

Effect of aspirin on maternal hemodynamics in Chinese women at high-risk for pre-eclampsia: longitudinal study

Xueqin Wang, Jing Lin, Yunyu Chen, Seng Lok Wong, JiaoLiu, Fangzi Liu, So Ling Lau, Qinjian Zhang, Xia Xu, Ming Him Ng, Janice Sheung Ying WONG, DaljitS. Sahota, Alex P.W. Lee, Liona C. Poon

The Chinese University of Hong Kong, Hong Kong

Objective

To compare maternal hemodynamics of Chinese women at low and high risk for preterm pre-eclampsia (PE), and assess the differences in hemodynamic parameters between high-risk women with or without prophylactic aspirin.

Methods

This was a prospective longitudinal case–control study of 857 Chinese women with a singleton pregnancy who participated in the first-trimester screen-and-prevent program for PE at the Prince of Wales Hospital, Hong Kong SAR, China, between February 2020 and March 2023. The risk of developing preterm PE (delivery before 37 weeks) was determined using the Fetal Medicine Foundation combined test (maternal factors with mean arterial pressure, uterine artery pulsatility index and placental growth factor). The study population comprised three groups of women: (1) high-risk (adjusted risk $\geq 1:100$) for preterm PE who received 100 mg or 160 mg of aspirin according to maternal weight (<40 kg or ≥ 40 kg, respectively), starting before 16 weeks until 36 weeks’ gestation or until delivery or until PE was diagnosed; (2) high-risk (adjusted risk $\geq 1:100$) for preterm PE who did not receive aspirin; and (3) low-risk (adjusted risk < 1:100) for preterm PE women who were matched 1:1 to high-risk women, according to maternal age, weight, and date of the scan. Mean arterial pressure (MAP) was measured

using a device validated for pregnancy, and heart rate (HR), stroke volume (SV), cardiac output (CO) and systemic vascular resistance (SVR) were evaluated using two-dimensional transthoracic echocardiography at 12 to 15⁺⁶ weeks, 20 to 24⁺⁶ weeks and 30+0 to 37+6 weeks of gestation. Log10 transformation was applied to fit the data to a Gaussian distribution. A linear mixed-effects analysis was performed to compare the longitudinal changes of maternal hemodynamics across gestation between the three study groups.

Results

This study comprised 389 women at low-risk of preterm PE, 379 women at high-risk of preterm PE that received aspirin and 89 women at high-risk that did not receive aspirin. There was no significant difference in the estimated marginal mean (EMmean) of log₁₀ HR across gestation among the three study groups (all P > 0.05). Compared to the low-risk group, both high-risk groups (with and without aspirin) exhibited consistently higher EMmean of log₁₀ MAP and log₁₀ SVR, and lower EMmean of log₁₀ CO and log₁₀ SV throughout gestation (all p < 0.001). Although maternal hemodynamic trajectories differed across the EMmean of log₁₀ SV, CO, MAP and SVR between high-risk women with aspirin and those without, there were no significant differences in these parameters between the two high-risk groups (all P > 0.05).

Conclusion

This study highlights the significant differences in maternal hemodynamic adaptation during pregnancy between high-risk and low-risk Chinese women for preterm PE. Compared to low-risk women, high-risk women exhibited increased mean arterial pressure and systemic vascular resistance, along with reduced stroke volume and cardiac output as early as the first trimester, and these alterations persisted throughout gestation. Notably, aspirin prophylaxis showed limited effect on improving maternal hemodynamics in women at high risk for preterm PE, highlighting the need for alternative strategies to address the hemodynamic maladaptation in high-risk women.

