

## OBSTETRICS

# Risk of cesarean in obese nulliparous women with unfavorable cervix: elective induction vs expectant management at term

Heather Wolfe, MD; Julia Timofeev, MD; Eshetu Tefera, MS; Sameer Desale, MS; Rita W. Driggers, MD

**OBJECTIVE:** The objective of the study was to examine maternal and neonatal outcomes in obese nulliparous women with an unfavorable cervix undergoing elective induction of labor compared with expectant management after 39.0 weeks.

**STUDY DESIGN:** This was a retrospective analysis of a cohort of nulliparous women with a vertex singleton gestation who delivered at MedStar Washington Hospital Center from 2007 to 2012. Patients with unfavorable cervix between 38.0 and 38.9 weeks (modified Bishop <5) and a body mass index of 30.0 kg/m<sup>2</sup> or greater at the time of delivery were included. Women undergoing elective induction between 39.0 and 40.9 weeks' gestation were compared with those who were expectantly managed beyond 39.0 weeks. Outcomes were analyzed using  $\chi^2$ , Student *t*, or Wilcoxon rank sum tests as appropriate with a significance set at  $P < .05$ .

**RESULTS:** Sixty patients meeting inclusion criteria underwent elective induction of labor and were compared with 410 patients

expectantly managed beyond 39.0 weeks. The rate of cesarean delivery was significantly higher in the electively induced group (40.0% vs 25.9%, respectively,  $P = .022$ ). Other maternal outcomes, including operative vaginal delivery, rate of third- or fourth-degree lacerations, chorioamnionitis, postpartum hemorrhage, and a need for a blood transfusion were similar. The neonatal intensive care unit admission rate was higher in the electively induced group (18.3% vs 6.3%,  $P = .001$ ). Birthweight, umbilical artery pH less than 7.0, and Apgar less than 7 at 5 minutes were similar.

**CONCLUSION:** Elective labor induction at term in obese nulliparous parturients carries an increased risk of cesarean delivery and higher neonatal intensive care unit admission rate as compared with expectant management.

**Key words:** cesarean, nulliparous, obese, unfavorable cervix

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Obesity is increasing in prevalence in the United States' pregnant population.<sup>1</sup> Body mass index (BMI) of 30.0 kg/m<sup>2</sup> or greater has been associated with many adverse health outcomes in pregnancy including thromboembolic disease, gestational hypertension, gestational diabetes mellitus, preeclampsia, birth defects, and cesarean delivery.<sup>1-6</sup> In addition, obesity is an independent risk

factor for cesarean delivery in the first stage of labor.<sup>7</sup>

More than 22% of all gravid women undergo induction of labor.<sup>8</sup> Medical and/or fetal indications for induction of labor include placental abruption, chorioamnionitis, fetal distress or demise, gestational hypertension, preeclampsia, premature rupture of membranes, post-term pregnancy, and others.<sup>8</sup> Elective or

social indications may include risk of rapid labor, distance from hospital, psychosocial indications, or simply maternal request.<sup>8</sup>

Cervical status is an important predictor of the likelihood of having a successful vaginal delivery. A recent large study utilizing a contemporaneous labor database concluded that dilation, station, and effacement alone could be

From Georgetown University School of Medicine (Dr Wolfe) and the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, MedStar Washington Hospital Center (Drs Timofeev and Driggers), Washington, DC, and the Department of Biostatistics and Epidemiology, MedStar Health Research Institute, Hyattsville, MD (Mr Tefera and Mr Desale).

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Dr Wolfe is currently affiliated with the Department of Obstetrics and Gynecology, Walter Reed National Military Medical Center, Bethesda, MD.

Drs Timofeev and Driggers are currently affiliated with the Division of Maternal-Fetal Medicine, Department of Gynecology and Obstetrics, Johns Hopkins University School of Medicine, Baltimore, MD.

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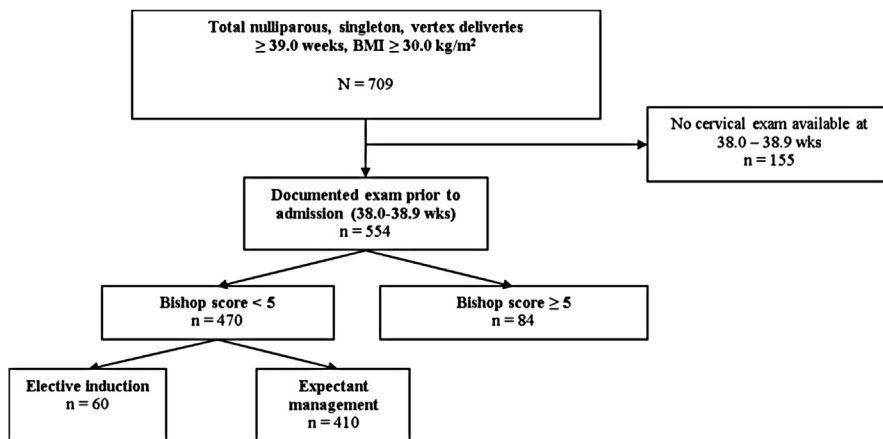
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**FIGURE**  
**Patient selection diagram**



