Effects of earthquake on perinatal outcomes: A Chilean register-based study

Yasna K Palmeiro-Silva,Pelusa Orellana,Pia Venegas,Aneta Dobierzewska,Lara Monteiro,Manuel Varas-Godoy,Errol Norwitz,Greg Rice,Eduardo Osorio,Sebastián E Illanes

Abstract

Background: Natural disasters increase the level population stress, including pregnant women, who can experience prenatal maternal stress, affecting to the fetus and trigger perinatal complications, such as low birth weight, smaller head circumference, etc. However, little is known about effects of earthquake on perinatal outcomes.

Objective: To evaluate the effect of earthquake occurred on February 27, 2010 and perinatal outcomes of Chilean pregnant women, and to examine these effects by timing of exposure during pregnancy and newborn gender.

Methods: A register-based study was performed using data collected from women who had a vaginal delivery in a large private health center in Santiago, Chile, during 2009 and 2010. The study population was categorized according to exposure to earthquake and timing during gestation. Primary perinatal outcomes were gestational age at birth, birth weight, length and head circumference. Analyses adjusted for gender, gestational age at exposure, parity, maternal age and income.

Results: A total of 1,966 eligible vaginal deliveries occurred during 2009 and 2,110 in 2010. Birth weight was not affected by the trimester of exposure; however, length, head circumference and gestational age at birth were significantly different according to trimester of exposure and gender of newborn. In multivariable analysis, newborns were shorter by 2 mm, 5 mm and 4.5 mm, if they were exposed during their first, second and third trimester, respectively. Furthermore, newborns had a smaller head circumference by 1.2 mm and 1.5 mm if they were exposed during first and second trimester of gestation.

Conclusion: In this cohort, exposure to the February 2010 earthquake resulted in earlier delivery and reduced length and head circumference in the offspring. This association varied according to trimester of exposure and fetal gender. Health workers should include exposed to high levels of stress associated with natural disasters when assessing pregnancy risk factors.

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Protocol

Step 1.

A register-based study was performed using demographic and routinely collected data on all

pregnancies delivered at a single large private health center in Santiago (Metropolitan Region), Chile.

Step 2.
Ethical approval from the Institutional Review Board at Clínica Dávila in Santiago.

Step 3.
The study was conducted using retrospective and de-identified data, thus, no patient consent was required.

Step 4.
All demographic and clinical information were abstracted and recorded by professional workers (medical doctors, midwives, and nurses).

Step 5.
The data abstracted included: date of delivery, gestational age at delivery (in weeks), maternal age (in years), parity of mother, location of residence, gender of newborns, birth weight (in grams), length (in centimeters), head circumference (in centimeters), Apgar at 5 minutes, and small for gestational age (SGA) (defined as newborn birth weight <10th percentile for gestational age).

Step 6.
The database contained a total of 7,031 and 7,471 deliveries in 2009 and 2010, respectively.

Step 7.
Subjects were excluded if they delivered outside of the study period (February 27 to December 11) in order to evaluate similar time-periods during pregnancy.

Step 8.
Early preterm deliveries, C-sections, multiple pregnancies and stillbirths also were excluded to avoid bias related to other complications that could trigger the process of delivery.

Step 9.
Women who delivered between February 27 and December 11, 2009 were classified as “non-exposed”; women who delivered during the same period in 2010 were classified as “exposed”.

Step 10.
Women who delivered between September 6 and December 11 were categorized as being exposed (or non-exposed) during their first trimester, from May 31 to September 5 were regarded as being exposed (or not) during their second trimester, and between February 27 and May 30 were exposed (or not) during their third trimester.

Step 11.
Perinatal outcomes measured included: birth weight, length, ponderal index (weight/height3), head circumference, Apgar at 5 minutes, proportion of SGA newborns, preterm delivery (birth between 34-37 weeks). Gender of newborns, location of residence, gestational age, parity and maternal age were considered as effect modifiers; location of residence was related to three categories of average annual income: low income (500,000 to 1 million Chilean pesos), middle income (1 to 1.5 million Chilean pesos) and high income (more than 1.5 million Chilean pesos).

Step 12.
Normal distribution of continuous variables was assessed by Shapiro-Wilk tests.

Step 13.
Quantitative non-normally-distributed variables are presented as median and 25th - 75th percentile.

Step 14.
Normally-distributed variables are presented as the mean and standard deviation (SD) and qualitative variables are presented as percentages.

Step 15.

Normally-distributed data were analyzed using two-tailed Student’s t tests, and Wilcoxon-Mann-Whitney tests were used for non-normally distributed data for two groups comparisons, meanwhile, ANOVA and Kruskal-Wallis tests were used for comparisons between the three groups, as appropriate.

Step 16.
Chi2 tests was used to analyze proportions between the two groups.

Step 17.
A generalized linear model was used to perform multivariable analysis.

Step 18.
All statistical analyses were performed using STATA/IC 13 for Mac (StataCorp LP, Collegue Station, TX, USA) and significance assigned on the basis of 95% confidence intervals and $p<0.05$.

Step 19.