

Table IV. Adjusted odds ratios for selected complications associated with weight gain during pregnancy in each BMI group among parous women

	Weight gain (kg/w)						
	<0.15 (n = 69)	0.15-0.20 (n = 114)	0.20-0.25 (n = 245)	0.25-0.30 (n = 268)	0.30-0.35 (n = 202)	0.35-0.40 (n = 100)	0.40 ≤ (n = 69)
Low BMI Group							
Complication							
SGA	5.42 (2.86-10.27)	2.78 (1.53-5.06)	1.39 (0.82-2.42)	1.00	0.47 (0.22-1.01)	0.37 (0.12-1.09)	1.00 (0.41-2.42)
LGA	-	-	0.35 (0.09-1.31)	1.00	0.65 (0.18-2.01)	1.37 (0.46-4.69)	2.16 (0.63-7.44)
Medium BMI Group							
Complication							
Cesarean delivery	0.57 (0.34-0.83)	1.01 (0.71-1.44)	1.00	1.49 (1.09-2.04)*	1.21 (0.84-1.74)	1.43 (0.89-2.29)	1.34 (0.68-2.65)
SGA	2.21 (1.67-2.93)	1.68 (1.23-2.07)	1.00	0.85 (0.65-1.11)	0.71 (0.51-0.98)	0.48 (0.29-0.81)	0.34 (0.15-0.79)
LGA	0.43 (0.26-0.75)	0.68 (0.46-1.01)	1.00	1.48 (1.15-2.33)*	1.64 (1.18-2.27)	2.23 (1.51-3.31)	3.94 (2.56-6.03)
1-min Apgar score <4	0.86 (0.27-2.52)	0.76 (0.38-1.52)	1.00	1.35 (0.78-2.34)	1.41 (0.76-2.62)	2.21 (1.08-4.53)	2.26 (0.96-5.71)
NICU admission	1.57 (0.96-2.56)	1.32 (0.84-2.10)	1.00	1.11 (0.72-1.72)	1.29 (0.80-2.08)	1.54 (0.84-2.82)	1.79 (0.86-3.74)
High BMI Group							
Complication							
Preeclampsia	0.55 (0.23-1.33)	0.36 (0.12-1.07)	0.38 (0.16-0.93)	1.00	0.60 (0.27-1.33)	1.07 (0.51-2.28)	1.11 (0.51-2.41)
Severe preeclampsia	-	-	5.14(0.56-46.9)	1.00	3.69 (0.37-36.00)	5.36 (0.54-52.66)	2.07 (0.12-33.95)
SGA	2.82 (1.17-6.78)	1.17 (0.37-3.29)	1.07 (0.44-2.64)	1.00	0.48 (0.16-1.42)	0.65 (0.15-1.79)	0.39 (0.19-1.45)
LGA	0.38 (0.18-0.77)	0.52 (0.27-1.01)	0.69 (0.41-1.14)	1.00	1.22 (0.71-2.09)	1.25 (0.69-2.27)	2.27 (1.31-3.95)
1-min Apgar score <4	0.55 (0.13-2.18)	0.71 (0.18-2.75)	0.67 (0.23-1.99)	1.00	1.13 (0.42-2.97)	1.77 (0.65-4.83)	1.77 (0.64-4.87)

Data are presented as odds ratio (95% confidence interval).

Underlined data: $p < 0.05$ and the odds ratio ≥ 1.5 .*: $p < 0.05$ and the odds ratio < 1.5 .

emergent cesarean delivery, and LGA in the nulliparous group, and pre-eclampsia, severe pre-eclampsia, blood loss of more than 1,000 ml at delivery, cesarean delivery, LGA, 1-min Apgar score <4, 1-min Apgar score <7, and NICU admission in the parous group. These results indicate that deviation from prepregnant BMI 18–23.9, particularly above this range, poses a risk of pregnancy complications.

In this study, we classified prepregnant BMIs for Japanese women in relation to the incidence of pregnancy complications and adverse neonatal outcomes. Our classification differs from that for Caucasian women in which prepregnant BMIs less than 19.8 and more than 26 were defined as underweight and overweight, respectively, based on the quartile range of BMI of women at reproductive age (11).

Our results suggest that optimal weight gains during pregnancy in nulliparous women were 0.25–0.40 kg/week in the low prepregnant BMI (<18) group, 0.20–0.30 kg/week in the medium prepregnant BMI (18–23.9) group, and ≥ 0.05 kg/week in the high prepregnant BMI (≥ 24) group. Among parous women, the corresponding values were ≥ 0.20 , 0.20–0.30, and 0.05–0.30 kg/week. On the basis of 40 weeks of gestation, optimal weight gains during pregnancy in nulliparous women were 10–16 kg in the low prepregnant BMI group, 8–12 kg in the medium prepregnant BMI group, and ≥ 2 kg in the high prepregnant BMI group. For parous women, the corresponding values were ≥ 8 , 8–12, and 2–12 kg. Our results indicated that weight gains less than the optimal in the nulliparous women were associated with SGA in all three prepregnant BMI groups, and 1-min Apgar score <4 in the low prepregnant BMI group, while weight gain larger than the optimal was associated with pre-eclampsia, cesarean delivery, and LGA in the low and medium prepregnant BMI groups, and severe pre-eclampsia in the medium prepregnant BMI group. On the other hand, in parous women, weight gains less than the optimal were associated with only SGA in all three prepregnant BMI groups, while weight gains larger than the optimal were linked to LGA in the medium and high prepregnant BMI groups, and 1-min Apgar score <4 in the medium prepregnant BMI group.

Several groups studied weight gains during pregnancy (6,8,9) and two groups recommended weight gains on the basis of prepregnant BMI. One indicated that optimal weight gains for Caucasian women were 12–18 kg for low prepregnant BMI (<19.8), 11.5–16 kg for moderate prepregnant BMI (19.8–26), and 7–11.5 kg for high prepregnant BMI (>26) (11). The other reported that recom-

mended weight gains for Chinese women were 13–16.7, 11–16.4, and 7.1–14.4 kg for low (<19), moderate (19–23.5), and high (>23.5) prepregnant BMIs, respectively (20), indicating a similarity between Caucasian and Chinese women. In comparison, our study showed that optimal weight gains for Japanese women were generally smaller, which may be attributable to differences in the BMI classification, lifestyle, and management of delivery, such as infrequent use of obstetric anesthesia in Japan.

The present study suggests that control of weight gain during pregnancy depending on prepregnant BMI as classified in relation to the incidence of adverse pregnancy outcome and neonatal complications would lead to better obstetric management for Japanese women.

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