Induction of Labor in Women of Advanced Maternal Age.

Joanne Quiñones MD, MSCE
Lehigh Valley Health Network, Joanne_N.Quinones@lvhn.org

Grazelda Kwakye-Ackah

Abbey Burger

Gregory Kainz
Gregory_F.Kainz@lvhn.org

Guillermo De La Vega MD
Lehigh Valley Health Network, Guillermo_A.Delavega@lvhn.org

Published In/Presented At

Quinones, J. N., Kwakye-Ackah, G., Burger, A., Kainz, G., & De La Vega, G. (2017, January). *Induction of Labor in Women of Advanced Maternal Age*. Poster Presented at: Society of Maternal Fetal Medicine, 37th annual Pregnancy Meeting, Las Vegas, Nevada.

Induction of Labor in Women of Advanced Maternal Age

Joanne N. Quinones[1], Grazelda Kwakye-Ackah[2], Abbey Burger[2], Gregory Kainz[2], Guillermo De La Vega[2]

[1]Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, [2]Department of Obstetrics and Gynecology, Lehigh Valley Health Network, Allentown, Pennsylvania

ABSTRACT

OBJECTIVE: To determine if term induction of labor in patients of advanced maternal age (AMA) leads to a higher rate of cesarean delivery when compared to term induction of labor in patients younger than age 35 at the time of delivery.

STUDY DESIGN: This is a single center retrospective cohort study of singleton intrauterine gestations that were induced and delivered at Lehigh Valley Health Network between July 2010 and July 2013. Primary outcome of interest was the rate of cesarean delivery by maternal age. Exposure of interest was maternal age. Cases were women 35 years or older at the time of delivery who were induced at term. Controls were women less than 35 years of age who were induced within one to three days of AMA women. Using a power of 90% and an alpha level of 0.05, we estimated that 291 AMA women and 582 controls would be needed to find an increase in the cesarean rate from 20% to 30% among AMA women.

RESULTS: There were a total of 791 patients evaluated in this study, 264 AMA women and 527 non AMA. The primary outcome, cesarean delivery, was similar between the two groups (23.1% in the AMA group vs 26.4% in the non AMA group, p=0.32). After adjustment, the rate of cesarean delivery was not influenced by maternal age but was higher in nulliparous women (adjusted OR 7.39; 95% CI 4.83-11.31; p<0.001) and lower in women with a Bishop score > 4 at the time of labor induction (adjusted OR 0.62; 95% CI 0.43-0.89; p=0.009).

CONSLUSION: In our population, advanced maternal age did not increase the rate of cesarean delivery among women who were induced at term. Cesarean delivery rate was higher in nulliparous women and lower in women with a ripe Bishop score at the time of labor induction.

OBJECTIVE:

Over recent years older women are accounting for an increasing proportion of pregnancies. Although there is no universal definition of advanced maternal age, studies have shown that women aged 35 and older are at increased risk of morbidity and mortality.[1] Therefore, age 35 is often used to define advanced maternal age. In 2012, the rate of births for women aged 35-39 increased 2% to 48.3 per 1000 women; while the rate for women aged 40-44 increased 1% to 10.4 births per 1000 women.[2]

Studies over the years have shown an increased cesarean delivery rate in women of advanced maternal age as compared to younger women. In a study by Callaway, in 2005 the cesarean section rate was 49% in women aged 45 and older as compared to 23% in women aged 20-29.[3] A large study by Gilbert in 1999 looked at 1,160,000 women delivered between 1992-1993, 24,000 of those women were age 40 or older. The study showed a cesarean section rate of 47.0% in nulliparous women 40 and older as compared to 22.5% in nulliparous younger women.[4] A study by Lin in 2005 concluded that request for cesarean delivery increases with maternal age.[5]

Factors thought to contribute to the increased rate of cesarean delivery in women of advanced maternal age include prevalence of medical conditions, induction of labor, fetal malposition and increased maternal request. However, recent data found that among women of advanced maternal age, induction of labor at 39 weeks of gestation, as compared with expectant management, had no significant effect on the rate of cesarean delivery.[6]

The objective of our retrospective study was to determine if term induction of labor in patients of advanced maternal age (AMA) leads to a higher rate of cesarean delivery when compared to term induction of labor in patients younger than age 35 at the time of delivery.

STUDY DESIGN:

This is a single center retrospective cohort study of singleton intrauterine gestations that were induced and delivered at Lehigh Valley Health Network between July 2010 and July 2013. Primary outcome of interest was the rate of cesarean delivery by maternal age. Exposure of interest was maternal age. Cases were women 35 years or older at the time of delivery who were induced at term. Controls were women less than 35 years of age who were induced within one to three days of AMA women. Using a power of 90% and an alpha level of 0.05, we estimated that 291 AMA women and 582 controls would be needed to find an increase in the cesarean rate from 20% to 30% among AMA women.