Wolfe. Risk of cesarean with unfavorable cervix. *Am J Obstet Gynecol* 2014.

reliably used to predict likelihood of a successful vaginal delivery.<sup>9</sup> This simplified Bishop score has demonstrated a similarly high predictive ability of successful induction as the original score utilizing all 5 parameters.<sup>9</sup>

There are conflicting data on whether induction of labor increases the cesarean delivery rate. Multiple studies have reported an increased rate of cesarean in patients undergoing elective induction, though those studies used spontaneous labor for comparison, which may not be an appropriate control group.<sup>10-18</sup> One recent investigation showed that nulliparous women with an unfavorable cervix undergoing elective induction of labor had a statistically similar cesarean delivery rate when compared with expectantly managed women.<sup>10</sup>

Our aim was to evaluate cesarean delivery rate in an obese parturient undergoing elective induction of labor. We hypothesized that obese nulliparous women with an unfavorable cervix will have a higher rate of cesarean delivery when electively induced as compared to expectant management.

## MATERIALS AND METHODS

This was a retrospective analysis of a cohort of obese, nulliparous women with an unfavorable cervix on examination at 38.0-38.9 weeks, delivering at term (gestational age of  $\geq 39.0$  weeks) between 2007 and 2012 at MedStar

Washington Hospital Center in Washington, DC. Inclusion criteria were nulliparity, gestational age of 39.0 weeks or longer, singleton in a vertex presentation, with a documented cervical examination between 38.0 and 38.9 weeks demonstrating a modified Bishop score less than 5, and a BMI of 30.0 kg/m<sup>2</sup> or greater at delivery.<sup>9</sup>

Women with medical comorbidities, such as chronic hypertension and pre-existing diabetes, and women undergoing induction of labor for a medical, obstetric, or fetal indication outside the gestational age parameters of this study were excluded. Women undergoing elective inductions of labor prior to 39.0 or beyond 41.0 weeks were also excluded. This study was approved by the MedStar Health Research Institute Institutional Review Board.

Gestational age was established by a certain last menstrual period (if available) and consistent with ultrasound dating. The conception date was used for women who underwent assisted reproductive therapy. If a last menstrual period was not known or if a discrepancy existed between the menstrual and sonographic dating, gestational age was defined as established by the earliest sonographic evaluation. The modified Bishop score was determined by 1 of several providers at our institution and included resident physicians, staff physicians, and midwives. Weight gain was

calculated based on data in the electronic medical record system using a recorded prepregnancy weight and the weight recorded at the time of admission.

The electronic medical charts were queried and all patients meeting the study criteria were included in the analysis. Medical records were reviewed by 2 investigators (H.W. and J.T.) to ascertain pregnancy dating, indications, and mode of delivery. Obese women with an unfavorable cervix between 38.0 and 38.9 weeks' gestation, undergoing elective induction of labor between 39.0 and 40.9 weeks were compared with a control group consisting of women with an unfavorable cervix between 38.0 and 38.9 weeks whose pregnancy was expectantly managed beyond 39.0 weeks' gestation. Pregnancy in these women progressed, ultimately resulting in 1 of several possible outcomes (spontaneous labor, induced labor for medical, obstetric, or fetal indications resulting in cesarean or vaginal delivery, or induction beyond 41.0 weeks).

The primary outcome of the study was the rate of cesarean delivery with additional examined outcomes including operative delivery rate, number of third- or fourth-degree lacerations, chorioamnionitis, postpartum hemorrhage (defined as an estimated blood loss  $>500$  mL in a vaginal delivery or  $>1000$  mL in a cesarean section), blood transfusions, intensive care unit admission, birthweight, umbilical artery pH less than 7.0, Apgar less than 7 at 5 minutes, neonatal intensive care unit (NICU) admission, and neonatal death. Outcomes were compared using the  $\chi^2$ , Fisher exact test, Student *t* test, or Wilcoxon rank sum tests as appropriate with significance set at  $P < .05$ , with all analyses performed using SAS version 9.1 (SAS Institute, Inc, Cary, NC).

## RESULTS

Of 470 patients meeting the inclusion criteria, 60 underwent elective induction of labor and were compared with 410 patients who were expectantly managed beyond 39.0 weeks. Patient selection is depicted in the [Figure](#).

Maternal characteristics were similar between the 2 groups including age, BMI

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