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Effect of the interpregnancy interval after an abortion on maternal and perinatal health in Latin America

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KEYWORDS

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Post-abortion;
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Abstract

Objective: To investigate whether the length of the interval between an abortion and the next pregnancy is associated with increased risks of adverse maternal and perinatal outcomes in Latin America. **Method:** Retrospective cross-sectional study using information from 258,108 women delivering singleton infants and whose previous pregnancy resulted in abortion recorded in the Perinatal Information System database of the Latin American Centre for Perinatology and Human Development, Montevideo, Uruguay, between 1985 and 2002. Adjusted odds ratios were obtained through logistic regression analysis. **Result:** Compared with the post-abortion interpregnancy intervals of 18 to 23 months, intervals shorter than 6 months were significantly associated with increased risks of maternal anemia, premature rupture of membranes, low birth weight, very low birth weight, preterm delivery, and very preterm delivery. **Conclusion:** In Latin America, post-abortion interpregnancy intervals shorter than 6 months are independently associated with increased risks of adverse maternal and perinatal outcomes in the next pregnancy. **Definition:** Post-abortion interpregnancy interval (PAII): the time elapsed between the day of the abortion and the first day of the last menstrual period for the index pregnancy.

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1. Introduction

Both short and long interpregnancy intervals following a pregnancy that ended after 19-week gestation have been found to increase the risk of several adverse pregnancy outcomes, such as low birth weight, preterm delivery, small for gestational age, maternal death, and anemia [1,2]. A short interpregnancy interval after a spontaneous abortion has not been found to be associated with an increased risk of a subsequent abortion by some researchers [3–5]. However, Wohlfahrt and Nybo [6] reported a higher risk of spontaneous abortion when the interpregnancy interval following a spontaneous abortion was longer than 5 years. The effect of the interval between an abortion and the next conception on perinatal and maternal morbidity and mortality has received less attention.

We have defined the post-abortion interpregnancy interval (PAII) as the time elapsed between the day of the abortion (spontaneous or induced) and the first day of the last menstrual period for the index pregnancy. A short PAII may play a role if the uterus needs time to recover after an abortion or if an abortion increases the risk of infection. It is estimated that 50 million induced abortions occur worldwide annually [7]. Therefore, it is of great public health importance to know the effects of interpregnancy interval following an abortion on perinatal and maternal health. The aim of this study was to determine whether the length of the interval between an abortion and the next pregnancy is associated with increased risk of adverse pregnancy outcomes.

2. Materials and methods

The data for this study were obtained from the Perinatal Information System database located at the Latin American Center for Perinatology and Human Development (CLAP) in Montevideo, Uruguay. The database characteristics have previously been described in detail [2]. Briefly, from the first antenatal visit until discharge of both mother and neonate, the attendant physicians or nurses collect data in the perinatal clinical record in check-box format which includes demographic information, reproductive history, maternal characteristics, prenatal care, labor management, maternal complications during pregnancy, delivery, and the puerperium, and neonatal outcomes. Then, data are entered in on site computer and quality control is conducted. Later, they are sent to the Latin

American Centre for Perinatology and Human Development where a further data entry, quality control check, and validation are performed. From 1985 through 2002, the Perinatal Information System database has recorded pregnancies of women who delivered in public hospitals from Argentina, Uruguay, Paraguay, Peru, Colombia, Chile, Honduras, Bolivia, Brazil, El Salvador, Dominican Republic, Costa Rica, Mexico, Nicaragua, Panama, Ecuador, Belize, and Venezuela. Approximately 40% of the data is from hospitals in Argentina and Uruguay.

Only women delivering singleton infants and whose previous pregnancy resulted in abortion (spontaneous or induced) were included in the study. Abortion was defined as a pregnancy which terminated (spontaneously or induced) within 20 weeks after the first day of the last menstrual period. There was no distinction made during the data collection process between spontaneous and induced abortions because of the cultural stigma and illegality of abortion in these countries. The PAII was defined as the time elapsed between the day of the abortion and the first day of the last menstrual period for the index pregnancy. Intervals were computed in weeks and then converted to months. The PAIIs were arbitrarily categorized as ≤ 2 , 3–5, 6–11, 12–17, 18–23, 24–59, and ≥ 60 months. Gestational age was estimated from the date of last menstrual period, and amended by means of ultrasonography in a quarter of women.

