

Obstetric outcomes in the second birth of women with a previous caesarean delivery: a retrospective cohort study from Peru

Resultados obstétricos no segundo parto em mulheres com uma cesárea anterior: um estudo de coorte retrospectivo no Peru

Original Article

Keywords

Cesarean section/adverse effects
Delivery, obstetrics
Infant, newborn
Pregnancy
Pregnancy outcome
Pre-eclampsia
Obstetric labor, premature

Palavras-chave

Cesárea/efeitos adversos
Parto obstétrico
Recém-nascido
Gravidez
Resultado da gravidez
Pré-eclâmpsia
Trabalho de parto prematuro

Abstract

PURPOSE: To examine obstetric outcomes in the second birth of women who had undergone a previous cesarean delivery. **METHODS:** This was a large hospital-based retrospective cohort study. We included pregnant women who had a previous delivery (vaginal or cesarean) attending their second birth from 2001 to 2009. Main inclusion criteria were singleton pregnancies and delivery between a gestation of 24 and 41 weeks. Two cohorts were selected, being women with a previous cesarean delivery (n=7,215) and those with a vaginal one (n=23,720). Both groups were compared and logistic regression was performed to adjust for confounding variables. The obstetric outcomes included uterine rupture, placenta previa, and placental-related complications such as placental abruption, preeclampsia, and spontaneous preterm delivery. **RESULTS:** Women with previous cesarean delivery were more likely to have adverse outcomes such as uterine rupture (OR=12.4, 95%CI 6.8–22.3), placental abruption (OR=1.4, 95%CI 1.1–2.1), preeclampsia (OR=1.4, 95%CI 1.2–1.6), and spontaneous preterm delivery (OR=1.4, 95%CI 1.1–1.7). **CONCLUSIONS:** Individuals with previous cesarean section have adverse obstetric outcomes in the subsequent pregnancy, including uterine rupture, and placental-related disorders such as preeclampsia, spontaneous preterm delivery, and placental abruption.

Resumo

OBJETIVO: Analisar os resultados obstétricos no segundo parto de mulheres que já haviam realizado uma cesariana. **MÉTODOS:** Estudo de coorte retrospectivo em um hospital materno. Foram incluídas mulheres grávidas que deram à luz (vaginal ou cesárea) de 2001 a 2009. Os principais critérios de inclusão foram: mulheres com 24 a 41 semanas de gestação e com um parto prévio. Duas coortes foram selecionadas, sendo uma incluindo mulheres com uma cesariana anterior (n=7.215) e outra com um parto vaginal (n=23.720). Ambos os grupos foram comparados, e uma regressão logística foi realizada para ajustar devido às variáveis de confusão. Os resultados obstétricos incluídos foram ruptura uterina, placenta prévia, complicações relacionadas com uma placentação inadequada, tais como descolamento prematuro da placenta, pré-eclâmpsia e parto prematuro espontâneo. **RESULTADOS:** Mulheres com uma cesariana anterior foram mais propensas a ter resultados adversos, tais como ruptura uterina (OR=12,4, IC95% 6,8–22,3), descolamento prematuro da placenta (OR=1,4, IC95% 1,1–2,1), pré-eclâmpsia (OR=1,4, IC95% 1,2–1,6) e parto prematuro espontâneo (OR=1,4, IC95% 1,1–1,7). **CONCLUSÕES:** Pessoas com uma cesárea anterior têm resultados obstétricos adversos na gravidez subsequente, incluindo ruptura de útero, distúrbios relacionados com uma placentação inadequada, tais como pré-eclâmpsia, parto prematuro espontâneo e descolamento prematuro da placenta.

Correspondence

Walter Ricardo Ventura Laveriano
Department of Obstetrics and Gynecology,
Instituto Nacional Materno-Perinatal
941 Miroquesada Avenue
Lima, Peru

Received

02/22/2012

Accepted with modifications

03/07/2013

Study carried out at Instituto Nacional Materno-Perinatal – Lima, Peru.

