Table S1 Characteristics of participants in this study (n=458), those who completed SDQ (n=2033) and whole cohort population (n=18935, live-birth only).

|  |  |
| --- | --- |
| **Characteristics** | **n （%）or mean ± S.D.** |
|  |  | This study (n=458) | Who completed SDQ (n=2033) | Whole cohort population (n=18935) |
| **Maternal age（years）** |  | 30.7 ± 4.6 | 31.4 ± 4.6 | 30.4 ± 4.8 |
| **Maternal education** | **Middle school** | 13 (2.8) | 71 (3.5) | 979 (5.2) |
|  | **High School** | 167 (36.5) | 733 (36.1) | 7862 (41.5) |
|  | **Community college, vocational school**  | 203 (44.4) | 876 (43.1) | 7281 (38.5) |
|  | **College or above**  | 69 (15.1) | 304 (15.0) | 1958 (10.3) |
| **Maternal BMI（kg/m2）** |  | 21.0 ± 3.0 | 21.1 ± 3.3 | 21.2 ± 3.4  |
| **Parity** | **≧ 1** | 222 (48.6) | 1067 (52.8) | 9831 (51.9) |
| **Maternal cotinine levels (ng/ml)** | **≦ 0.21 (non-smokers)** | 248 (54.3) | 933 (45.9) | 6253 (33.0) |
| **0.22-11.48 (passive smokers)** | 174 (38.1) | 646 (31.8) | 7122 (37.6) |
| **> 11.48 (active smokers)** | 36 (7.9) | 162 (8.0) | 2372 (12.5) |
| **Family income** **(million yen/year)** | **< 3** | 86 (18.8) | 354 (17.4) | 3547 (18.7) |
| **3-5** | 172 (37.6) | 756 (37.2) | 6906 (36.5) |
| **5-8** | 103 (22.5) | 516 (25.4) | 3918 (20.7) |
| **≧ 8** | 35 (7.7) | 143 (7.0) | 1154 (6.1) |
| **Paternal age（years）** |  | 32.5 ± 5.5 | 33.0 ± 5.5 | 32.2 ± 5.7  |
| **Paternal education** | **Middle school** | 16 (3.5) | 97 (4.8) | 1394 (7.4) |
|  | **High School** | 166 (36.3) | 759 (37.3) | 7477 (39.5) |
|  | **Community college, vocational school**  | 135 (29.5) | 487 (24.0) | 4179 (22.1) |
|  | **College or above**  | 142 (31.1) | 630 (31.0) | 4769 (25.1) |
| **Infant sex** | **Boy** | 250 (54.6) | 1007 (49.6) | 9552 (50.5) |
| **Gestational age (days)** |  | 275 ± 8 | 274 ± 11 | 274 ± 11 |
| **Birth weight　（g）** |  | 3055 ± 361 | 3005 ± 419 | 3019 ± 432 |

Table S2 Comparison of characteristics of participants in this study and who completed SDQ stratified by SDQ total difficulties categories.

|  |  |
| --- | --- |
| **Characteristics** | **n （%）or mean ± S.D.** |
|  | **Normal** | **Borderline/clinical** |
|  |  | **this study (n=245)** | **who completed SDQ (n=1622)** | **this study (n=213)** | **who completed SDQ (n=411)** |
| **Maternal age（years）** |  | 31.5 ± 4.3 | 31.6 ± 4.5 | 29.8 ± 4.8 | 30.6 ± 4.9 |
| **Maternal education** | **≦ 12** | 88 (35.9) | 604 (37.2) | 92 (43.2) | 200 (48.7) |
|  | **≧ 13** | 154 (62.8) | 979 (60.4) | 118 (55.4) | 201 (48.9) |
| **Maternal BMI（kg/m2）** |  | 21.0 ± 3.0 | 21.0 ± 3.2 | 21.2 ± 3.4  | 21.6 ± 3.7 |
| **Parity** | **≧ 1** | 132 (53.9) | 877 (54.1) | 90 (42.3) | 190 (46.2) |
| **Maternal cotinine levels (ng/ml)** | **≦ 0.21 (non-smokers)** | 151 (61.6) | 776 (47.8) | 97 (45.5) | 157 (38.2) |
| **0.22-11.48 (passive smokers)** | 81 (33.1) | 510 (31.4) | 93 (43.7) | 136 (33.1) |
| **> 11.48 (active smokers)** | 13 (5.3) | 119 (7.3) | 23 (10.8) | 43 (10.5) |
| **Family income** **(million yen/year)** | **< 5M** | 125 (51.0) | 857 (52.9) | 133 (62.4) | 253 (61.6) |
| **≧ 5M** | 90 (36.7) | 558 (34.4) | 48 (22.5) | 101 (24.6) |
| **Paternal age（years）** |  | 32.5 ± 5.5 | 33.3 ± 5.4 | 32.2 ± 5.7  | 32.0 ± 5.5 |
| **Paternal education** | **≦ 12** | 89 (36.3) | 670 (41.3) | 86 (40.4) | 186 (45.3) |
|  | **≧ 13** | 154 (62.9) | 907 (55.9) | 123 (57.7) | 20 (51.1) |
| **Infant sex** | **Boy** | 122 (49.8) | 758 (46.7) | 128 (60.1) | 248 (60.3) |
| **Gestational age (days)** |  | 275 ± 8 | 274 ± 11 | 275 ± 9 | 273 ± 13 |
| **Birth weight　（g）** |  | 3037 ± 339 | 3006 ± 409 | 3076 ± 383 | 3002 ± 429 |