Adverse maternal outcomes were classified according to International Classification of Diseases, 10th revision (ICD-10). Preeclampsia and eclampsia were codes O14 and O15, respectively. Third trimester bleeding included placenta previa with hemorrhage (code O44.1) and placental abruption (code O45). Anemia, premature rupture of membranes, gestational diabetes mellitus, postpartum hemorrhage, and puerperal endometritis were codes O99.0, O42, O24.4, O72 and O85, respectively.

Adverse perinatal outcomes evaluated were LBW (live baby weighing less than 2500 g at birth), very LBW (live baby weighing less than 1500 g at birth), preterm delivery (live baby delivered at less than 37-week gestation), very preterm delivery (live baby delivered at less than 32-week gestation), SGA (live baby with birth weight below the 10th percentile for the gestational age and gender, according to the Williams et al. [8] reference curve), fetal death (delivery of a dead baby at or after 20-week gestation), early neonatal death (neonatal death occurring during the first 7 days of life), and low Apgar scores at 5 min (less than 7).

Table 1 Maternal socio-demographic and obstetric characteristics according to post-abortion interpregnancy interval

Outcome	Post-abortion interpregnancy interval (months)						
	0–2 (n=2503)	3–5 (n=9112)	6–11 (n=39,491)	12–17 (n=34,070)	18–23 (n=30,199)	24–59 (n=88,789)	≥60 (n=53,944)
Mean maternal age (years±S.D.)	25.1±6.6	25.5±6.4	26.9±6.1	27.6±6.0	28.3±6.1	29.3±5.9	32.8±5.4
Mean parity (years±S.D.)	1.6±1.7	1.8±1.7	2.3±2.2	2.5±2.2	2.6±2.3	2.6±2.2	2.4±1.8
History of low birth weight (%)	3.3	3.2	3.2	3.3	3.2	3.3	3.3
History of fetal death (%)	3.0	2.9	2.8	2.6	2.7	2.0	1.8
History of early neonatal death (%)	2.4	2.2	1.6	1.9	1.7	1.6	1.5
Mother living with infant's father (%)	85.7	86.1	86.3	85.2	85.8	85.6	86.7
No antenatal care (%)	20.6	18.1	15.7	14.0	13.5	12.9	12.2
Cigarette smoking (%)	12.0	12.4	11.9	12.1	12.2	11.8	12.3
History of chronic hypertension (%)	1.0	1.1	1.2	1.3	1.7	1.9	3.5
Mother's education (years) (%)							
0	4.1	4.0	4.1	4.2	4.1	4.0	3.9
1–5	52.3	53.0	54.2	54.6	54.3	55.0	54.5
≥6	43.6	43.0	41.7	41.2	41.6	41.0	41.6

Rates of adverse pregnancy outcomes were calculated for each PAII. Estimates of crude odds ratio (OR) with 95% confidence interval (CI) were computed as measures of association between each PAII and adverse pregnancy outcome considered. The interval 18–23 months was used as the referent category because this was the interval with the lowest rates of adverse pregnancy outcomes. Adjusted odds ratios were derived through logistic regression models. To test whether the PAII was an independent risk factor for adverse pregnancy outcomes, we evaluated

the following maternal socio-demographic and obstetric variables as potential confounding factors: maternal age, parity, mother's education, marital status, cigarette smoking, pre-pregnancy body mass index, weight gain during pregnancy, history of low birth weight, perinatal death, and chronic hypertension, gestational age at first attendance for antenatal care, number of antenatal visits, geographic area, hospital type, and year of delivery. Early neonatal death and low Apgar scores at 5 min were additionally adjusted for birth weight and gestational age. All analyses