¹Department of Obstetrics and Perinatology, Instituto Nacional Materno-Perinatal – Lima, Peru.

²Universidad Nacional Mayor de San Marcos – Lima, Peru.

Introduction

Cesarean section is by far the most common major surgical procedure in obstetrics. Currently, its rates are above the levels of reference stated by the World Health Organization (WHO), in both developed and developing countries, with a tendency to increase^{1,2}. Studies based on global population in Latin America have reported a 33% rate².

Delivery by cesarean section is associated with increased risk of maternal and perinatal morbidities in the current pregnancy³. Additionally, it has been reported an increased risk of adverse obstetric outcomes in the following pregnancy regardless of the delivery mode. These outcomes include high risk of uterine rupture, which is raising according to the number of previous cesarean section^{4,5}, and of developing placental abruption^{6,7}. Also, some studies have showed an enormous possibility of developing placenta previa⁶⁻⁸, albeit this was not confirmed by others⁹. Recently, it has been seen an association between previous cesarean section and other perinatal outcomes, such as low birth weight and small-for-gestational age infant^{10,11}.

There is some evidence that previous scar in the uterus could contribute to an impaired placentation, which may be the basis of developing future placental-related complications such as placental abruption, preeclampsia, and spontaneous preterm delivery^{11,12}. However, the results of studies on women with a previous cesarean and obstetric outcomes in the following pregnancy vary substantially across populations and by study design, and commonly have not accounted for important confounding factors such as maternal age, previous obstetric and medical history, parity, and prior delivery method.

We aimed at examining obstetric outcomes as uterine rupture, placental abruption, preeclampsia, and spontaneous preterm delivery in the subsequent pregnancy among women with a previous cesarean delivery compared to those with the vaginal one.

Methods

A large retrospective cohort study was conducted to examine adverse obstetric outcomes in women who delivered at a national reference centre for maternal and perinatal care (*Instituto Nacional Materno-Perinatal*, Lima, Peru), between January 2001 and December 2009. Demographic, obstetric, and perinatal data were collected prospectively in a standardized format, which were retrieved from an electronic database. The study protocol was approved by the local institutional review board. Inclusion criteria were: gestational age (GA) at birth between 24+0 and 41+6 weeks; birth

weight of more than 500 g, and complete data on the outcome variables. Exclusion criteria included multiple pregnancies, more than one previous birth, and previous uterine surgery. The study population was divided into two groups: women with a previous cesarean delivery and those with a previous vaginal one (Figure 1).

The following obstetric outcomes were searched as potentially affected by cesarean delivery: uterine rupture (including total and partial uterine rupture according to the postoperative report); placenta previa (as per the postoperative report); placental abruption (confirmed at operation); preeclampsia; spontaneous preterm delivery (spontaneous birth before 37 weeks); low birth weight (birth weight $\leq 2,500$ g); intrauterine death (confirmed by ultrasound); and low Apgar score at five minutes defined as score < 7 . Preeclampsia was defined below as systolic pressure of ≥ 140 mmHg or diastolic of ≥ 90 mmHg on at least two occasions after a gestation period of 20 weeks with proteinuria of 300 mg or more in 24 hours or at least 1+ dipstick analysis of midstream or catheter urine specimen if no 24-hour collection was available.

Maternal and obstetric characteristics included: maternal age, defined as the mother's age at time of