INCLUSION CRITERIA:

Exposed (Study) Group

- Patients of advanced maternal age (≥35) with a singleton gestation
- Admitted for induction of labor at term (≥37 weeks gestation)
- Complete records of the pregnancy and delivery within our network

Non-exposed (Control) Group

- Patients of non-advanced maternal age (<35) with a singleton gestation
- Admitted for induction of labor at term (≥37 weeks gestation)
- Complete records of the pregnancy and delivery within our network

EXCLUSION CRITERIA:

- Gestational age less than 37 weeks gestation
- Previous cesarean delivery attempting a trial of labor
- Multi-fetal gestations in either exposed or control group
- Major fetal anomalies in either exposed or control group
- Aneuploidy in either exposed subjects or control group
- Incomplete pregnancy and delivery information

Statistical analyses were performed using STATA software. Statistical analyses included χ^2 test for categorical variables and Student's t test for continuous variables. $p < 0.05$ was considered significant. Risk ratios were generated to evaluate the risk of cesarean delivery by maternal age in women induced when compared to women less than 35 years of age at delivery.

Logistic regression models were constructed to evaluate the risk of cesarean delivery in women induced at term by maternal age adjusting for potential confounders such as parity, Bishop score and co-morbidities.

RESULTS:

There were a total of 791 patients evaluated in this study, 264 AMA women and 527 non AMA. The primary outcome, cesarean delivery, was similar between the two groups (23.1% in the AMA group vs 26.4% in the non AMA group, p=0.32). After adjustment for potential confounders, the rate of cesarean delivery was not influenced by maternal age but was higher in nulliparous women (adjusted OR 7.39; 95% CI 4.83-11.31; p<0.001) and lower in women with a Bishop score > 4 at the time of labor induction (adjusted OR 0.62; 95% CI 0.43-0.89; p = 0.009).

Table 1. Demographic Characteristics of Patient Population by Maternal Age

Characteristics	Non-AMA (n=527)	AMA (n=264)	p value
Maternal age (years)	26.6 ± 4.8	38.0 ± 2.6	<0.0001
Nulliparity, n (%)	305 (57.9)	101 (38.3)	<0.001
Marital Status, n (%)			<0.001
• Married • Divorced / Widowed • Never Married	253 (48.0) 25 (4.7) 249 (47.3)	199 (75.4) 26 (9.9) 39 (14.8)	
Race / Ethnicity, n (%)			0.73
• Not Hispanic • Hispanic • N/A • Other	422 (80.1) 103 (19.5) 1 (0.2) 1 (0.2)	208 (78.8) 56 (21.2) 0 (0) 0 (0)	
Insurance, n (%)			0.008
• Government • Private • Self-Pay	134 (25.4) 361 (68.5) 32 (6.1)	43 (16.3) 208 (78.8) 13 (4.9)	
Private Service vs Resident service, n (%)	348 (66.4)	207 (78.4)	<0.001
Tobacco Use, n (%)	71 (13.5)	28 (10.6)	0.25
Alcohol Use, n (%)	2 (0.4)	2 (0.8)	0.40
Drug Use, n (%)	6 (1.1)	1 (0.4)	0.28
Pregestational Diabetes	10 (1.9)	4 (1.5)	0.70
Gestational Diabetes	65 (12.3)	66 (25.0)	<0.001
Essential Hypertension	21 (4.0)	33 (12.5)	<0.001
Any Comorbidity	89 (16.9)	89 (33.7)	<0.001
Gestational Hypertensio or Preeclampsia	114 (21.6)	33 (12.5)	<0.001
History of Preterm Delivery	17 (3.2)	17 (6.4)	0.04
Group B Strep	149 (28.3)	79 (29.9)	0.63

Table 2. Admission Characteristics of the Patient Population by Maternal Age

Characteristics	Non-AMA (n=527)	AMA (n=264)	p value
Gestational Age at Admission (weeks)	39.8 ± 1.3	40.0 ± 1.0	0.18
Indication for Induction of Labor, n (%)			0.001
• Prolonged pregnancy • Premature Rupture of Membranes • Non Reassuring Antenatal Testing • Oligohydramnios • Gestational Hypertension or Preeclampsia or Chronic Hypertension • Intrauterine Growth Restriction • Diabetes, any • Elective • Other	140 (26.7) 69 (13.1) 16 (3.0) 43 (8.2) 128 (24.3) 14 (2.7) 49 (9.3) 33 (6.3) 38 (7.2)	44 (16.7) 37 (14.0) 9 (3.4) 16 (6.1) 60 (22.7) 13 (4.9) 15 (5.7) 15 (5.7) 41 (15.5)	
First Method of Induction, n (%)			0.91
• Foley Bulb and Oxytocin • Foley Bulb and Misoprostol • Foley Bulb • Misoprostol • Oxytocin • Artificial Rupture of Membranes	146 (27.7) 38 (7.2) 3 (0.6) 40 (7.6) 296 (56.2) 4 (0.8)	66 (25.0) 17 (6.4) 3 (0.8) 24 (9.1) 152 (57.6) 3 (1.1)	
Bishop Score > 4	227 (52.6)	135 (51.1)	0.71

