**Supplementary Material**

**Maternal Birth Weight is an Indicator of Preterm Birth from the Japan Environment and Children’s Study**

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**Differences in characteristics between study participants who were analyzed and participants who were excluded**

  Supplementary Table S1 shows differences in several characteristics between study participants who were analyzed and those who were excluded due to missing data or improbable data on MBW, missing data on the nationalities of participants, and missing data on weeks of delivery. Several variables, including maternal age at the MT1 questionnaire, height, pre-pregnancy body weight, pre-pregnancy BMI, history of hypertension, history of kidney disease, history of mental disorders, history of hyperthyroidism, history of hypothyroidism, history of SLE and/or APS, history of PCOS, history of adenomyosis, history of endometriosis, history of uterine anomaly, history of PTD, parity, conception method, HDP, GDM, type 1 diabetes, type 2 diabetes, placental abruption, gestational weeks at delivery, infant sex, infant birth weight, placental weight, deep venous thrombosis, amniotic fluid embolism, placenta previa, chorioamnionitis, smoking history, secondhand smoking status, alcohol drinking status, marital status, maternal highest level of education, annual household income, and regions where Regional Centres exist, were significantly different between the two groups.

**Association between MBW and PTD (delivery from 22 to <37 weeks of gestation) when multiple participation data were not excluded**

As a sensitivity analysis, a binomial logistic regression analysis using a generalized estimating equation (GEE) without excluding multiple participation data was conducted to examine the association between maternal birth weight (MBW) and preterm delivery (PTB) at less than 37 weeks of gestation. In the analysis, a compound symmetry working correlation matrix was used to take into account the correlations between the same pregnant women. Thereafter, the 95% confidence interval of the odds ratio was estimated using the Huber-White sandwich estimator. As shown in Supplementary Table S2, the results of the GEE logistic regression model were similar to the main results.

**Appendix**

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**Supplementary Table S1.** Differences in characteristics between participants who are analyzed and those excluded.

