had platelet counts from 50 × 10^9/L to 150 × 10^9/L; however, 17% of these women had platelet counts lower than 75 × 10^9/L. No patient had complications.

The frequency of moderate or severe neonatal thrombocytopenia at birth documented in this study is similar to that in our previous analysis of the literature. Six infants (5.5%) had platelet counts lower than 20 × 10^9/L, and 5 (4.6%) had platelet counts from 20 × 10^9/L to 49 × 10^9/L. Overall, 18 infants (14.6%) required treatment for thrombocytopenia. None of these infants experienced morbidity. Maternal platelet count during pregnancy or at the time of delivery was not predictive of the infant’s platelet count at birth. However, in women who gave birth more than once during our study, the first infant’s platelet count at birth predicted that of the second infant. In other words, mothers with a history of delivering a thrombocytopenic infant were at a greater risk for delivering another thrombocytopenic infant. This confirms the results of previous studies.26-29

Perhaps of most concern to us were the 2 fetal deaths. For one patient, the death appeared to be unrelated to thrombocytopenia, and though the fetus was stillborn at 39 weeks and was macerated, there was no evidence of hemorrhage. However, the other fetus, stillborn at 27 weeks, died a hemorrhagic death with diffuse hemorrhage throughout the body. This mother had undergone a previous splenectomy and had thrombocytopenia during the pregnancy requiring treatment with IV IgG. Despite treatment 1 week before delivery and a normal platelet count in the mother, the fetus had a hemorrhagic death. Extensive serologic and DNA typing of both parents for platelet antigenic discrepancies did not document neonatal alloimmune thrombocytopenia as an explanation for the thrombocytopenia, implying ITP by exclusion.

This study documents that mothers with ITP require monitoring during pregnancy and may require intervention with agents to raise the platelet count. For most women, however, pregnancy is uncomplicated, and even those with severe thrombocytopenia during pregnancy have good outcomes. Fetal loss of approximately 1% to 2% continues to occur in ITP and remains, so far, unavoidable.

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