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RESEARCH

Population-Based Risk Factors for Shoulder Dystocia

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ABSTRACT

Objective: To re-examine the risk factors for shoulder dystocia given the increasing rates of obesity and diabetes in pregnant women.

Design: Retrospective observational study.

Setting: Five hospitals located in Wisconsin, Florida, Maryland, Michigan, and Alabama.

Participants: We evaluated 19,236 births that occurred between April 1, 2011, and July 25, 2013.

Methods: Data were collected from electronic medical records and used to evaluate the risk of shoulder dystocia. Data were analyzed using a generalized linear mixed model, which controlled for clustering due to site.

Results: When insulin was prescribed, gestational diabetes was associated with an increased risk of shoulder dystocia (odds ratio = 2.10, 95% confidence interval [1.01, 4.37]); however, no similar association was found with regard to gestational diabetes treated with glycemic agents or through diet. Use of epidural anesthesia was associated with an increased risk for shoulder dystocia (odds ratio = 3.47, 95% confidence interval [2.72, 4.42]). Being Black or Hispanic, being covered by Medicaid or having no insurance, infant gestational age of 41 weeks or greater, and chronic diabetes were other significant risk factors.

Conclusion: With the changing characteristics of pregnant women, labor and birth clinicians care for more pregnant women who have an increased risk for shoulder dystocia. Our findings may help prospectively identify women with the greatest risk.

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Shoulder dystocia is a perinatal complication that can occur without warning and may be difficult to manage (Gherman et al., 2006). Shoulder dystocia occurs when a fetus's shoulders fail to exit the birth canal after the head. This situation requires immediate and sometimes significant manipulation of the fetus and repositioning of the woman to allow the shoulders to pass below the symphysis pubis (American College of Obstetricians and Gynecologists, 2017b; Gherman et al., 2006). The rate of shoulder dystocia is not precisely known. In recent studies with sample sizes of more than 200,000 births, researchers found rates that ranged from 0.26% to 4.4%; most fell in the lower half of this range (Lai, Johnson, Dover, & Kaul, 2016; Lamminpää, Vehviläinen-Julkunen, Gissler, Selander, & Heinonen, 2016; McDonald et al., 2015; Øverland, Vatten, & Eskild, 2014; Ovesen, Jensen, Damm, Rasmussen, & Kesmodel, 2015). Even with appropriate response, complications that result from shoulder dystocia can affect the woman and the infant, including potential long-term shoulder, arm, and hand paralysis in infants (Grobman et al., 2011). With changes in the characteristics of pregnant women, understanding and addressing risk factors could help to reduce harm to women and their infants (Landro, 2016).

Although shoulder dystocia remains difficult to predict (American College of Obstetricians and Gynecologists, 2017b), many researchers have identified possible risk factors for the condition (see Supplemental Table S1). Infant birth weight greater than 4,000 g and macrosomia have been associated with an increased incidence rate of shoulder dystocia (Cheng, Lao, Sahota, Leung, & Leung, 2013; Dodd, Catcheside, & Scheil, 2012; Øverland et al., 2012, 2014; Parantainen, Palomäki, Talola, & Uotila, 2014; Revicky, Mukhopadhyay, Morris, & Nieto, 2012; Tsur, Sergienko, Wiznitzer, Zlotnik, & Sheiner, 2012),

as has instrumental birth (Cheng, Norwitz, & Caughey, 2006; Gupta, Hockley, Quigley, Yeh, & Impey, 2010; Øverland et al., 2012, 2014; Parantainen et al., 2014; Revicky et al., 2012; Sheiner et al., 2006). Researchers also found a relationship between a woman's body mass index (BMI) and shoulder dystocia; women with elevated BMIs at the time of childbirth were often at increased risk for the condition (Cheng et al., 2013; Cheng et al., 2006; Gupta et al., 2010; Schummers, Hutcheon, Bodnar, Lieberman, & Himes, 2015), and one group of researchers found that women with BMIs greater than or equal to 30 kg/m^2 had a nearly three times greater risk (Mazouni et al., 2006). Chronic diabetes (Abell et al., 2016; Boghossian et al., 2014; Shand, Bell, McElduff, Morris, & Roberts, 2008; Son, Lim, Lee, Cho, & Park, 2015) and gestational diabetes (Burkhardt, Schmidt, Kurmanavicius, Zimmermann, & Schaffer, 2014; Dodd et al., 2012; Lai et al., 2016; Lamminpää et al., 2016; Ovesen et al., 2015; Øverland et al., 2012; Tsur et al., 2012) were also associated with increased risk for shoulder dystocia. Whether the effect of the latter may be mitigated by treatment is not yet clear.