Table 3. Labor and Delivery Characteristics Among Patient Population by Maternal Age

Characteristics	Non-AMA (n=527)	AMA (n=264)	p value
Use of Intrauterine Pressure Catheter (IUPC), n (%)	163 (30.9)	66 (25.0)	0.08
Epidural Anesthesia, n (%)	491 (93.2)	247 (93.6)	0.84
Intrapartum Complications, n (%)			0.55
• Preeclampsia • Chorioamnionitis • Abruptio Placentae • Other	102 (19.9) 32 (6.1) 1 (0.2) 1 (0.2)	51 (19.3) 11 (4.2) 1 (0.4) 2 (0.8)	
Postpartum Complications, n (%)			0.001
• Postpartum hemorrhage • Preeclampsia Diagnosed Postpartum • Endometritis • Acute Blood Loss Anemia • Other	9 (1.7) 0 (0.0) 0 (0.0) 107 (20.3) 1 (0.2)	6 (2.3) 1 (0.4) 0 (0.0) 18 (6.8) 5 (1.9)	

Table 4. Primary Outcome and Indication for Cesarean Delivery

Characteristics	Non-AMA (n=527)	AMA (n=264)	p value
Cesarean Delivery, n (%)	139 (26.4)	61 (23.1)	0.32
Indications for Cesarean, n (%)			
• Non-reassuring Fetal Heart Tracing • Arrest of the Active Phase • Arrest of Descent • Failed Induction of Labor • Malpresentation • Other	14 (2.7) 54 (10.2) 21 (4.0) 45 (8.5) 3 (0.6) 2 (0.4)	7 (2.7) 26 (9.8) 14 (5.3) 10 (3.8) 1 (0.4) 3 (1.1)	

Table 5. Unadjusted Analyses of Potential Predictors of Cesarean Delivery Among Women Undergoing Labor Induction

Potential Predictor	Relative Risk (95% CI)	p value
Advanced Maternal Age	RR 0.88 (0.67, 1.73)	0.32
Nulliparity	RR (4.48 (3.50, 7.07)	<0.0001
Bishop score > 4	RR 0.55 (0.43, 0.71)	<0.0001
BMI > 30	RR 1.10 (0.86, 1.41)	0.47
Any Co-morbidity	RR 1.29 (1.02, 1.64)	0.04
Private Obstetrician (vs. Resident)	RR (0.67, 1.11)	0.26

Table 6. Adjusted Analyses of Potential Predictors of Cesarean

Potential Predictor	Adjustd Odds Ratio (95% CI)	p value
Advanced Maternal Age	AOR 1.19 (0.81, 1.75)	0.38
Nulliparity	AOR 7.39 (4.83, 11.31)	<0.0001
Bishop Score > 4	AOR 0.62 (0.43, 0.89)	<0.009
Any Co-morbidity	AOR 1.31 (0.91, 1.86)	0.142

CONCLUSION:

In our population, advanced maternal age did not increase the rate of cesarean delivery among women who were induced at term. Cesarean delivery rate was higher in nulliparous women and lower in women with a ripe Bishop score at the time of labor induction.

References:

1. Management of stillbirth. ACOG Practice Bulletin No. 102. Washington D.C.: *American College of Obstetricians and Gynecologists*; 2009.
2. Hamilton BE, Martin JA, Ventura SJ. Births: Preliminary Data for 2012. National Vital Statistics Reports, CDC 2013; 62:3.
3. Callaway LK, Lust K, McIntyre HD. Pregnancy outcomes in women of very advanced maternal age. *Aust N Z J Obstet Gynaecol* 2005;45:12.
4. Gilbert WM, Nesbitt TS, Danielsen B. Childbearing beyond age 40: pregnancy outcome in 24,032 cases. *Obstet Gynecol* 1999;93:9.
5. Lin HC, Xirasagar S. Maternal age and the likelihood of a maternal request for cesarean delivery: a 5-year population-based study. *Am J Obstet Gynecol* 2005;192:848.
6. Walker KF, Bugg GJ, Macpherson M, McCormick C et al. Randomized trial of labor induction in women 35 Years of age or older. *N Engl J Med* 2016;374:813-822.