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Platelet counts during pregnancy in Chinese women

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Abstract

Objectives: Gestational thrombocytopenia (GT) is the most common cause of thrombocytopenia during pregnancy. However, the occurrence and severity of thrombocytopenia throughout pregnancy in Chinese women are not fully defined.

Methods: We analyzed platelet counts in Chinese women who received prenatal care and/or delivered at the First Affiliated Hospital with Nanjing Medical University between January 2, 2018 and July 19, 2018 in China. These platelet counts were compared with those of nonpregnant women in the same study period.

Results: The platelet counts of all women continued to decrease significantly each trimester ($p < 0.0001$). The mean platelet counts of the 818 women who had pregnancy-related complications were lower than those of the 796 women who had uncomplicated pregnancies during the third trimester ($p = 0.047$). At the time of delivery, platelet counts less than $150 \times 10^9/L$ were more common in women with pregnancy-related complications than in women with uncomplicated pregnancy (26.7% vs. 19.7%, $p = 0.03$).

Conclusions: Platelet counts decrease throughout pregnancy in Chinese women and platelet counts less than $150 \times 10^9/L$ were more common in women with pregnancy-related complications than in women with uncomplicated pregnancy. The pregnant women should be paid more attention for thrombocytopenia to avoid the occurrence of bleeding events.

Keywords: gestational thrombocytopenia; platelet counts; pregnancy.

Introduction

Platelet counts in pregnancy are known to differ by trimester with a gradual decrease beginning in the first trimester until delivery. The physiological causes of thrombocytopenia include increase in plasma volume (dilutional effect), pooling of platelets in the spleen due to increased spleen size during pregnancy and pooling of platelets within the intervillous space of the placenta [1]. Nevertheless, thrombocytopenia during pregnancy is mainly caused by gestational thrombocytopenia (GT), immune thrombocytopenia or preeclampsia/HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome. GT affects 5–10% of uncomplicated pregnancies with platelet counts less than $150 \times 10^9/L$ at the time of delivery [2, 3]. GT is benign and usually needs no additional tests or specialized care. Clinical reports suggest that almost all asymptomatic pregnancies with platelet counts between $100 \times 10^9/L$ and $150 \times 10^9/L$ are GT or even healthy pregnancy without an increased risk of maternal or fetal bleeding complications [4]. Recently, Reese et al. reported that platelet counts in all pregnant women including non-Hispanic white, non-Hispanic black and Hispanic begin to decrease in the first trimester and continue to decrease until the time of delivery [5]. However, the trends in platelet counts throughout pregnancy in other races/ethnicities remain unknown [6]. Here, we evaluate the trends in platelet counts during pregnancy in Chinese women.

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Materials and methods

Study populations

We analyzed platelet counts in Chinese women who received prenatal care and/or delivered at the First Affiliated Hospital with Nanjing Medical University between January 2, 2018 and July 19, 2018 in China. Major pregnancy-related complications that were recorded as such were hypertension or diabetes before or during pregnancy, preeclampsia, HELLP syndrome, preterm birth (defined as birth before 37 weeks of gestation), placental abnormalities (e.g. placental abruption, placenta previa or placenta accreta) and hypothyroidism. The percentage of hypertension or diabetes before or during pregnancy is 38.14%, preeclampsia 2.93%, HELLP 1.47%, preterm birth 11.12%, placental abnormalities 7.33%, hypothyroidism 22.62% and others 16.39%. Preexisting disorders that were considered to be associated with thrombocytopenia were recorded as immune thrombocytopenic purpura, systemic lupus erythematosus, human immunodeficiency virus infection and hepatitis B or C. Women who did not have these pregnancy-related complications or preexisting disorders were considered to have uncomplicated pregnancies.

Platelet counts

A complete blood count with differential tests anticoagulated with ethylenediaminetetraacetic acid (EDTA) was determined using the XE-2100 with original reagents (Sysmex, Kobe, Japan). Low platelet counts ($<100 \times 10^9/L$) were confirmed by peripheral blood smear examination. Manual platelet count was performed when necessary.

Statistical analysis

SPSS13.0 software (SPSS Inc., Chicago, IL, USA) was used for statistical analysis of the data. The continuous variables which were normally distributed were expressed as the mean and 95% confidence interval (CI). Univariate analyses included a paired t-test, independent-samples t-test and chi-square (χ^2) test. The difference was statistically significant with $p < 0.05$.

Results and discussion

During the study period, a total of 796 women had uncomplicated pregnancies, 818 had pregnancy-related complications and 339 had preexisting disorders which could

Table 1: Platelet counts during pregnancy and in nonpregnant women.

