



Original Contribution

Prevalence and descriptive analysis of congenital heart disease in parturients: obstetric, neonatal, and anesthetic outcomes[☆]



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Received 3 August 2014; revised 18 March 2015; accepted 16 April 2015

Keywords:

Anesthesia;
Congenital heart disease;
Neonates;
Obstetric;
Outcome;
Pregnancy

Abstract

Study objective: The study objectives are to (1) assess prevalence of congenital heart disease (CHD), (2) describe outcomes of pregnancies in women with CHD, (3) compare outcomes in women with and without CHD, and (4) characterize neonatal outcomes in pregnancies complicated by CHD.

Design: This was a retrospective cohort study of women who delivered at the University of Colorado Hospital. Diagnosis of CHD was identified based on history of cardiac disease, pulmonary disease, or subacute bacterial endocarditis prophylaxis during labor and confirmed with echocardiogram when available. Comprehensive retrospective review of anesthetic, obstetric, and neonatal outcomes was performed.

Setting: University of Colorado Hospital.

Patients: 18,226 women.

Interventions: Medical record review.

Measurements: Valvular abnormalities, New York Heart Failure Association classification scores, types of CHD, maternal age, race, gravidity, parity, maternal prepregnancy body mass index, cigarette use, type of delivery, type of analgesia used, early initiation of neuraxial analgesia, arrhythmias, need for peripartum diuretics, prolonged maternal hospital stay, preterm birth, small for gestational age, neonatal CHD, neonatal or maternal intensive care unit (ICU) admissions, and maternal or neonatal death.

Main results: We identified 117 pregnancies in 110 women with CHD. Parturients with CHD were more likely to have operative vaginal delivery ($P < .0001$), neonatal ICU admissions ($P = .003$), and had prolonged hospital stays. Occurrence of CHD in neonates was 6%. Moderate-to-severe valvular disease was associated with increased rates of operative vaginal delivery, early initiation of neuraxial labor analgesia, cardiac complications (including arrhythmia and use of diuretics), prolonged hospital stay, and maternal ICU admission. However,

[☆] Disclosures: No grants, sponsors, or funding sources to be disclosed.

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most deliveries and births were uncomplicated; and there were one case each of maternal mortality and fetal death after birth.

Conclusion: Operative abdominal deliveries and neonatal ICU admissions are more common in women with CHD, but these pregnancies are generally well tolerated with low mortality rates.

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1. Introduction

Maternal cardiac disease is a major cause of peripartum maternal mortality and is also associated with increased risk of fetal and neonatal morbidity and mortality [1-6]. Advances in surgical and medical care have led to more women with congenital heart defects surviving to childbearing age with estimates suggesting that 85% of neonates born with congenital heart defects will reach adulthood [7-9].

Pregnant women with congenital heart disease (CHD) may appear clinically to have relatively normal cardiac function. However, changes in the hematologic and cardiovascular systems during the peripartum period can compromise function and increase risk [8,10]. For example, cardiac output may double immediately postpartum due to increases in heart rate and stroke volume due to pain and autotransfusion of fluid from the contracted uterus. Increased plasma volume, decreased systemic vascular resistance, aortocaval compression, circulating catecholamines from pain, and postpartum hemorrhage are important causes of cardiac and hemodynamic stress that place these women at higher risk for adverse maternal and fetal outcomes [10]. Maternal sequelae of CHD during pregnancy such as arrhythmias, stroke, pulmonary edema, heart failure, intensive care unit (ICU) admission, and death are well documented [6,11,12]. Some sequelae of CHD, such as pulmonary hypertension and Eisenmenger syndrome, carry such a high risk of maternal mortality in pregnancy that women with these diseases are advised to avoid becoming pregnant [13]. However, fetal risks (eg, intrauterine growth restriction, prematurity, neonatal ICU admissions, and death) are also significant and should not be underestimated [14]. Moreover, neonates born of mothers with CHD also have increased risk of cardiac anomalies [6,15].

The aims of this study were (1) to assess the prevalence of CHD in a cohort of women at the University of Colorado Hospital, (2) describe outcomes of pregnancies in women with CHD, (3) compare these outcomes in women with and without CHD, and (4) characterize neonatal outcomes in pregnancies complicated by CHD. We hypothesized that pregnancies complicated by CHD would have an increased incidence of maternal and fetal complications.

2. Materials and methods

This was a retrospective cohort study approved by the Colorado Multiple Institutional Review Board. We conducted

a secondary data analysis of all women who delivered at the University of Colorado Hospital between October 2005 and October 2011 (the period of data available upon initiation of the study) using the Department of Obstetrics and Gynecology Perinatal Database. A comprehensive set of data on maternal risk factors, events during labor and delivery, pregnancy complications, and neonatal events is collected daily on every delivery that occurs at the University of Colorado Hospital. Trained research staff collate the data. Using Web-based data entry, data are transmitted to the Data Coordinating Center in the Division of Biostatistics and Bioinformatics at National Jewish Health. Quality control includes procedures for automatic range checks and an annual secondary review between 10% and 15% of the records.

We reviewed records of 18,226 deliveries to identify women with CHD. Our primary data analysis identified women with history of cardiac disease, pulmonary disease, or subacute bacterial endocarditis prophylaxis administered during labor and found 857 pregnancies. Subacute bacterial endocarditis prophylaxis was chosen as an inclusion criterion because patients receiving prophylactic antibiotics were likely to have CHD. We then reviewed medical records and available echocardiogram results for each of these pregnancies to identify women with CHD. Our final analytic data set contained 117 pregnancies in 110 women with CHD. We performed a thorough evaluation of each woman's medical record to document presence of moderate-to-severe valvular abnormalities associated with CHD.

New York Heart Association (NYHA) heart failure classification scores were assigned to each mother by cardiologists during third trimester clinic visits or by our research team when cardiology consultation was not performed. We assigned NYHA classes based on review of systems documentation during the third trimester (chosen due to a lack of documentation of functional status in the first and second trimesters for all women in the cohort). Types of CHD, including repaired and unrepaired defects, were categorized based on echocardiogram evidence or documentation in the medical record when echocardiogram was not available. The most severe heart defect was prioritized in women with multiple cardiac lesions. We also collected the following maternal risk factors: maternal age, race, gravidity, parity, maternal prepregnancy body mass index, and cigarette use.

Outcomes evaluated included arrhythmias, use of diuretics, prolonged maternal hospital stay, preterm birth (<37 weeks' gestation), small for gestational age (\leq 10th percentile for weight at gestational age at birth), neonatal CHD, neonatal or maternal ICU admissions, and maternal or

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