| **Variables** | **Participants who were analyzed in this study(N=78,693)1** | **Women who were excluded due to missing data(N=10,587)1** | ***P*-value2** |
| --- | --- | --- | --- |
| **Maternal age at MT1 questionnaire** | 30.9 ± 5.0 | 29.8 ± 5.6 | <0.001 |
| **Height, cm** | 158.2 ± 5.3 | 157.6 ± 5.4 | <0.001 |
| **Pre-pregnancy body weight, kg** | 53.0 ± 8.7 | 53.7 ± 9.9 | <0.001 |
| **Pre-pregnancy BMI, kg/m2** | 21.2 ± 3.2 | 21.6 ± 3.7 | <0.001 |
| **History of hypertension, N (%)** | 355 (0.5) | 61 (0.7) | 0.003 |
| **History of kidney disease, N (%)** | 346 (0.4) | 31 (0.3) | 0.2 |
| **History of mental disorders, N (%)** | 6,019 (7.7) | 811 (9.0) | <0.001 |
| **History of hyperthyroidism, N (%)** | 826 (1.1) | 96 (1.1) | 0.9 |
| **History of hypothyroidism, N (%)** | 762 (1.0) | 79 (0.9) | 0.5 |
| **History of SLE and/or APS, N (%)** | 196 (0.2) | 13 (0.1) | 0.05 |
| **History of PCOS, N (%)** | 1,806 (2.3) | 137 (1.5) | <0.001 |
| **History of adenomyosis, N (%)** | 266 (0.3) | 22 (0.2) | 0.2 |
| **History of endometriosis, N (%)** | 2,929 (3.7) | 284 (3.2) | 0.01 |
| **History of uterine anomaly, N (%)** | 225 (0.3) | 24 (0.3) | 0.9 |
| **History of preterm delivery, N (%)** | 2,416 (3.1) | 364 (3.9) | <0.001 |
| **Parity, N (%)** |  |  | <0.001 |
|  Primipara | 43,451 (55.2) | 5,961 (63.7) |  |
|  Multipara | 33,400 (42.4) | 3,221 (34.4) |  |
|  Missing | 1,842 (2.3) | 175 (1.9) |  |
| **Conception method, N (%)** |  |  | <0.001 |
|  Spontaneous pregnancy | 72,999 (92.8) | 8,943 (95.6) |  |
|  Non-ART | 2,969 (3.8) | 213 (2.3) |  |
|  ART | 2,470 (3.1) | 170 (1.8) |  |
|  Missing | 255 (0.3) | 31 (0.3) |  |
| **HDP, N (%)** | 2,350 (3.0) | 312 (3.3) | 0.07 |
| **GDM, N (%)** | 2,148 (2.7) | 276 (2.9) | 0.2 |
| **Type 1 diabetes** | 61 (0.1) | 7 (0.1) | 1.0 |
| **Type 2 diabetes** | 98 (0.1) | 15 (0.2) | 0.3 |
| **Placental abruption, N (%)** | 319 (0.4) | 32 (0.3) | 0.4 |
| **Gestational weeks at delivery, weeks** | 39.3 ± 1.5 | 39.1 ± 1.8 | <0.001 |
| **Infant sex, N (%)** |  |  | <0.001 |
|  Male | 40,271 (51.2) | 4,814 (51.5) |  |
|  Female | 38,422 (48.8) | 4,537 (48.5) |  |
|  Missing | 0 (0.0) | 2 (0.0) |  |
| **Infant birth weight, g** | 3,026 ± 413 | 2,994 ± 455 | <0.001 |
| **Placental weight, g** | 558.8 ± 111 | 562.8 ± 133 | 0.01 |
| **DVT, N (%)** | 24 (0.0) | 5 (0.1) | 0.4 |
| **Amniotic fluid embolism, N (%)** | 3 (0.0) | 0 (0.0) | 1.0 |
| **Placenta previa, N (%)** | 497 (0.6) | 42 (0.4) | 0.04 |
| **Chorioamnionitis, N (%)** | 473 (0.6) | 52 (0.6) | 0.6 |
| **Smoking history N (%)** |  |  | <0.001 |
|  Never | 46,560 (59.2) | 4,134 (44.2) |  |
|  Previously did, but quit before realizing current pregnancy | 18,071 (23.0) | 2,036 (21.8) |  |
|  Previously did, but quit after realizing current pregnancy | 9,947 (12.6) | 1,641 (17.5) |  |
|  Continue Smoking | 3,153 (4.0) | 918 (9.8) |  |
|  Missing | 962 (1.2) | 628 (6.7) |  |
| **Secondhand smoking status, N (%)** |  |  | <0.001 |
|  Almost never/ Never | 39,467 (50.2) | 3,423 (36.6) |  |
|  1-7 days a week | 38,442 (48.9) | 5,360 (57.3) |  |
|  Missing | 784 (1.0) | 574 (6.1) |  |
| **Alcohol drinking status, N (%)** |  |  | <0.001 |
|  Never | 26,947 (34.2) | 2,976 (31.8) |  |
|  Quit drinking before  | 43,036 (54.7) | 4,986 (53.3) |  |
|  Continue drinking | 7,934 (10.1) | 824 (8.8) |  |
|  Missing | 776 (1.0) | 571 (6.1) |  |
| **Marital status, N (%)** |  |  | <0.001 |
|  Married | 74,761 (95.0) | 8,049 (86.0) |  |
|  Unmarried | 2,622 (3.3) | 522 (5.6) |  |
|  Divorced or widowed | 568 (0.7) | 190 (2.0) |  |
|  Missing | 742 (0.9) | 596 (6.4) |  |
| **Highest level of education, N (%)** |  |  | <0.001 |
|  Junior high school | 3,072 (3.9) | 975 (10.4) |  |
|  High school | 23,436 (29.8) | 3,475 (37.1) |  |
|  Technical junior college | 1,279 (1.6) | 141 (1.5) |  |
|  Technical/vocational college | 18,014 (22.9) | 1,695 (18.1) |  |
|  Associate degree | 14,173 (18.0) | 1,119 (12.0) |  |
|  Bachelor's degree | 16,585 (21.1) | 1,099 (11.7) |  |
|  Graduate degree (Master's/Doctor’s) | 1,202 (1.5) | 77 (0.8) |  |
|  Missing | 932 (1.2) | 776 (8.3) |  |
| **Annual household income (million, Japanese yen), N (%)** |  |  | <0.001 |
|  <2 | 3,724 (4.7) | 794 (8.5) |  |
|  2-3.99 | 24,711 (31.4) | 2,990 (32.0) |  |
|  4-5.99 | 24,495 (31.1) | 2,220 (23.7) |  |
|  6-7.99 | 12,108 (15.4) | 858 (9.2) |  |
|  8-9.99 | 5,008 (6.4) | 373 (4.0) |  |
|  10-11.99 | 1,845 (2.3) | 123 (1.3) |  |
|  12-14.99 | 720 (0.9) | 57 (0.6) |  |
|  15-19.99 | 410 (0.5) | 34 (0.4) |  |
|  ≥20 | 236 (0.3) | 25 (0.3) |  |
|  Missing | 5,436 (6.9) | 1,883 (20.1) |  |
| **Regions where Regional Centres exist, N (%)** |  |  | <0.001 |
|  Hokkaido | 5,889 (7.5) | 581 (6.2) |  |
|  Tohoku | 17,370 (22.1) | 2,148 (23.0) |  |
|  Kanto | 9,470 (12.0) | 1,095 (11.7) |  |
|  Chubu | 14,302 (18.2) | 1,518 (16.2) |  |
|  Kinki | 13,568 (17.2) | 1,607 (17.2) |  |
|  Chugoku | 2,395 (3.0) | 297 (3.2) |  |
|  Shikoku | 5,282 (6.7) | 841 (9.0) |  |
|  Kyusyu-Okinawa | 10,417 (13.2) | 1,270 (13.6) |  |
|  |