One group of researchers found that treatment through diet, self-monitoring, and insulin as needed reduced the rate of shoulder dystocia in pregnant women (Landon et al., 2009), but another group found no significant effect of such an approach (Crowther et al., 2005). A third group of researchers examined shoulder dystocia in women with gestational diabetes and found no detectable difference in risk between women who were treated with diet alone or with insulin (Lamminpää et al., 2016).

In addition to these well-established risk factors, additional risk factors suggested in the literature include non-White race/ethnicity (Berggren, Boggess, Funk, & Stuebe, 2012; Cheng et al., 2006; Colombara, Soh, Menacho, Schiff, & Reed, 2011; Dodd et al., 2012), shorter height (Cheng et al., 2013; Gupta et al., 2010; Mazouni et al., 2006; Parantainen et al., 2014), multiparity (Gupta et al., 2010; Mazouni et al., 2006; Øverland et al., 2012, 2014), lack of prenatal care (Sheiner et al., 2006), history of previous shoulder dystocia (Kleitman, Feldman, Walfisch, Toledano, & Sheiner, 2016; Øverland, Spydslaug, Nielsen, & Eskild, 2009), prolonged labor (Gupta et al., 2010; Øverland et al., 2012, 2014), and induction of labor (Dodd et al., 2012; Øverland et al., 2012).

The prevalence of risk factors for shoulder dystocia is increasing in the United States.

Still unclear is the relationship between shoulder dystocia and epidural anesthesia, which is used in more than 50% of births in the United States (Centers for Disease Control and Prevention [CDC], 2016), but some evidence suggests that use of epidural anesthesia may be associated with an increased incidence of shoulder dystocia. In a study in Norway, researchers found a shoulder dystocia incidence rate of 1.36% in infants born to women who were given epidural anesthesia compared with an overall rate of 0.68% (adjusted odds ratio [OR] = 1.17, 95% confidence interval [CI] [1.11, 1.23]; Øverland et al., 2012). They found similar results in a later study (Øverland et al., 2014). Researchers in Sweden found an OR of 1.89 (95% CI [1.07, 3.34]) for the same comparison (Christoffersson, Kannisto, Rydhstroem, Stale, & Walles, 2003). Conversely, other investigators found no significant relationship between epidural use and shoulder dystocia (Cheng et al., 2006; Gupta et al., 2010; Ouzounian & Gherman, 2005; Parantainen et al., 2014; Revicky et al., 2012).

In the United States, the prevalence of many known and suspected risk factors for shoulder dystocia is increasing. According to the CDC (2013, 2016), the percentage of women giving birth with prepregnancy BMIs in the overweight or obese range (above 25.0 kg/m^2) increased from 48.7% to 51.4% over the 5-year period between 2011 and 2015. The prevalence of gestational diabetes increased from 4.82% in 2011 to 5.68% in 2015, and the prevalence of chronic diabetes increased from 0.74% in 2011 to 0.81% in 2015 (CDC, 2013, 2016). More infants are being born in larger birth weight categories. The percentage of newborns with birth weights greater than 4,000 g increased from 7.77% of the total population in 2011 to 8.0% in 2015 (CDC, 2013, 2016). The use of epidural anesthesia is increasing as well, and 70.9% of women who gave birth in the United States in 2011 received epidural and/or spinal anesthesia during labor compared with 72.8% in 2015 (CDC, 2013, 2016). These trends are a few examples of ongoing changes in childbearing women that may contribute to an increased risk of shoulder dystocia.

Given these rapid changes in the characteristics of pregnant women and in their care during labor

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