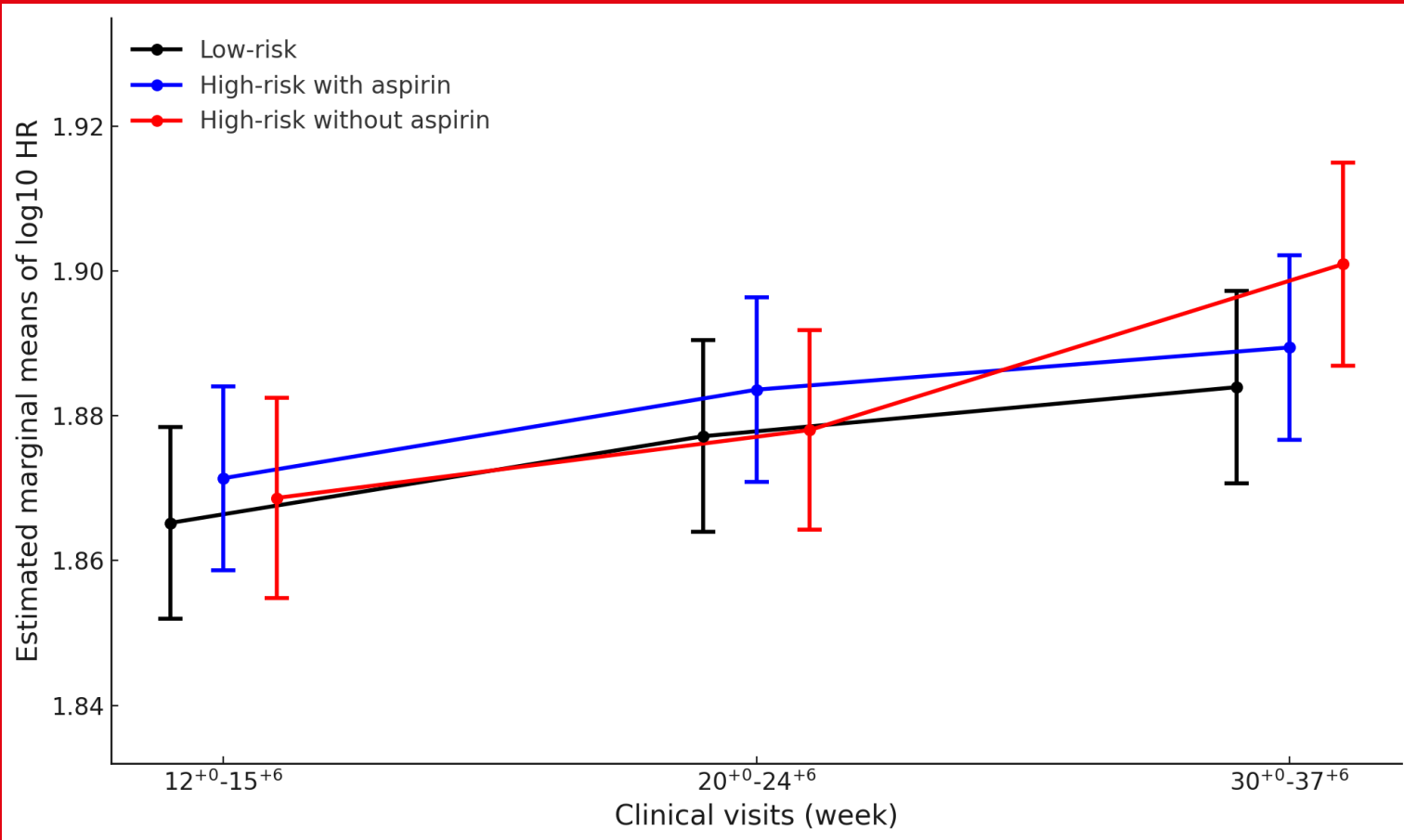


Figure 1. Temporal changes of estimated marginal mean of log₁₀ heart rate across gestation.

