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The Association Between Advanced Maternal Age and Short Interpregnancy Intervals on Preterm Labor

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Abstract

Background: Preterm birth is the leading cause of neonatal and infant mortality and has become a major health concern due to the increasing rates of infant deaths in the United States (WHO, 2017). Studying maternal risk factors for preterm labor provides insight to this obscure condition and can assist in the identification of high risk women, as well as facilitate appropriate pregnancy planning. **Purpose:** Although research can be found on interpregnancy intervals and maternal age as independent risk factors for premature labor, gaps exist within the relation of these variables. This study was done to investigate whether there is a significant risk association between advanced maternal age (35 years and older) and short interpregnancy intervals on premature labor, that deems transferring out of a low risk birthing center to a more advanced hospitalized setting. **Methodology:** De-identified data regarding obstetric history, medical history, and pregnancy morbidity was abstracted from women who delivered at Baby + Co., a birthing center in Nashville, Tennessee, between the years of 2015 and 2018. The population set included 1001 women, 5 of which delivered preterm. Means and standard deviations for the two groups were calculated, and two sided t-tests and corresponding p-values were calculated. **Result:** There was no statistical significance regarding maternal age and preterm transfers (p-value of 0.762). However, there was a positive correlation between short interpregnancy intervals and preterm birth (p-value .007). **Discussion:** Due to the low risk population included in this study, there is a need for additional research conducted within a higher risk population set to determine the significance and interaction between advanced maternal age and short interpregnancy intervals on preterm labor.

Keywords: preterm birth; interpregnancy intervals; maternal age; birthing center; low risk

Background

Among the 130 million neonates born each year, approximately 15 million are born preterm. One in every nine infants are born premature. Gestational age is a strong prognostic factor, after neonatal birth weight, for the outcome of pregnancy. Premature infants are defined as those born before 37 weeks gestation, with the normal carrying term being 39 weeks (WHO, 2017). Across the globe, prematurity is the greatest cause of neonatal mortality and was reportedly responsible for 1 million infant deaths in 2015. The infants that do survive prematurity may live with substantial birth defects: learning disabilities, visual impairments, and neurological deficits. Even with medical advances, the statistics on neonatal morbidity due to preterm labor remains unchanged (Stewart & Graham, 2010). Although researchers continue to attempt to understand the pathophysiology behind preterm deliveries, the events that lead to these occurrences are not fully understood (Stewart & Graham, 2010). The most established method of prevention is to identify and treat known maternal risk factors for premature labor.

Literature Review

Targeting maternal predisposing conditions for preterm birth presents insight and understanding of the mechanisms leading to early deliveries, and it helps to identify women at risk. Known maternal risk factors for preterm infants include a history of preterm labor, twin gestations, and a short interpregnancy interval. Additional maternal risk factors for increased preterm labor include the presence of advanced maternal age (35 years and older), maternal diabetes, high blood pressure, and under and overweight body mass index (BMI) (Waldenström, Cnattingius, Vixner & Norman, 2017). It is necessary to study the combined effects of these risk factors on premature delivery as well as their independent effects. Although research can be found on interpregnancy intervals and maternal age as independent risk factors for premature

labor, gaps exist within the relation of these variables. Therefore, this study aimed to investigate whether there is a significant risk association between advanced maternal age (35 years and older) and short interpregnancy intervals on premature labor, that deems transferring out of a low risk birthing center to a more advanced hospital setting.

Maternal age. In recent years, there has been a significant increase in the maternal age at childbirth. Women in high-income countries are becoming more educated and holding positions of power in the workforce, which is associated with increased childbearing age. In 2006, about 1 in 12 first births were to women aged 35 years and over, compared with 1 in 100 births in 1970. However, even with improved reproductive technology, advanced maternal age continues to be associated with adverse pregnancy outcomes including preterm birth, stillbirth, and increased rates of Caesarean section (Kenny et al., 2013). The present study attempted to examine the association of maternal age as it relates to adverse pregnancy outcomes within the birthing center setting. Another risk factor investigated in this study was the effects of short interpregnancy intervals on premature morbidity and mortality.

Interpregnancy interval. An interpregnancy interval is defined as the period between a previous birth to the moment of conception of a subsequent infant (Ekin, 2015). A short interpregnancy interval is defined as less than 18 months between birth of the initial child and conception of the succeeding child. Gemmill and Lindberg (2013) note that prevention of short interpregnancy intervals has become a public health priority in the US due to the associated risk to the mother (i.e., preeclampsia) and infant (i.e., preterm birth, low birth weight). Advanced maternal age could be a determinant factor of the interpregnancy time interval for mothers. Women who experience short intervals between pregnancies occur most often in teen pregnancies and those women initiating childbearing after 30 years of age (Gemmill & Lindberg,

2013). In women of advanced maternal age, late initiation of child-bearing suggests an increase in short periods between pregnancies. This premise is supported by Gemmill and Lindberg (2013) with the finding that nearly 75% of the women initiating childbearing later in life with short interpregnancy intervals were intended pregnancies. However, Restrepo-Mendez et al. (2015) states that delaying a first birth until older maternal age creates a large possibility for adverse outcomes. Due to the nature of these risk factors, and their interconnection and possible relation to preterm labor, it is crucial to study these elements. Determining whether short interpregnancy intervals or advanced maternal age creates a higher risk for spontaneous premature labor could be used to educate prospective mothers on effective pregnancy planning.