Table 2 Rates of adverse maternal outcomes according to post-abortion interpregnancy interval

Outcome	Post-abortion interpregnancy interval (months)						
	0–2	3–5	6–11	12–17	18–23	24–59	≥60
Preeclampsia	3.7	3.6	3.6	3.7	3.4	3.5	5.6
Eclampsia	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Third trimester bleeding	1.5	1.5	1.3	1.1	1.1	1.2	1.3
Premature rupture of membranes	9.7	8.2	5.7	5.6	5.7	5.7	5.9
Postpartum hemorrhage	5.5	5.4	5.1	5.3	5.1	5.2	5.3
Puerperal endometritis	4.3	4.4	4.4	3.9	3.9	4.0	4.0
Gestational diabetes mellitus	1.0	1.0	1.0	1.2	1.1	1.1	1.6
Anemia	10.0	7.8	6.6	6.4	5.8	6.0	6.2

Figures are percentage of women.

Table 3 Rates of adverse perinatal outcomes according to post-abortion interpregnancy interval

Outcome	Post-abortion interpregnancy interval (months)						
	0–2	3–5	6–11	12–17	18–23	24–59	≥60
Low birth weight	18.1	16.4	8.6	8.0	7.0	7.4	7.6
Very low birth weight	3.2	2.6	1.6	1.4	1.3	1.4	1.6
Preterm birth	20.4	16.6	9.5	9.0	8.4	8.5	9.1
Very preterm birth	4.2	3.7	1.9	1.7	1.5	1.5	1.7
Small for gestational age	15.7	15.9	14.5	14.2	13.5	13.8	14.4
Low Apgar scores at 5 min	1.2	1.2	1.1	1.1	1.0	1.1	1.2
Fetal death	1.6	1.7	1.7	1.5	1.5	1.6	1.6
Early neonatal death	0.8	0.8	0.8	0.8	0.7	0.8	0.8

Figures are percentage of infants.

were done using the SPSS 8.0 programme package (SPSS, Chicago, IL).

3. Results

A total of 258,108 women delivering singleton infants and whose previous pregnancy resulted in an abortion were recorded on our database between 1985 and 2002. Short PAII (<6 months) and long PAII (>59 months) between pregnancies were observed for 4.5% and 20.9% of women, respectively. Nearly 45% of women had a PAII less than 24 months.

Table 1 shows the socio-demographic and obstetric characteristics of the mothers at the index pregnancy according to PAII. Younger maternal age, low parity, histories of fetal death and early neonatal death, and lack of antenatal care were associated with short intervals between an abortion and the next pregnancy. Women with a long PAII were more likely to be older and with history of

chronic hypertension. There were no obvious differences among the groups with regard to history of low birth weight, marital status, mother's education, and cigarette smoking during pregnancy.

Table 2 shows the rates of adverse maternal outcomes according to PAII. Women with short PAII (<6 months) had the highest rates of premature rupture of membranes, third trimester bleeding, and anemia. The rates of preeclampsia, eclampsia, and gestational diabetes mellitus were highest among women with long PAII (>59 months). There were no differences in the rates of postpartum hemorrhage and puerperal endometritis. As shown in Table 3, infants conceived less than 6 months after an abortion had the highest rates of low birth weight, very low birth weight, preterm delivery, and very preterm delivery. There were no differences among the PAII groups with regard to small for gestational age, low Apgar score at 5 min, fetal death, and early neonatal death.