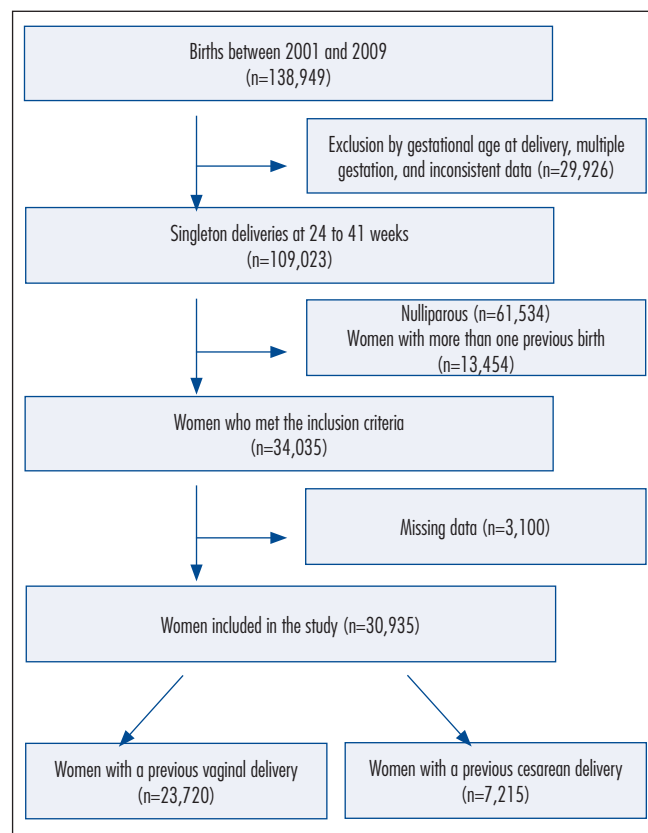


Figure 1. Population study.

delivery; maternal weight (in kg); previous spontaneous abortion; previous intrauterine death; and history of chronic hypertension.

Normality of continuous variables was tested with the Kolmogorov-Smirnov test. Continuous variables were summarized by robust estimators (i.e. median and interquartile ranges). Comparisons between women with a previous vaginal delivery or with a cesarean section were performed by the Mann-Whitney's U test for continuous variables and χ^2 test for categorical ones. The adjusted Odds Ratios (OR) and 95% confidence intervals (CI) were calculated after multivariate logistic regression analyses adjusted for confounding factors, such as maternal age, maternal weight, previous spontaneous abortions, previous intrauterine death, preeclampsia, and chronic hypertension. All statistical analyses were carried out with STATA software (version 9.0; Stata Corporation, College Station, TX, USA). A p-value of less than 0.05 was considered significant.

Results

During the nine-year study period, 138,949 deliveries occurred in the studied hospital (Figure 1). A total of 30,935 women with a second birth filled out the inclusion criteria. Of these, 23,720 had had a previous vaginal delivery and 7,215 had had a previous delivery by cesarean section.

General and obstetrics characteristics of both groups are presented in Table 1. Median maternal age was higher in women with a previous vaginal birth ($p < 0.001$), whereas its weight was higher in subjects with a previous cesarean section compared to those who had a previous vaginal delivery ($p < 0.001$). People with a previous cesarean section were more likely to have had one spontaneous abortion ($p = 0.01$). No significant differences in the number of previous intrauterine death and chronic hypertension were observed.

Table 2 shows the occurrence of obstetric outcomes by group. Women with a previous cesarean section were more likely to have uterine rupture (0.7 *versus* 0.1%, $p < 0.001$), placental abruption (0.6 *versus* 0.4%, $p = 0.03$), preeclampsia (4.9 *versus* 3.4%, $p < 0.001$), and spontaneous preterm delivery < 37 weeks (1.9 *versus* 1.3%, $p < 0.001$) in the following pregnancy. No significant differences were found in the risk of placenta previa (1.0 *versus* 0.9%, $p = 0.55$), or in other obstetric outcomes (i.e. low birth weight, intrauterine death, or five-minute Apgar score < 7). In addition, these females were more likely to have a repeated cesarean section (77.8 *versus* 31.1%, $p < 0.001$).

Table 1. General and obstetrics characteristics of the study population

Characteristics	Previous cesarean delivery (n=7,215) n (%)	Previous vaginal delivery (n=23,720) n (%)	Significance p-value
Maternal age in years, median – IQR ⁽ⁱ⁾	26 (22–30)	27 (22.5–31.5)	$< 0.001^*$
Maternal weight in kg, median – IQR ⁽ⁱ⁾	65 (60.5–69.5)	64 (59–69)	$< 0.001^*$
Previous spontaneous abortion ⁽ⁱⁱ⁾ :	n (%)	n (%)	
None	5,267 (73.3)	17,721 (74.8)	0.01*
One	1,595 (22.2)	4,881 (20.6)	
More than one	320 (4.5)	1,090 (4.6)	
Previous intrauterine death ⁽ⁱⁱ⁾	104 (1.5)	337 (1.5)	0.8
Chronic hypertension ⁽ⁱⁱ⁾	158 (2.2)	570 (2.4)	0.2

Comparison between groups – (i): Mann-Whitney's U-test; (ii): χ^2 for categorical variables; IQR: interquartile range; * $p < 0.05$.