Methodology

This research project was conducted succeeding approval of the University of Arkansas Institutional Review Board. The study population included low risk women seeking obstetric care at Baby + Co., a Nashville birthing center. The data set included 1001 de-identified records for pregnancies between 2015 and 2018. Medical records were abstracted to produce data on the following variables: maternal age, interpregnancy interval, obstetric history, medical history, and current pregnancy morbidity. All information was de-identified and reported in aggregate. The population was divided into two groups: preterm transfer (5 women) and non-preterm deliveries (996 women). For the statistical analysis, the individual effect of the independent variables: maternal age and interpregnancy intervals, on preterm birth was observed. Due to the low incidence of preterm labor, the association between the two independent variables could not be studied fully. Means and standard deviations for the two groups were calculated using Microsoft Excel. Two sided t-tests and corresponding p-values were calculated using the Selected Statistics Services calculator (Statistical Services, 2019).

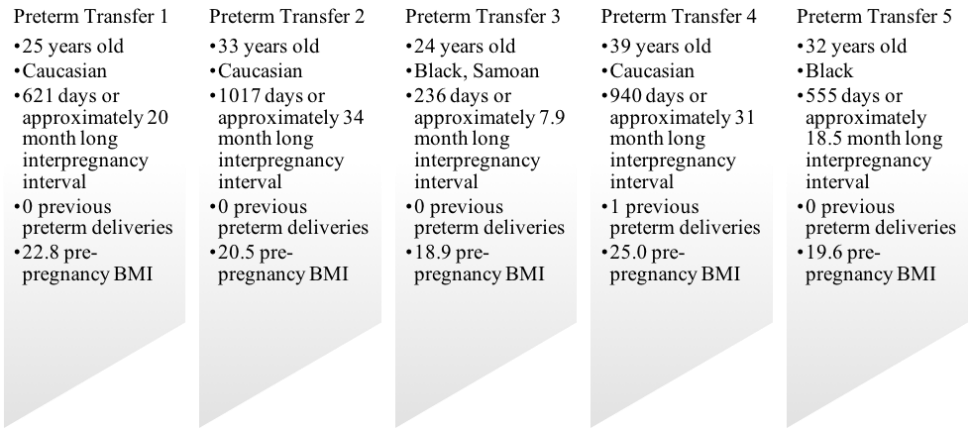
Results

The overall prevalence of preterm transfer in this study population was 5/1001 or .49%, which is significantly less than the rate of preterm birth in the general population of Tennessee, reported as 11.1% in 2017 by the March of Dimes (National Center for Health Statistics, 2017). The study population was older (31.1 years) than typical in Tennessee, where the majority of births are to women under 30 years of age (Tennessee Department of Health, 2017). There was no difference in average age between the two groups, preterm transfer and non-preterm transfer, within the study (p-value of .762). The mean age for the preterm transfer group was 30.6 years old. Whereas, the mean age for the non-preterm transfer group was 31.6 years of age. However, within the preterm transfer population there was a greater age range (as evidenced by a standard deviation value of 6.2) when compared to the non-preterm transfer population (standard deviation value of 4.8). Although our results did not point towards maternal age as a factor for preterm labor, the interpregnancy interval results were significant (p-value of .007). The interpregnancy interval among the preterm transfer patients was significantly shorter (674 days, approximately 22 months) when compared to the group of patients not transferred preterm (1270 days, approximately 42 months). This indicates that there was a positive correlation between short interpregnancy intervals and preterm birth.

Table 1.1. Overview of Preterm Risk Factors, Maternal Age and Interpregnancy Interval

	Preterm Transfer	Non-Preterm Transfer	2 sided t-test p-value
Number in Group	5	996	
Mean Age (STD)	30.6 (6.2)	31.6 (4.8)	0.762
Mean Interpregnancy Interval in Days (STD)	674 Days (315)	1270 Days (3820)	.007

Table 1.2. Comparison of Preterm Transfer Individuals



Discussion

Overall, the data set included women at low risk for preterm delivery in a birthing center population. This study's results do not alter the current criteria for preterm delivery transfers in Baby + Co., or other similar birthing center settings. The low prevalence of preterm transfer in this group (5/1001) and the mean age may have limited the ability of the data to discriminate based on maternal age. However, the interpregnancy interval findings, even in this small group, are compelling. The prevention of short interpregnancy intervals have been labeled by Gemmill

and Lindberg (2013) and World Health Organization (2017) as a public health priority due to the associated risk to the mother and the infant. The findings in this study warrants proper education for prospective mothers, and those of child-bearing age, about the benefits of pregnancy planning and preventing short interpregnancy intervals. Provider discussions with this patient population should cover the importance of family planning based on maternal age and interpregnancy intervals. If prospective mothers or women of childbearing age possess risk factors such as short interpregnancy intervals or advanced maternal age, they should be monitored more frequently through prenatal visits to ensure the safety of the mother and baby. Further studies in populations with greater overall prevalence of preterm birth should be done to confirm or refute these findings. Additionally, study populations that contain a wider range across all age groups should be studied to determine the association and correlation between the two risk factors, advanced maternal age and short interpregnancy intervals, on preterm labor.

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