1Continuous variables and categorical variables were expressed as mean ± standard deviation and number (%), respectively. 2Two-sample Student’s t-test; Pearson's Chi-squared test.

Abbreviations: APS, antiphospholipid antibody syndrome; ART, assisted reproductive technology; BMI, body mass index; DVT, deep venous thrombosis; GDM, gestational diabetes mellitus; HDP, hypertensive disorders of pregnancy; PCOS, polycystic ovary syndrome; PTD, preterm delivery; SLE,systemic lupus erythematosus.

**Supplementary Table S2. Association between maternal birth weight and preterm delivery at less than 37 weeks of gestation using GEE logistic regression model without excluding multiple participation data.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Outcome** | **Maternal birth weight** | ***P-*value*for trend*** | **Continuous variable, per 500 g of maternal birth weight decrease** |
| **<2,500 g** | **2,500-2,999 g** | **3,000-3,499 g** | **3,500-3,999 g** | **≥4,000 g** |
| **(N=4,135)** | **(N=24,661)** | **(N=40,728)** | **(N=12,231)** | **(N=1,880)** |
| **PTD****(Delivery from 22 to <37 weeks of gestation)** |  |  |  |  |  |  |  |
| **Cases/N (%)** | 263 (6.4) | 1,262 (5.1) | 1,708 (4.2) | 469 (3.8) | 76 (4.0) | NA | NA |
| **Model 1, Crude OR (95% Cl)** | 1.548(1.351-1.772) | 1.231(1.142-1.326) | Reference | 0.908(0.818-1.008) | 0.962(0.760-1.219) | <0.0001 | 1.191(1.144-1.240) |
| **Model 2, Adjusted OR (95% Cl)** | 1.569(1.369-1.797) | 1.244(1.154-1.341) | Reference | 0.898(0.809-0.997) | 0.942(0.744-1.193) | <0.0001 | 1.199(1.152-1.248) |
| **Model 3, Adjusted OR (95% Cl)** | 1.464(1.275-1.680) | 1.207(1.118-1.302) | Reference | 0.909(0.818-1.011) | 0.926(0.731-1.173) | <0.0001 | 1.171(1.124-1.221) |
| **Model 4, Adjusted OR (95% Cl)** | 1.402(1.219-1.613) | 1.184(1.097-1.279) | Reference | 0.921(0.828-1.024) | 0.949(0.749-1.201) | <0.0001 | 1.150(1.104-1.199) |

Model 1: Crude model. Model 2: Adjusting for regions where the Regional Centres exist and maternal age. Model 3: Adjusting for maternal height, pre-pregnancy BMI, conception method, parity, history of mental illness, history of kidney disease, history of hyperthyroidism, history of hypothyroidism, history of SLE and/or APS, history of gynecologic disease (PCOS, endometriosis, adenomyosis, uterine malformation), smoking history, secondhand smoking history, alcohol consumption socioeconomic factors, including marital status, education level, and annual income in addition to model 2. Model 4: Adjusting for both HDP and GMD (i.e., GDM, type 1 diabetes, and type 2 diabetes) in addition to model 3.

Categorical variables: regions where the Regional Centres exist, maternal age, pre-pregnancy BMI, conception method, parity, history of mental illness, history of kidney disease, history of hyperthyroidism, history of hypothyroidism, history of SLE and/or APS, history of gynecologic disease (PCOS, endometriosis, adenomyosis, uterine malformation), smoking history, secondhand smoking history, alcohol consumption, marital status, education level, annual income, HDP, GDM, type 1 diabetes, and type 2 diabetes

Continuous variables: maternal age, and height

Abbreviations: APS, antiphospholipid antibody syndrome; BMI, body mass index; CI, confidence interval; GDM, gestational diabetes mellitus; GEE, generalized estimating equation; GMD, glucose metabolism disorders; HDP, hypertensive disorders of pregnancy; OR, odds ratio; PCOS, polycystic ovary syndrome; PTD, preterm delivery; SLE, systemic lupus erythematosus; NA, not applicable.