Variable	Women with uncomplicated pregnancies ^a				Nonpregnant women
	First trimester	Second trimester	Third trimester	Delivery	
Overall					
No. of women who could be evaluated	368	515	313	274	2293
Platelet count ($\times 10^{-3}$ per mm^3)					
Mean (95% CI)	216 (211–222)	210 (206–214)	199 (193–204)	191 (185–197)	244 (242–246)
Range	49–369	96–438	92–453	89–467	125–350
Age range					
Mean platelet count (95% CI), $\times 10^{-3}$ per mm^3					
15–19 years	–	–	219	234	234 (192–275)
20–34 years	215 (210–221)	211 (207–215)	199 (193–205)	191 (185–197)	244 (242–247)
35–44 years	225 (212–239)	208 (197–219)	200 (183–218)	193 (171–214)	242 (239–246)
>44 years	146	160	135	111	
Platelet counts, number of women (%)					
$\geq 150,000$	338 (91.8)	486 (94.4)	273 (87.2)	220 (80.3)	
125,000–149,000	22 (6.0)	24 (4.7)	27 (8.6)	36 (13.1)	
100,000–124,000	6 (1.6)	4 (0.8)	11 (3.5)	16 (5.8)	
80,000–99,000	1 (0.3)	1 (0.2)	2 (0.6)	2 (0.7)	
60,000–79,000	0 (0.0)	0 (0.0)	0 (0.0)	0 (0)	
<60,000	1 (0.3)	0 (0.0)	0 (0.0)	0 (0)	

Table 1 (continued)

Variable	Women with uncomplicated pregnancies ^a				Nonpregnant women
	First trimester	Second trimester	Third trimester	Delivery	
Women with uncomplicated pregnancies (no missing platelet counts) ^b					
Overall					
No. of women who could be evaluated	54	54	54	54	
Platelet count, ×10 ⁻³ per mm ³					
Mean (95% CI)	226 (212–240)	217 (202–231)	211 (194–228)	195 (178–213)	
Range	146–369	150–351	114–453	106–467	
Women with complicated pregnancies ^c					
Overall					
No. of women who could be evaluated	113	597	586	476	
Platelet count, ×10 ⁻³ per mm ³					
Mean (95% CI)	221 (212–229)	208 (203–212)	192 (188–197)	185 (180–190)	
Range	136–372	16–457	33–360	24–429	
Platelet counts, number of women (%)					
≥150,000	106 (93.8)	528 (88.4)	462 (78.8)	349 (73.3)	
125,000–149,000	7 (6.2)	49 (8.2)	82 (14.0)	78 (16.4)	
100,000–124,000	0 (0.0)	15 (2.5)	35 (6.0)	38 (8.0)	
80,000–99,000	0 (0.0)	3 (0.5)	5 (0.9)	7 (1.5)	
60,000–79,000	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	
<60,000	0 (0.0)	2 (0.3)	2 (0.3)	3 (0.6)	
Pregnant women with preexisting disorders ^d					
Overall					
No. of women who could be evaluated	46	120	178	200	
Platelet count, ×10 ⁻³ per mm ³					
Mean (95% CI)	147 (132–162)	148 (140–155)	139 (134–144)	132 (128–137)	
Range	16–276	16–258	33–310	24–325	
Platelet counts, number of women (%)					
≥150,000	8 (17.4)	27 (22.5)	22 (12.4)	16 (8.0)	
125,000–149,000	29 (63.0)	68 (56.7)	104 (58.4)	114 (57.0)	
100,000–124,000	6 (13.0)	19 (15.8)	43 (24.2)	53 (26.5)	
80,000–99,000	1 (2.2)	4 (3.3)	7 (3.9)	12 (6.0)	
60,000–79,000	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)	
<60,000	2 (4.4)	2 (1.7)	2 (1.1)	3 (1.5)	

^aA total of 796 women had uncomplicated pregnancies and were included in our analyses. At the time of delivery, 54 of 274 women (19.7%) with uncomplicated pregnancies had platelet counts less than 150,000 per mm^3 . ^bA total of 54 women with uncomplicated pregnancies who had platelet counts determined at each trimester and at the time of delivery. The difference in the mean platelet count between the women who had no missing platelet counts and the 742 women who had missing platelet counts throughout pregnancy was not significant ($p = 0.39$). ^cA total of 818 women had pregnancy-related complications and were included in our analyses. At the time of delivery, 26.7% (127 of 476 women) with pregnancy-related complications had platelet counts less than 150,000 per mm^3 , a percentage that was significantly greater than that among women with uncomplicated pregnancies ($p = 0.03$). The mean platelet counts of the 818 women who had pregnancy-related complications were higher than those of the 796 women who had uncomplicated pregnancies during the third trimester ($p = 0.047$) but were not significantly different during the first trimester ($p = 0.35$) and second trimester ($p = 0.49$) or at the time of delivery ($p = 0.13$). ^dA total of 339 women had preexisting disorders associated with thrombocytopenia and were included in our analyses. The mean platelet counts of the 339 women who had preexisting disorders associated with thrombocytopenia were lower than those of the women who had uncomplicated or complicated pregnancies at all trimesters and at the time of delivery ($p < 0.0001$ for all comparisons).