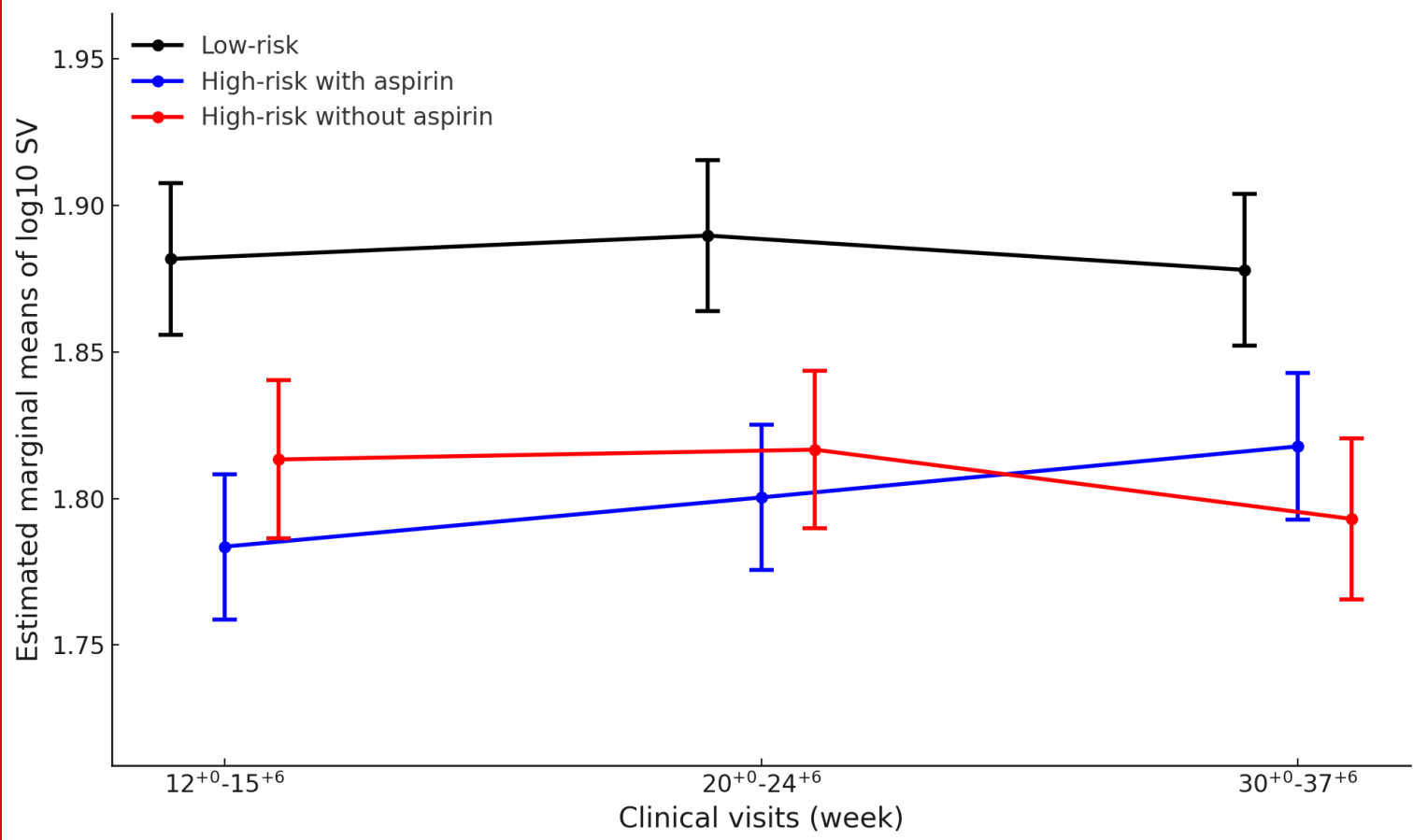


Figure 2. Temporal changes of estimated marginal mean of log₁₀ stroke volume across gestation.

