Oxytocin utilization for women undergoing an induction of labor by 1 kg/m^2 increase in body mass index

OBJECTIVE: Women with obesity have higher oxytocin utilization and are simultaneously more likely to undergo and fail an induction of labor than women without obesity.[1–5] Historically, research has focused on obesity as a categorical variable[2,4,5] despite the involvement of a heterogenous patient population, which may have important ramifications for induction of labor protocols such as using low- vs high-dose oxytocin.[1] In this study, we examined body mass index (BMI) at the time of delivery as a continuous variable by 1 kg/m^2 increase and cumulative oxytocin utilization, average oxytocin rate, maximum oxytocin rate, length of induction, and cesarean delivery.

STUDY DESIGN: Data were collected retrospectively on women with term, singleton pregnancies undergoing an induction of labor from January 1, 2018 through June 20, 2018 at a large academic center. Women with pregnancies complicated by fetal anomalies or stillbirth (n=8), previous cesarean (n=33), lack of oxytocin utilization (n=252), or missing BMI data (n=4) were excluded. The primary independent variable was BMI at the time of delivery, and the primary outcome was cumulative oxytocin utilization. A secondary effect measure modifier was parity, and the secondary outcomes included average oxytocin rate, maximum oxytocin rate, length of induction, and cesarean delivery. The labor, maternal, and neonatal characteristics were collected by the medical record. The adjusted mean difference or odds ratios were calculated using multivariable linear and logistic regression.

RESULTS: Of the 797 women in our cohort, 531 (66.6%) had obesity with a mean BMI of 34 kg/m^2. Women with obesity were more likely to have hypertensive disorders of pregnancy (112 vs 33; P=.003), less likely to have pregnancies complicated by fetal growth restriction (23 vs 35; P<.001), more likely to deliver a neonate with a higher mean birthweight (3380 vs 3175 g; P<.001), and more likely to have a cesarean delivery but no difference for indication.

TABLE
Association of outcomes per body mass index (in kg/m^2) unit at time of delivery among women undergoing an induction of labor

Outcomes by parity	Adjusted mean difference[a] (95% CI)	Adjusted odds ratio[b] (95% CI)
Nulliparous (n=460)		
Cumulative oxytocin dose, units	141.1 (38.2–244.0)	—
Average oxytocin rate, mU/min	0.04 (−0.02 to 0.09)	—
Maximum oxytocin rate, mU/min	0.13 (0.04–0.22)	—
Length of induction (min)	17.3 (9.4–25.2)	—
Cesarean delivery	—	1.07 (1.03–1.10)
Multiparous (n=317)		
Cumulative oxytocin dose, milliunits	139.8 (45.3–234.4)	—
Average oxytocin rate, mU/min	0.10 (0.03–0.17)	—
Maximum oxytocin rate, mU/min	0.19 (0.08–0.30)	—
Length of induction, min	9.4 (2.4–16.4)	—
Cesarean delivery	—	1.05 (0.99–1.12)

BMI defined as weight/height^2 at the time of admission for delivery; induction defined as nonspontaneous labor; length of induction defined from start of oxytocin.

BMI, body mass index; *CI*, confidence interval.

[a] Mean difference (slope, beta) per unit increase in BMI. Adjusted for magnesium, fetal growth restriction, and hypertensive disorders by multivariable linear regression; [b] Odds ratio for cesarean delivery per unit increase in BMI. Adjusted for magnesium, fetal growth restriction, and hypertensive disorders by multivariable logistic regression.

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The most common indication was arrest of dilation/descent. The mean oxytocin rate was 6.21 mU/min, mean maximum rate of oxytocin was 10.3 mU/min, and mean length of induction was approximately 10 hours and 58 minutes in our cohort. There were BMI-dependent associations per 1 kg/m^2 difference in BMI for approximately all outcomes (Table). Regardless of parity, the cumulative oxytocin utilization was significantly higher per 1 kg/m^2 increase in BMI after adjusting for confounders (adjusted mean difference [95% confidence interval], 141.1 [38.2–244.0] and 139.8 [45.3–234.4] units for nulliparous and multiparous women, respectively). The length of induction was also increased by 17.3 (9.4–25.2) and 9.4 (2.4–16.4) minutes for nulliparous and multiparous women, respectively, per 1 kg/m^2 increase in BMI. In other words, a nulliparous woman with a BMI of 40 kg/m^2 would require an approximately 4 hours longer induction than a nulliparous woman with a BMI of 25 kg/m^2. These associations persisted when the analytical population included only those women who had a successful vaginal delivery.

CONCLUSION: Oxytocin utilization in women undergoing an induction of labor demonstrates BMI-dependent association at the time of delivery. Future studies should focus on BMI-dependent induction protocols for oxytocin utilization. ■

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