be associated with thrombocytopenia; of these women, 54 uncomplicated pregnancies had platelet counts determined at each trimester and at the time of delivery (Table 1). To exclude statistical error caused by personnel differences in different trimesters, we compared the mean

platelet count of different trimesters between the women who had no missing platelet counts and the women who had missing platelet counts. The data suggested that the difference in the mean platelet count between the women who had no missing platelet counts and the

Figure 1: Mean platelet counts over time and platelet count distribution.

(A) The mean platelet counts of the women who had uncomplicated pregnancies are shown. I bars show 95% confidence intervals. The mean platelet counts of the 796 women who had uncomplicated pregnancies are shown at each trimester (with the mean time of gestation when they were measured indicated on the x-axis) and at the time of delivery. The mean platelet counts of the 54 women with uncomplicated pregnancies who had platelet counts determined at each trimester and at the time of delivery are also shown in panel (A). Platelet counts measured during the postpartum period were not included in this figure because of the small sample size. (B) The mean platelet counts of the women who had uncomplicated pregnancies, the women who had pregnancy-related complications and the women who had preexisting disorders that were associated with thrombocytopenia are shown. The mean platelet count in the 2293 nonpregnant women is designated by N on the x-axis. (C) The distribution of the mean platelet counts of the nonpregnant women and the distribution of the mean platelet counts during the first trimester (mean gestation, 12.2 weeks) and at the time of delivery in women who had uncomplicated pregnancies are shown.

counts of the 818 women who had pregnancy-related complications were lower than those of the 796 women who had uncomplicated pregnancies during the third trimester ($p=0.047$), but this difference was not statistically significant during the first trimesters ($p=0.35$), and second trimesters ($p=0.49$), or at the time of delivery ($p=0.13$). The mean platelet counts of the 339 women who had preexisting disorders associated with thrombocytopenia were lower than those of the women who had uncomplicated or complicated pregnancies at all trimesters and at the time of delivery ($p<0.0001$ for all comparisons) (Figure 1B). The results showed a remarkable decrease in mean platelet counts during pregnancy in Chinese women, beginning in the first trimester. At the time of delivery, platelet counts less than $150 \times 10^9/L$ were more common in women with pregnancy-related complications than in women with uncomplicated pregnancy (26.7% vs. 19.7%, $p=0.03$). The average decline in the mean platelet count was 16.3% from the first trimester to delivery time in women with complicated pregnancy, 11.5% among women with uncomplicated pregnancy and 10.2% among pregnant women with preexisting disorders. The results showed a remarkable decrease in the distribution of the mean platelet counts of the nonpregnant women, women in the first trimester (mean gestation, 12.2 weeks) and at the time of delivery in women who had uncomplicated pregnancies (Figure 1C). To avoid the statistical error caused by platelet counts from different people in different trimesters, we chose the maximum specimen size group (women with complicated pregnancies in the

742 women who had missing platelet counts during one or more trimesters was not significant (Figure 1A). The results showed that the pregnant women had significantly lower mean platelet counts than the nonpregnant women during each trimester and at the time of delivery ($p<0.001$). The platelet counts of all women regardless of the presence of complications continued to decrease significantly each semester ($p<0.0001$), and those of pregnant women with preexisting disorders also decreased significantly with $p=0.01$ (Figure 1B). The mean platelet

second trimester and women with preexisting disorders at the time of delivery), and again statistically compared the platelet counts of this subset group of women at different trimesters with those of women associated with uncomplicated pregnancies. The statistical results are consistent with the above.

This study provided first-hand evidence that platelet counts decrease throughout pregnancy in Chinese women and further confirmed the platelet counts less than $150 \times 10^9/L$ were more common in women with pregnancy-related complications than in women with uncomplicated pregnancy, which is consistent with that reported in Reese and colleagues' study. Additionally, the average decline in the mean platelet count of the women with pregnancy-related complications is the highest. This suggested that the group of pregnant women should be paid more attention for thrombocytopenia to avoid the occurrence of bleeding events. Our data defined the course of platelet counts throughout pregnancy and the potential severity of GT in Chinese women.

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