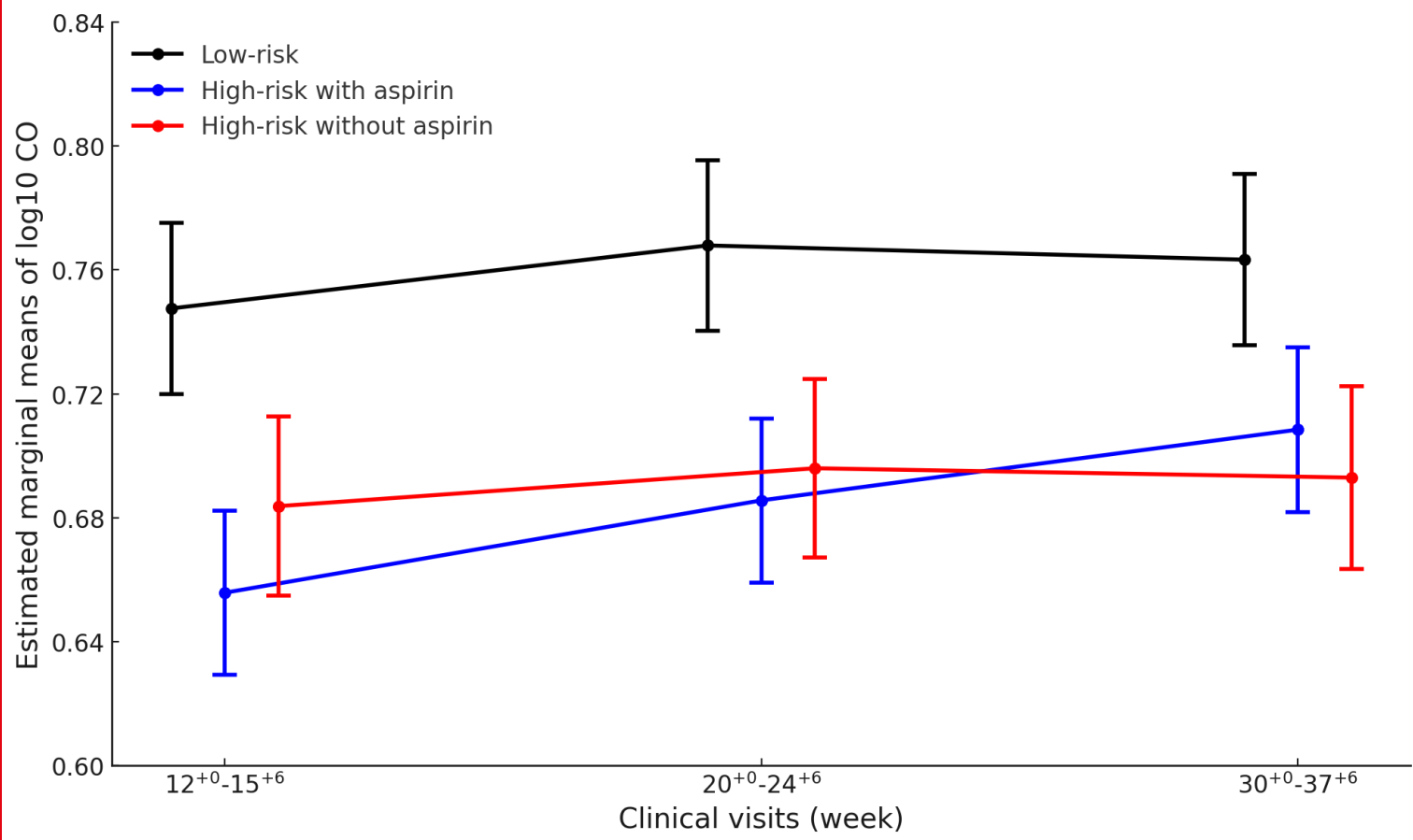


Figure 3. Temporal changes of estimated marginal mean of log₁₀ cardiac output across gestation.