Table 4 Adjusted odds ratio (95% confidence interval) for adverse maternal outcomes according to post-abortion interpregnancy interval

Outcome	Post-abortion interpregnancy interval (months)						
	0–2	3–5	6–11	12–17	18–23*	24–59	≥60
Preeclampsia	1.1 (0.7–1.4)	1.0 (0.8–1.2)	1.1 (0.9–1.2)	1.1 (0.9–1.2)	1.0	1.1 (0.9–1.2)	1.1 (0.9–1.2)
Eclampsia	1.1 (0.2–2.7)	1.1 (0.5–2.3)	1.0 (0.6–1.6)	1.1 (0.7–2.1)	1.0	1.1 (0.6–2.0)	1.1 (0.4–3.2)
Third trimester bleeding	1.0 (0.7–1.6)	1.1 (0.9–1.4)	1.2 (0.9–1.4)	1.1 (0.9–1.3)	1.0	1.0 (0.8–1.2)	1.1 (1.0–1.3)
Premature rupture of membranes	1.7 (1.4–2.2)	1.4 (1.3–1.6)	1.0 (0.9–1.1)	1.0 (0.9–1.1)	1.0	1.0 (0.9–1.1)	1.0 (0.9–1.1)
Postpartum hemorrhage	1.1 (0.8–1.3)	1.0 (0.9–1.1)	1.0 (0.9–1.1)	1.0 (0.9–1.0)	1.0	1.0 (0.9–1.1)	1.0 (1.0–1.1)
Puerperal endometritis	1.0 (0.8–1.2)	1.1 (0.9–1.2)	1.0 (1.0–1.1)	1.0 (0.9–1.1)	1.0	1.0 (0.9–1.1)	1.0 (0.9–1.1)
Gestational diabetes	1.0 (0.6–1.4)	1.0 (0.7–1.2)	1.0 (0.9–1.2)	1.0 (0.9–1.2)	1.0	1.0 (0.8–1.1)	1.1 (1.0–1.3)
Anemia	1.8 (1.4–2.2)	1.4 (1.2–1.6)	1.1 (1.0–1.2)	1.1 (0.9–1.2)	1.0	1.0 (0.9–1.1)	1.0 (0.9–1.1)

* Reference group.

Table 5 Adjusted odds ratio (95% confidence interval) for adverse perinatal outcomes according to post-abortion interpregnancy interval

Outcome	Post-abortion interpregnancy interval (months)						
	0–2	3–5	6–11	12–17	18–23*	24–59	≥60
Low birth weight	2.7 (2.3–3.2)	2.4 (2.2–2.7)	1.1 (1.0–1.2)	1.0 (1.0–1.1)	1.0	1.0 (0.9–1.1)	1.0 (1.0–1.1)
Very low birth weight	2.6 (1.9–3.2)	2.0 (1.8–2.3)	1.1 (1.0–1.3)	1.0 (0.9–1.2)	1.0	1.0 (0.9–1.1)	1.1 (0.9–1.2)
Preterm birth	2.6 (2.2–3.1)	2.2 (2.0–2.4)	1.1 (1.0–1.1)	1.0 (1.0–1.1)	1.0	1.0 (1.0–1.1)	1.0 (1.0–1.1)
Very preterm birth	2.6 (1.9–2.4)	2.2 (1.9–2.8)	1.2 (1.0–1.3)	1.1 (0.9–1.2)	1.0	1.0 (0.9–1.1)	1.1 (0.9–1.2)
Small for gestational age	1.0 (0.8–1.3)	1.1 (1.0–1.2)	1.1 (1.0–1.1)	1.0 (1.0–1.1)	1.0	1.0 (1.0–1.1)	1.0 (0.9–1.1)
Low Apgar scores at 5 min	1.1 (0.6–1.7)	1.1 (0.8–1.4)	1.1 (0.9–1.2)	1.0 (0.8–1.2)	1.0	1.1 (0.9–1.3)	1.1 (0.9–1.3)
Fetal death	1.2 (0.7–1.8)	1.0 (0.7–1.4)	1.0 (0.9–1.2)	1.0 (0.9–1.2)	1.0	1.0 (0.9–1.2)	1.1 (0.9–1.2)
Early neonatal death	1.0 (0.6–1.5)	1.1 (0.8–1.5)	1.1 (0.9–1.3)	1.1 (0.9–1.3)	1.0	1.0 (0.8–1.3)	1.1 (0.9–1.2)

* Reference group.