Table 2. Perinatal outcomes in both study groups

Perinatal outcome ⁽ⁱ⁾	Previous cesarean delivery (n=7,215) n (%)	Previous vaginal delivery (n=23,720) n (%)	Significance p-value
Uterine rupture	52 (0.7)	14 (0.1)	$< 0.001^*$
Placental abruption	40 (0.6)	89 (0.4)	0.03
Placenta previa	70 (1.0)	212 (0.9)	0.5
Preeclampsia	353 (4.9)	801 (3.4)	0.001*
Preeclampsia < 34 weeks	59 (0.8)	148 (0.6)	0.07
Spontaneous preterm birth < 37 weeks	138 (1.9)	317 (1.3)	0.001*
Low birth weight $< 2,500$ g	450 (6.2)	1434 (6.0)	0.5
Intrauterine death	30 (0.4)	94 (0.4)	0.8
Five-minute Apgar score < 7	34 (0.4)	129 (0.4)	0.9
Cesarean delivery in the index pregnancy	5,611 (77.8)	7,369 (31.1)	0.001*

Comparison between groups – (i): χ^2 test for all perinatal outcomes; * $p < 0.05$.

Table 3. Adjusted Odds Ratios of adverse pregnancy outcomes

Perinatal outcome	Unadjusted OR (95%CI)	Adjusted OR* (95%CI)
Uterine rupture	12.3 (6.9–22.2)	12.4 (6.8–22.3)**
Placental abruption	1.5 (1.0–2.2)	1.4 (1.1–2.1)**
Placenta previa	1.1 (0.8–1.4)	1.0 (0.8–1.3)
Preeclampsia	1.5 (1.3–1.7)	1.4 (1.2–1.6)**
Spontaneous preterm birth (< 37 weeks)	1.4 (1.2–1.8)	1.4 (1.1–1.7)**
Low birth weight ($< 2,500$ g)	1.1 (0.9–1.5)	1.1 (0.87–1.27)
Five-minute Apgar score < 7	1.0 (0.7–1.5)	1.0 (0.7–1.5)
Cesarean delivery in the index pregnancy	7.8 (7.3–8.3)	7.8 (7.3–8.3)**

*Odds Ratio (OR) adjusted according to maternal age, spontaneous abortions, and previous chronic hypertension; 95%CI: confidence interval; ** $p < 0.05$.

Adjusted ORs and 95% CIs for obstetric outcomes are presented in Table 3. Logistic regression concluded that women with a previous cesarean section had a greater possibility of developing uterine rupture (OR=12.4, 95%CI 6.8–22.3); placental abruption (OR=1.4, 95%CI 1.1–2.1); preeclampsia (OR=1.4, 95%CI 1.2–1.6); spontaneous preterm delivery (OR=1.4, 95%CI 1.1–1.7); and repeated cesarean (OR=7.8, 95%CI 7.3–8.3) in the following pregnancy compared to those with a previous vaginal delivery.

Discussion

The present study reported an increased risk of adverse obstetric outcomes related to placental dysfunction, such as: placental abruption, preeclampsia and spontaneous preterm delivery in the subsequent pregnancy among women with a previous cesarean section.

Not surprisingly, an association between previous cesarean section and uterine rupture was observed. We found an OR of 12.4 (95%CI 6.8–22.3), which is significant even though there is a wide confidence interval that is accordance with other previous reports^{13–17}. To note, we included cases of partial uterine rupture (dehiscence). Although we did not report the number of patients undergoing labor, in our hospital women with a previous cesarean section gave an informed consent for the trial of labor in the index pregnancy.

