Women with Caesarean section delivery have a higher risk of subsequent coronary heart disease than women with vaginal delivery

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Background: This population-based cohort study was conducted to elucidate the impact of Caesarean section (CS) delivery on the future risk of coronary heart disease (CHD) in pregnant women.

Methods: We analyzed data retrieved from the Longitudinal Health Insurance Database 2010, which includes medical claims data and registration files for 1 million enrollees randomly selected from the 2010 Registry for Beneficiaries ($n = 23.7$ million) of the National Health Insurance program in Taiwan. Subjects with a newly diagnosed CHD after delivery were identified with ICD-9-CM codes between January, 2000 and December, 2012. At least two separate inpatient or outpatient medical record diagnosis of CHD were included in this study to confirm the accuracy of the diagnosis. Multivariate Cox proportional-hazards regression models were performed to estimate the hazard ratios (HRs) and the 95% confidence intervals (CIs).

Results: A total of 52322 pregnant women were included (CS delivery: $n=18153$; vaginal delivery: $n=34169$). During 1 to 13 years of follow-up, the incidence of having subsequent CHD in women with CS delivery was significantly higher than that in women with vaginal delivery (1.4% vs. 0.9%; $P<0.001$). The between-group differences in age and length of hospital stay as well as the incidences of CHD-related prognostic factors, including diabetes mellitus, chronic hypertension, hyperlipidemia, obesity, chronic obstructive pulmonary disease (a proxy for smoking), and thrombophilia were significantly different (all $P<0.05$). The between-group differences in the incidences of pregnancy-related complications, including preeclampsia, pregnancy-related hypertension, antepartum haemorrhage, early or threatened labour, and preterm and low birth weight were also statistically significant (all $P<0.001$). After adjusting for the factors that were significantly different, the CS delivery women showed a significantly higher subsequent risk of CHD (HR = 1.32, 95% CI = 1.11-1.58, $P<0.001$) than the vaginal delivery women.

Conclusions: Women with CS delivery had an increased risk of a subsequent CHD comparing to those women with vaginal delivery.

Table 1. Distribution of sample characteristics according to delivery status.	Delivery status		P value ^a
	CS (N=18153)	VD (N=34169)	
Age (years), mean $\pm$ SD	29.76 $\pm$ 5.01	27.85 $\pm$ 4.77	<0.001
LOS (days), mean $\pm$ SD	6.44 $\pm$ 2.96	3.83 $\pm$ 2.45	<0.001
Preeclampsia, n (%)			<0.001
Yes	732 (4)	285 (0.8)	
No	17421 (96)	33884 (99.2)	
Multiple Gestation, n (%)			<0.001
Yes	720 (4)	80 (0.2)	
No	17433 (96)	34089 (99.8)	
Diabetes Mellitus, n (%)			<0.001
Yes	1309 (7.2)	2000 (5.9)	
No	16844 (92.8)	32169 (94.1)	
Chronic Hypertension, n (%)			<0.001
Yes	285 (1.6)	153 (0.4)	
No	17868 (98.4)	34016 (99.6)	
Pregnancy-related Hypertension, n (%)			<0.001
Yes	586 (3.2)	478 (1.4)	
No	17567 (96.8)	33691 (98.6)	
Antepartum Hemorrhage, n (%)			<0.001
Yes	3734 (20.6)	5117 (15)	
No	14419 (79.4)	29052 (85)	
Postpartum Hemorrhage, n (%)			0.892
Yes	120 (0.7)	221 (0.6)	
No	18033 (99.3)	33948 (99.4)	
Hyperlipidemia, n (%)			<0.001
Yes	113 (0.6)	109 (0.3)	
No	18040 (99.4)	34060 (99.7)	
Disorders of Fluid, Electrolyte, and Acid-Base Balance, n (%)			0.227
Yes	89 (0.5)	141 (0.4)	
No	18064 (99.5)	34028 (99.6)	
Thrombophilia or Coagulopathy, n (%)			0.011
Yes	46 (0.3)	51 (0.1)	
No	18107 (99.7)	34118 (99.9)	
Obesity, n (%)			<0.001
Yes	35 (0.2)	26 (0.1)	
No	18118 (99.8)	34143 (99.9)	
COPD, n (%)			<0.001
Yes	553 (3)	858 (2.5)	
No	17600 (97)	33311 (97.5)	
Early or threatened labor, n (%)			<0.001
Yes	5431 (29.9)	8813 (25.8)	
No	12722 (70.1)	25356 (74.2)	
Preterm and low birth weight, n (%)			<0.001
Yes	298 (1.6)	293 (0.9)	
No	17855 (98.4)	33876 (99.1)	

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

Table 2. Percentage of CHD among patient according to delivery status.	Delivery status		P value ^a
	CS (N=18153)	VD (N=34169)	
CHD, n (%)			<0.001
Yes	261 (1.4)	299 (0.9)	
No	17892 (98.6)	33870 (99.1)	

^a Tested by the Chi-square test.

Figure. CHD-free survival rate by mode of delivery as estimated by the Kaplan-Meier method. (Log-rank test, $p<0.001$)

Table 3. Time for CHD among patient according to delivery status.	Delivery status		P value ^a
	CS (n=261)	VD (n=299)	
CHD, years (mean $\pm$ SD)	5.74 $\pm$ 3.33	5.92 $\pm$ 3.30	0.506

^a Tested by the Mann-Whitney U test.

Table 4. Delivery status in predicting CHD.			
Variables	HR	95% CI	P value ^a
Delivery status (CS)	1.65	1.40 - 1.95	<0.001
Delivery status (VD)	1.00		
Delivery status (CS) ^b	1.34	1.12 - 1.59	0.001
Delivery status (VD)	1.00		
Delivery status (CS) ^c	1.34	1.12 - 1.59	0.001
Delivery status (VD)	1.00		
Delivery status (CS) ^d	1.32	1.11 - 1.58	0.002
Delivery status (VD)	1.00		

^a Tested by Cox proportional hazard regression.

^b Adjusted for age, preeclampsia, multiple gestation, diabetes mellitus, chronic hypertension, pregnancy-related hypertension, antepartum hemorrhage, hyperlipidemia, thrombophilia or coagulopathy, obesity, COPD, early or threatened labor, and preterm and low birth weight.

^c Adjusted for age, preeclampsia, 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, obesity, COPD, early or threatened labor, and preterm and low birth weight.

^d Adjusted for propensity score.