After controlling for major confounding factors, women with PAII less than 3 months compared with those conceiving at 18 to 23 months after a previous abortion had 80% increased risk of anemia (adjusted OR, 1.8; 95% CI, 1.4–2.2) and 70% increased risk of premature rupture of membranes (adjusted OR, 1.7; 95% CI, 1.4–2.2) (Table 4). Women with intervals of 3 to 5 months had 40% increased risk for these adverse outcomes. Infants conceived less than 3 months after an abortion were more than 2.5 times more likely than infants conceived 18 to 23 months after an abortion to be low birth weight (adjusted OR 2.7; 95% CI, 2.3–3.2), very low birth weight (adjusted OR 2.6; 95% CI, 1.9–3.2), premature (adjusted OR 2.6; 95% CI, 2.2–3.1), and very premature (adjusted OR, 2.6; 1.9–2.4) (Table 5). Moreover, infants conceived 3 to 5 months after an abortion had about two times increased risk for these adverse perinatal outcomes. We found no significant differences in the effect of interpregnancy interval following abortion on third trimester bleeding, postpartum hemorrhage, puerperal endometritis, preeclampsia, eclampsia, gestational diabetes mellitus, small for gestational age, low Apgar score at 5 min, fetal death, and neonatal death.

4. Discussion

Our results indicate that in Latin American, a PAII less than 6 months is independently associated

with increased risk of maternal anemia, premature rupture of membranes, low birth weight, very low birth weight, preterm delivery, and very preterm delivery. The large sample size that confers sufficient power to evaluate the relationship between post-abortion interpregnancy intervals and adverse pregnancy outcomes, the possibility to control for many confounding factors, and the relatively homogeneous population of women studied support the findings of our study.

There is controversy concerning the interval a woman should wait after an abortion before attempting a new pregnancy. It is common obstetric practice to recommend a waiting time of 3 months after a spontaneous abortion before another pregnancy is conceived. However, few studies support this advice. Wyss et al. [5] did not find significant differences in the proportion of premature deliveries between women who conceived within 90 days after a spontaneous abortion and those conceiving after 90 days. Basso et al. [9] using registries of 45,449 Danish women having a live birth preceded by a spontaneous abortion, reported that the risks of preterm delivery, low birth weight, and growth restriction increased as the PAII increased. Unfortunately, the authors provided only adjusted risk estimates for comparisons between the cohort of women preceded by a spontaneous abortion and a cohort of women preceded by a live birth. Zhou et al. [10] studied a cohort of 15,727 Danish women whose previous pregnancy terminated with a first trimester induced abortion and found an increased risk of

retained placenta in the subsequent pregnancy of women with just one abortion and PAIL less than 6 months. The authors suggested the surgical removal of fetal tissue may damage the endometrium and the uterine cavity which may increase the risk of placenta complications in subsequent pregnancies. However in our study on Latin American women, we did not find an association between the post abortion interpregnancy interval and third trimester bleeding (placenta previa or placental abruption) or postpartum hemorrhage.

A recent retrospective case series study [11] from the USA evaluated the neonatal outcomes of 64 singleton pregnancies conceived within 1 year after a spontaneous abortion. Of these, 19 conceived the subsequent pregnancy immediately after the spontaneous abortion, with none or only one menstrual period between the pregnancies (immediate conception group) and 45 conceived the subsequent pregnancy after at least two menstrual periods or had an interpregnancy interval of at least 100 days (delayed conception group). The two groups were similar in rates of preterm labor, preterm delivery, and spontaneous rupture of membranes. They also were similar with respect to the proportions of low birth weight, very low birth weight, Apgar scores at 5 min of <7, neonatal intensive care unit admissions, and neonatal death. Therefore, in this very small study, there was no association between short PAILs and adverse neonatal outcomes.

The reasons for the association between a short PAIL and adverse perinatal and maternal outcomes are unclear. Reproductive tract infections may be one of the mechanisms. To some degree, abortion, mainly that induced, could increase the risk of infection that has been associated with an increased incidence of preterm birth and premature rupture of membranes [12]. Other alternative explanations might be the maternal depletion of energy and protein resulting from a short PAIL that leads to a reduction in maternal nutritional status and anemia at conception and altered pregnancy outcomes [13,14].

