Preeclampsia significantly increases the future risk of coronary heart disease in women undergoing Caesarean section delivery

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Background: This population-based cohort study elucidated whether preeclampsia significantly increases the future risk of coronary heart disease (CHD) in women undergoing Caesarean section (CS) delivery.

Methods: We analyzed data retrieved from Taiwan Longitudinal Health Insurance Database. All of the CS women (2002~2007) in Taiwan, according to Diagnosis-Related Group codes, were included. The study endpoint was the primary diagnosis of CHD after delivery. Only subjects received treatment of CHD for at least twice were enrolled for analysis. The hazard ratios (HRs) and the 95% confidence intervals (CIs) were estimated using multivariate Cox proportional-hazards regression models.

Results: A total of 290736 CS women were included (preeclampsia: n=8383; non-preeclampsia: n=282354). During 1 to 6 years of follow-up, the incidence of CHD of the preeclampsia was significantly higher than that of the non-preeclampsia (0.2% vs. 0.1%; $P<0.001$). The preeclampsia and the non-preeclampsia were significantly different in age as well as the incidences of having general anesthesia, multiple gestation and CS by maternal request (all $P<0.001$). The preeclampsia and the non-preeclampsia were also significantly different in the incidences of CHD-related prognostic factors, including diabetes mellitus, chronic hypertension, hyperlipidemia, obesity, chronic obstructive pulmonary disease (a proxy for smoking), thrombophilia or coagulopathy, and disorders of fluid, electrolytes and acid-base balance (all $P<0.05$). The incidences of pregnancy-related complications, including pregnancy-related hypertension, antepartum hemorrhage, postpartum hemorrhage, early or threatened labor, and preterm and low birth weight were also significantly different between the preeclampsia and the non-preeclampsia (all $P<0.001$). After adjusting for the above-mentioned factors that differed significantly between the preeclampsia and the non-preeclampsia, the preeclampsia showed a significantly higher subsequent risk of developing CHD than the non-preeclampsia (HR = 2.77, 95% CI = 1.62 - 4.73, $P<0.001$).

Conclusions: CS women with preeclampsia had at least twice the risk of developing coronary heart disease when compared to those CS women without preeclampsia during 1 to 6 years of follow-up.

Figure 1. CHD-free survival rate by status of preeclampsia in CS patients as estimated by the Kaplan-Meier method. (Log-rank test, $p<0.001$)

Table 2. Percentage of CHD among patient according to the preeclampsia.			P value ^a
	Preeclampsia		
	Yes (n=8382)	No (n=282354)	
CHD, n (%)			<0.001
Yes	19 (0.2)	149 (0.1)	
No	8363 (99.8)	282205 (99.9)	
^a Tested by the Chi-square test.			

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Table 3. Time for CHD among patient according to the preeclampsia.			P value ^a
	Preeclampsia		
	Yes (n=19)	No (n=149)	
CHD, days(mean ± SD)	745.05 ± 635.34	819.28 ± 567.00	0.597
^a Tested by the Independent T test.			

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Table 1. Distribution of sample characteristics according to the preeclampsia

	Preeclampsia		P value
	Yes	No	
Total (N=290736)	(N=8382)	(N=282354)	
Age (years), mean± SD	30.71±5.36	29.92±4.92	<0.001
Mode of ansesthesia, n (%)			<0.001
General	1008 (12)	11077 (3.9)	
Neuraxial	7374 (88)	271277 (96.1)	
Multiple Gestation, n (%)			<0.001
Yes	517 (6.2)	10290 (3.6)	
No	7865 (93.8)	272064 (96.4)	
Diabetes Mellitus, n (%)			<0.001
Yes	184 (2.2)	978 (0.3)	
No	8198 (97.8)	281376 (99.7)	
Chronic Hypertension, n (%)			<0.001
Yes	36 (0.429)	84 (0.030)	
No	8346 (99.571)	282270 (99.970)	
Pregnancy-related Hypertension, n (%)			<0.001
Yes	144 (1.7)	3019 (1.1)	
No	8238 (98.3)	279335 (98.9)	
Antepartum Hemorrhage, n (%)			<0.001
Yes	365 (4.4)	17873 (6.3)	
No	8017 (95.6)	264481 (93.7)	
Postpartum Hemorrhage, n (%)			<0.001
Yes	117 (1.4)	1940 (0.7)	
No	8265 (98.6)	280414 (99.3)	
Hyperlipidermia, n (%)			0.026
Yes	2 (0.024)	7 (0.002)	
No	8380 (99.976)	282347 (99.998)	
Disorders of Fluid, Electrolyte, and Acid-Base Balance, n (%)			0.001
Yes	36 (0.4)	63 (0.022)	
No	8346 (99.6)	282291 (99.977)	
History of Cesarean Section, n (%)			<0.001
Yes	1269 (15.1)	87933 (31.1)	
No	7113 (84.9)	194421 (68.9)	
CS by maternal request, n (%)			<0.001
Yes	193 (2.3)	19492 (6.9)	
No	8189 (97.7)	262862 (93.1)	
Obesity, n (%)			0.024
Yes	3 (0.036)	19 (0.007)	
No	8379 (99.964)	282335 (99.993)	
COPD, n (%)			0.001
Yes	15 (0.2)	197 (0.1)	
No	8367 (99.8)	282157 (99.9)	
Early or threatened labor, n (%)			<0.001
Yes	2284 (27.2)	15854 (5.6)	
No	6098 (72.8)	266500 (94.4)	
Preterm and low birth weight, n (%)			0.001
Yes	4 (0.048)	12 (0.004)	
No	8378 (99.952)	282342 (99.996)	

^aTested by the Chi-square test and the Mann-Whitney U test.

Table 4. Preeclampsia in predicting CHD.

Variables	HR	95% CI	P value ^a
Preeclampsia	4.47	2.77 - 7.21	<0.001
Non-Preeclampsia	1.00		
Preeclampsia [*]	3.00	1.79 - 5.04	<0.001
Non-Preeclampsia	1.00		
Preeclampsia [*]	2.77	1.62 - 4.73	<0.001
Non-Preeclampsia	1.00		

^a Tested by Cox proportional hazard regression.

^{*} Adjusted for age, mode of ansesthesia, multiple gestation, diabetes mellitus, chronic hypertension, pregnancy-related hypertension, antepartum hemorrhage, postpartum hemorrhage, hyperlipidemia, disorders of fluid, electrolyte, and acid-base balance, thrombophilia or coagulopathy, history of CS, CS by maternal request, obesity, COPD, early or threatened labor, and preterm and low birth weight.

[†] Adjusted for propensity score.