The present study noticed an increased risk of placental abruption (OR=1.4) in women with a previous cesarean section, which is consistent with other analyses^{18,19}. Although we did not adjust for previous history of placental abruption, our findings are similar to previous studies controlling this factor⁶. This does not show increased risk of placenta previa as reported by others^{6,7,10,18,20}. Although some other studies did not find any association between previous cesarean and placenta previa⁹, there are several confounding variables that should be taken into account in prospective researches. Furthermore, our data did not allow us to classify the types of placenta previa. In contrast to Smith et al.²⁰, we did not see an increased risk of intrauterine death. However, we acknowledge that our study was not powerful enough to assess this outcome.

Still, an association between previous cesarean and related-placental complications, such as preeclampsia and spontaneous preterm delivery, was also described. This is biologically plausible since the cesarean section produces a disruption of the uterine cavity and an interruption of the circulation in future areas of implantation, which could cause dysfunction in the myometrium and endometrium^{11–13}.

A previous analysis from Daltveit et al.¹¹ has also reported association of previous cesarean delivery with preeclampsia even when the research was restricted to women with previous history of preeclampsia. Similarly, Kennare et al.¹⁰ have presented a relation with preterm delivery, albeit in their study there is no information about spontaneous preterm delivery. Since spontaneous preterm delivery has been associated with placental function²¹, we wanted to go further and test the hypothesis of association with spontaneous preterm delivery. These findings warrant further researches to improve our understanding on such topic.

Although a significant difference regarding maternal age and weight was seen, the little variances seem not to be clinically relevant. The main strength of this study is that the population attending our hospital is fairly homogeneous in terms of social and economic conditions. Therefore, the analysis was restricted to women of parity 1 with a single previous cesarean or single vaginal delivery, as multiple previous cesarean or previous successful vaginal delivery are known to influence the mode of delivery planning and obstetric outcomes. However, we acknowledge that this study has a several number of limitations, including its retrospective design. We were not able to identify important confounding factors, such as the obstetric indication for the previous cesarean and the birth interval. In addition, we did not have data about the previous history of preeclampsia, induction of labor, and spontaneous preterm delivery that are important confounding factors.

Among our population, the rate of repeated cesarean was high (about 78%) which is similar to developed countries²². The hospital under analysis is a major referral center for maternal and perinatal care, and such number may reflect an increased proportion of women at high risk. The raised rate of cesarean sections has considerable clinical and public health importance, and any strategy for its reduction is great, including the trial of labor in women with a previous cesarean section and the recognition of short- and long-term complications. A cesarean delivery amplifies the risk of mortality and surgical complications for the mother in the next pregnancies²³. In addition to some infrequent adverse events (i.e. placenta accreta and uterine rupture), other obstetrics outcomes such as those reported herein (i.e. placental abruption, preeclampsia and preterm delivery) might be useful in counseling and reconsidering the option of a cesarean section in a nulliparous woman.

In conclusion, a previous cesarean section increases adverse obstetric outcomes related to placental dysfunction in a subsequent pregnancy, including preeclampsia, spontaneous preterm delivery, and placental abruption.