Potential constraints to our study must be considered. As stated previously, our results could have been influenced by the fact that we were unable to distinguish between spontaneous and induced abortions. In addition, the CLAP database is from public hospitals spread across Latin American and the Caribbean, and is therefore not population-based. Moreover, the accuracy of specific diagnoses registered in this large database has not been extensively checked but it is unlikely that inaccuracies are more or less in short

intervals compared with other intervals groups. It should be emphasized that our study is based on a population coming from public hospitals in developing countries and its findings may not be generalized to other populations. Finally, despite our adjusting for several variables, there is still potential for confounding by other unknown factors.

The findings of the present investigation have important implication for clinical practice. Based on the results, we support the recommendation that women who have an abortion should wait for at least 5 months before becoming pregnant again in order to prevent adverse perinatal and maternal outcomes in the subsequent pregnancy. Our study offers a clear message about the importance of birth spacing by using the available methods of family planning after an abortion. This information further supports post-abortion care initiatives that integrate family planning services as a part of the program. Women need to receive counseling on the use of contraceptives and the potential health implications if there is a short PAIL. An additional important clinical practice implication is pregnancies following a short post-abortion interpregnancy interval need to be carefully monitored during antenatal care. These women should also be advised of the importance of having a medically trained attendant at the birth given the increased risk for prematurity and LBW.

References

- [1] Zhu BP, Rolfs RT, Nangle BE, Horan JM. Effect of the interval between pregnancies on perinatal outcomes. *N Engl J Med* 1999;340:589–94.
- [2] Conde-Agudelo A, Belizan JM. Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study. *BMJ* 2000;321:1255–9.
- [3] Rud B, Klunder K. The course of pregnancy following spontaneous abortion. *Acta Obstet Gynecol Scand* 1985; 64:277–8.
- [4] Vlaanderen W, Fabriek LM, van Tuyll van Serooskerken. Abortion risk and pregnancy interval. *Acta Obstet Gynecol Scand* 1988;67:139–40.
- [5] Wyss P, Biedermann K, Huch A. Relevance of the miscarriage—new pregnancy interval. *J Perinat Med* 1994; 235–41.
- [6] Wohlfahrt J, Nybo Andersen AM, Melbye M. Interval between pregnancies and risk of spontaneous abortion. *Epidemiology* 2000;11:92–3.
- [7] The Alan Guttmacher Institute. *Facts in Brief*. New York: The Alan Guttmacher Institute; 2001.
- [8] Williams RL, Creasy RK, Cunningham GC, Hawes WE, Norris FD, Tashiro M. Fetal growth and perinatal viability in California. *Obstet Gynecol* 1982;59:624–32.
- [9] Basso O, Olsen J, Christensen K. Risk of preterm delivery, low birthweight and growth retardation following sponta-

- neous abortion: a registry-based study in Denmark. *Int J Epidemiol* 1998;27:642–6.
- [10] Zhou W, Nielsen GL, Larsen H, Olsen J. Induced abortion and placenta complications in the subsequent pregnancy. *Acta Obstet Gynecol Scand* 2001;80:1115–20.
- [11] Pruyn Golstein RR, Croughan MS, Robertson PA. Neonatal outcomes in immediate versus delayed conceptions after spontaneous abortion: a retrospective case series. *Am J Obstet Gynecol* 2002;186:1230–6.
- [12] Goldenberg RL, Culhane JF. Infection as a cause of preterm birth. *Clin Perinatol* 2003;30:677–700.
- [13] Winkvist A, Rasmussen KM, Habicht JP. A new definition of maternal depletion syndrome. *Am J Public Health* 1992;82:691–4.
- [14] Smits LJ, Essed GGM. Short interpregnancy intervals and unfavourable pregnancy outcome: role of folate depletion. *Lancet* 2001;358:2074–7.