

# IMPACT OF AMBIENT AIR POLLUTION EXPOSURE TIMING DURING ASSISTED REPRODUCTIVE TECHNOLOGY CYCLES ON PREGNANCY OUTCOMES

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## **Background:**

Ambient air pollution has been associated with poor pregnancy outcomes in unassisted and assisted pregnancies [1]. However, it is unclear how timing of ambient air pollution exposure during an Assisted Reproductive Technology (ART) cycle influences the risk of poor pregnancy outcomes.

## **Objective:**

The aim of this pilot study was to explore how ambient air pollution exposure during each stage of an ART cycle influences pregnancy outcomes.

## **Materials and Methods:**

This retrospective cohort study analyzed fresh autologous ART cycles at a single academic center from 2000-2016. Fine particulate matter 2.5 (PM<sub>2.5</sub>) exposure was estimated using high spatiotemporal resolution ensemble models which predict daily concentration at 1km x 1km resolution [2]. Exposure was analyzed in 4 time periods: 1) 4 weeks before starting stimulation, 2) stimulation until oocyte retrieval, 3) retrieval until embryo transfer (ET), and 4) ET until first serum human chorionic gonadotropin (hCG) test (approximately 12 days after ET). Average and maximum PM<sub>2.5</sub> values were calculated for each period and then treated continuously.

The primary outcome was live birth (LB). Secondary outcomes were conception (based on hCG level), clinical pregnancy (CP), and spontaneous abortion (SAB). A generalized estimating equation model with logit link and robust standard errors was used to test the effect of PM<sub>2.5</sub> on outcomes while adjusting for covariates and controlling for repeated measures from multiple cycles from a single patient. Covariates were female age (reference: 20-30 years), body mass index, smoking status, and embryo quality (reference: good).

## **Results:**

The cohort had 1,340 transfer cycles from 1,170 patients. There were conceptions in 827 cycles (61.7%), 760 (56.7%) CPs, 84 (11.1%) SABs, and 666 (49.7%) LBs. Ten of the CPs ended in stillbirths. For each 10µg/m<sup>3</sup> increase in maximum PM<sub>2.5</sub> in time period 3, there was 20% decreased odds of conceiving (aOR 0.80; 95% CI 0.67-0.97, p=0.02) and 52% increased odds of SAB (aOR 1.52, 95% CI 1.09-2.12, p=0.02). Each 10µg/m<sup>3</sup> increase in the average PM<sub>2.5</sub> in time period 3 had 98% increased odds of SAB (aOR 1.98, 95% CI 1.14-3.44, p=0.02). For each 10µg/m<sup>3</sup> increase in maximum PM<sub>2.5</sub> in time period 4 there was 40% increased odds of SAB (aOR 1.40, 95% CI 1.04-1.87, p=0.03).

**Conclusions:**

Exposure to ambient fine particulate air pollution between retrieval and the fourth week of gestation is associated with decreased chance of pregnancy and increased risk of SAB. ART providers should counsel patients of these findings and recommend that patients take precautions to decrease exposure during these time periods.

**Support:**

Hotaling:

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Consultant: Turtle Health, Maximus, Carrot

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**References:**

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2. Di Q, Amini H, Shi L, et al. An ensemble-based model of PM2.5 concentration across the contiguous United States with high spatiotemporal resolution. *Environ Int*. 2019;130:104909.