References

- Hamilton BE, Hoyert DL, Martin JA, Strobino DM, Guyer B. Annual summary of vital statistics: 2010-2011. *Pediatrics*. 2013;131(3):548-58.
- Villar J, Valladares E, Wojdyla D, Zavaleta N, Carroli G, Velazco A, et al. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. *Lancet*. 2006;367(9525):1819-29.
- Villar J, Carroli G, Zavaleta N, Donner A, Wojdyla D, Faundes A, et al. Maternal and neonatal individual risks and benefits associated with caesarean delivery: multicentre prospective study. *BMJ*. 2007;335(7628):1025.
- Shatz L, Novack L, Mazor M, Weisel RB, Dukler D, Rafaeli-Yehudai T, et al. Induction of labor after a prior cesarean delivery: lessons from a population-based study. *J Perinat Med*. 2012. [Epub ahead of print]
- Gregory KD, Korst LM, Cane P, Platt LD, Kahn K. Vaginal birth after cesarean and uterine rupture rates in California. *Obstet Gynecol*. 1999;94(6):985-9.
- Silver RM. Implications of the first cesarean: perinatal and future reproductive health and subsequent cesareans, placentation issues, uterine rupture risk, morbidity, and mortality. *Semin Perinatol*. 2012;36(5):315-23.
- Lydon-Rochelle M, Holt VL, Easterling TR, Martin DP. First-birth cesarean and placental abruption or previa at second birth(1). *Obstet Gynecol*. 2001;97(5 Pt 1):765-9.
- Taylor VM, Kramer MD, Vaughan TL, Peacock S. Placenta previa and prior cesarean delivery: how strong is the association? *Obstet Gynecol*. 1994;84(1):55-7.
- McMahon MJ, Li R, Schenck AP, Olshan AF, Royce RA. Previous cesarean birth. A risk factor for placenta previa? *J Reprod Med*. 1997;42(7):409-12.
- Kennare R, Tucker G, Heard A, Chan A. Risks of adverse outcomes in the next birth after a first cesarean delivery. *Obstet Gynecol*. 2007;109(2 Pt 1):270-6.
- Dalveit AK, Tollanes MC, Pihlstrom H, Irgens LM. Cesarean delivery and subsequent pregnancies. *Obstet Gynecol*. 2008;111(6):1327-34.
- Abenhaim HA, Benjamin A. Effect of prior cesarean delivery on neonatal outcomes. *J Perinat Med*. 2011;39(3):241-4.
- Dandolu V, Graul AB, Lyons A, Matteo D. Obstetrical hysterectomy, cesarean delivery and abnormal placentation. *J Matern Fetal Med*. 2012;25(1):74-7.
- Kaczmarczyk M, Sparén P, Terry P, Cnattingius S. Risk factors for uterine rupture and neonatal consequences of uterine rupture: a population-based study of successive pregnancies in Sweden. *BJOG*. 2007;114(10):1208-14.
- Ofir K, Sheiner E, Levy A, Katz M, Mazor M. Uterine rupture: risk factors and pregnancy outcome. *Am J Obstet Gynecol*. 2003;189(4):1042-6.
- Ronel D, Wiznitzer A, Sergienko R, Zlotnik A, Sheiner E. Trends, risk factors and pregnancy outcome in women with uterine rupture. *Arch Gynecol Obstet*. 2012;285(2):317-21.
- Guise JM, Berlin M, McDonagh M, Osterweil P, Chan B, Helfand M. Safety of vaginal birth after cesarean: a systematic review. *Obstet Gynecol*. 2004;103(3):420-9.
- Yang Q, Wen SW, Oppenheimer L, Chen XK, Black D, Gao J, et al. Association of cesarean delivery for first birth with placenta praevia and placental abruption in second pregnancy. *BJOG*. 2007;114(5):609-13.
- Pariante G, Wiznitzer A, Sergienko R, Mazor M, Holcberg G, Sheiner E. Placental abruption: critical analysis of risk factors and perinatal outcomes. *J Matern Fetal Neonatal Med*. 2011;24(5):698-702.
- Smith GC, Pell JP, Dobbie R. Cesarean section and risk of unexplained stillbirth in subsequent pregnancy. *Lancet*. 2003;362(9398):1779-84.
- Beta J, Akolekar R, Ventura W, Syngelaki A, Nicolaides KH. Prediction of spontaneous preterm delivery from maternal factors, obstetric history and placental perfusion and function at 11-13 weeks. *Prenat Diagn*. 2011;31(1):75-83.
- Brennan DJ, Robson MS, Murphy M, O'Herlihy C. Comparative analysis of international cesarean delivery rates using 10-group classification identifies significant variation in spontaneous labor. *Am J Obstet Gynecol*. 2009;201(3):308.e1-8.
- Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstet Gynecol*. 2006;107(6):1226-32.