Table S3 SDQ score distribution stratified by child sex.

|  |  |  |
| --- | --- | --- |
|  | Boys (n=250) | Girls (n=208) |
|  | Normal | Borderline/clinical | Normal | Borderline/clinical |
| **Total difficulties** | 122 (48.8) | 128 (51.2) | 123 (59.1) | 85 (40.9) |
| **Conduct problems** | 167 (66.8) | 83 (33.2) | 149 (71.6) | 59 (28.4) |
| **Hyperactivity/inattention** | 165 (66.0) | 85 (34.0) | 167 (80.3) | 41 (19.7) |
| **Emotional symptoms** | 173 (69.2) | 77 (30.8) | 169 (81.3) | 39 (18.7) |
| **Peer problems** | 210 (84.0) | 40 (16.0) | 184 (88.5) | 24 (11.5) |
| **Prosocial behavior** | 177 (70.8) | 73 (29.2) | 169 (81.2) | 39 (18.8) |

n (%).

Table S4 Adjusted odds ratios for ten folds increase of maternal BPA and phthalate metabolite levels on having behavioral problems (total difficulties) among 3 groups (normal, borderline, and clinical).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Group (number) | BPA | MnBP | MiBP | MEHP | MECPP | ∑DBPm | ∑DEHPm |
|  | OR (95% CI) |
| Normal (245) | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Borderline (125) | 1.30 (0.93, 1.81) | 0.42 (0.17, 1.06) | 0.31 (0.11, 0.87)+ | 0.80 (0.52, 1.23) | 0.80 (0.37, 1.73) | 0.39 (0.15, 1.01) | 0.79 (0.49, 1.25) |
| Clinical (88) | 1.22 (0.79, 1.87) | 0.84 (0.27, 2.66) | 0.68 (0.19, 2.43) | 1.13 (0.70, 1.84) | 2.04 (0.78, 5.30) | 0.79 (0.24, 2.61) | 1.18 (0.70, 2.01) |

Adjusted for parental ages, maternal cotinine levels, family income during pregnancy, child sex, birth order (first child or not), and child age at SDQ complete.

+p < 0.05

Table S5 Adjusted odds ratios for ten folds increase of maternal BPA and phthalate metabolite levels on having behavioral problems using 80% cutoff scores.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Number of children in borderline/clinical (%) | BPA | MnBP | MiBP | MEHP | MECPP | ∑DBPm | ∑DEHPm |
|  |  | OR (95% CI) |
| **Total difficulties (≧13)** | 88 (19.2) | 1.06(0.72, 1.57) | 1.15(0.38, 3.47) | 1.06(0.31, 3.62) | 1.20(0.76, 1.88) | 2.02(0.84, 4.87) | 1.11(0.35, 3.53) | 1.26 (0.77, 2.05) |
| **Conduct problems (≧4)** | 71 (15.5) | 1.03(0.68, 1.57) | 0.77(0.24, 2.43) | 0.69(0.19, 2.48) | 0.85(0.53, 1.37) | 2.98(1.17, 7.59)+ | 0.74(0.22, 2.46) | 0.89(0.53, 1.49) |
| **Hyperactivity/inattention (≧6)** | 81 (17.7) | 1.02(0.68, 1.53) | 1.20(0.39, 3.69) | 1.11(0.32, 3.80) | 1.49(0.94, 2.36) | 1.53(0.63, 3.72) | 1.17(0.36, 3.76) | 1.54(0.94, 2.55) |
| **Emotional symptoms (≧4)** | 98 (21.4) | 0.75(0.51, 1.12) | 0.65(0.24, 1.74) | 0.56(0.19, 1.66) | 0.77(0.50, 1.21) | 0.53(0.24, 1.20) | 0.62(0.22, 1.73) | 0.76(0.47, 1.23) |
| **Peer problems (≧4)** | 64 (14.0) | 0.99(0.65, 1.52) | 0.92(0.30, 2.87) | 0.45(0.14, 1.49) | 0.78(0.47, 1.29) | 0.90(0.36, 2.25) | 0.79(0.25, 2.54) | 0.76(0.44, 1.44) |
| **Prosocial behavior (≦5)** | 112 (24.5) | 1.46(1.04, 2.06)+ | 0.97(0.39, 2.40) | 0.96 (0.36, 2.56) | 0.89 (0.59, 1.33) | 1.10(0.53, 2.31) | 0.95 (0.37, 2.42) | 0.88(0.56, 1.36) |

Adjusted for parental ages, maternal cotinine levels, family income during pregnancy, child sex, birth order (first child or not), and child age at SDQ complete.

+p < 0.05