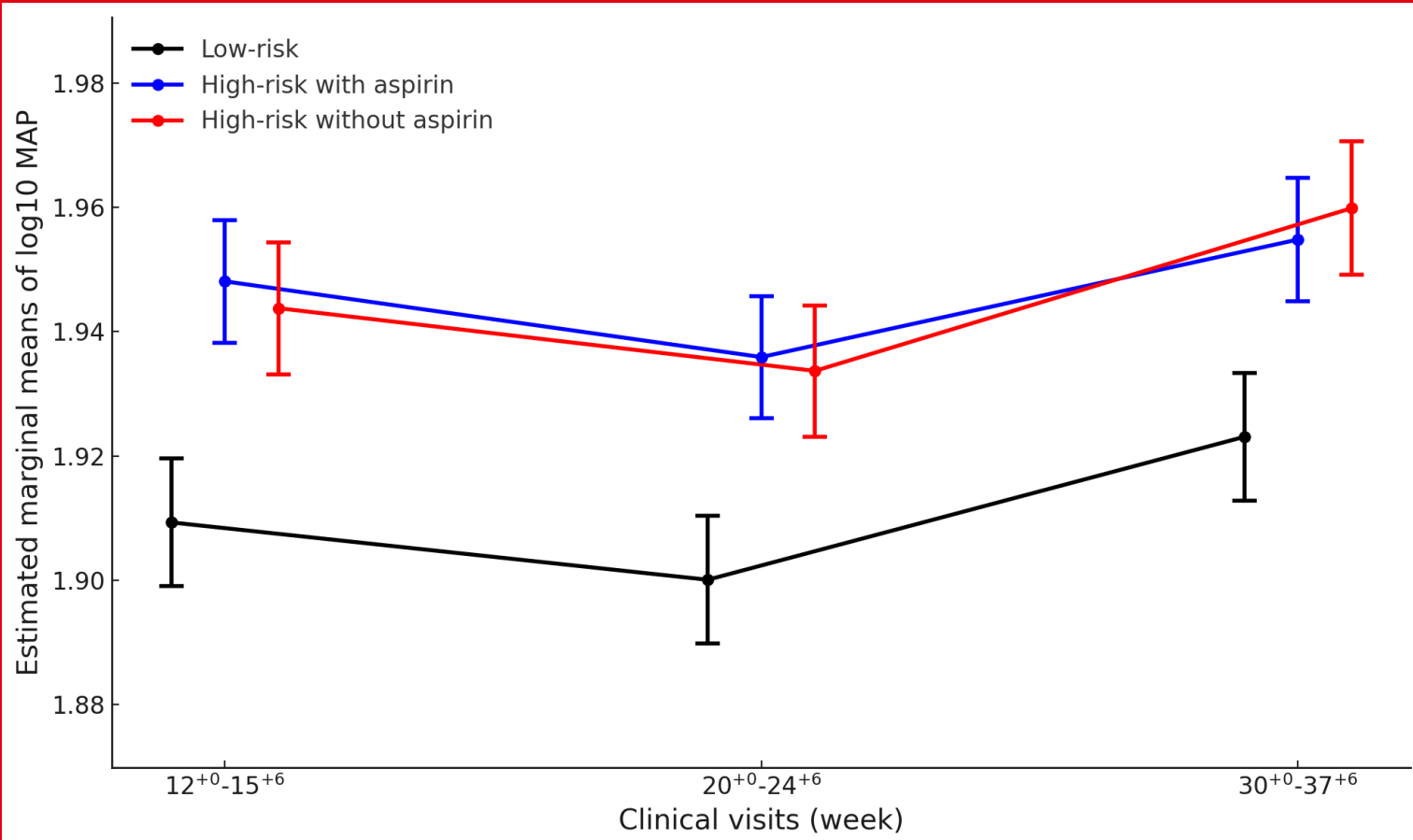


Figure 4. Temporal changes of estimated marginal mean of log₁₀ mean arterial pressure across gestation.

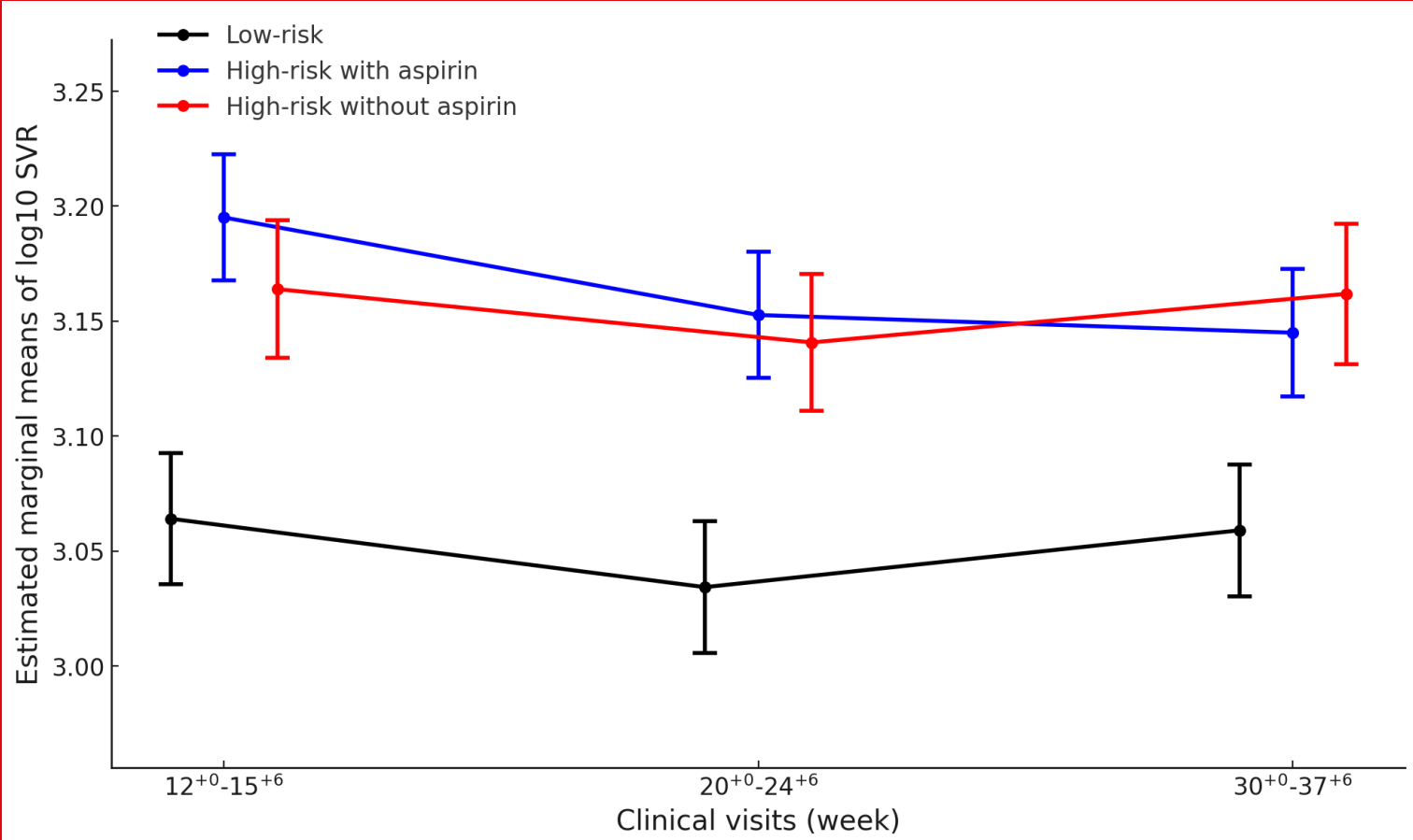


Figure 5. Temporal changes of estimated marginal mean of log₁₀ systemic vascular resistance across gestation.