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Pregnancy and cardiovascular risk

Embarazo y riesgo cardiovascular

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INTRODUCTION

Cardiovascular diseases are among the leading causes of maternal death.[1] These entities complicate between 0.2 and 4% of pregnancies, and this prevalence is increasing. On the one hand, girls with congenital heart disease reach childbearing age thanks to partial or total surgical correction of the heart disease; on the other hand, assisted fertilization techniques have extended maternal age with older mothers with more significant comorbidities. Finally, the increase in the prevalence of cardiovascular risk factors (CVRFs) in women of any age also operates as an additional factor.[2,3] Latin America also adds another scourge, the Chagas-Mazza disease. According to data from the World Health Organization (WHO), 60 million people are at risk of suffering from it,[4] and 20-30% of them will develop heart disease. The impact on women is related to heart disease and the additional risk of vertical transmission.

EVALUATION OF THE GLOBAL RISK OF PREGNANT WOMEN WITH HEART DISEASE

The risk of possible complications during pregnancy is related to multiple factors, such as:

1. The type of underlying heart disease
2. Ventricular and valvular function
3. Pre-gestational functional class
4. The presence of cyanosis
5. The presence of CVRFs
6. Obstetric history
7. Maternal age

The risk calculation must be personalized, integrating all the variables.[5] The hemodynamic changes of pregnancy, i.e., increased cardiac output and heart rate and decreased vascular resistance, will influence heart disease and may aggravate it.[6,7] Sometimes, the diagnosis of maternal heart disease is established during pregnancy because these changes decompensate the underlying disease.

Therefore, the pre-pregnancy consultation is of great value since it allows the estimation of the individual risk, requesting complementary studies, planning the surgical correction, and establishing a multidisciplinary follow-up team.

1. Type of maternal heart disease

The most widely used current tool to estimate maternal and fetal risk is the modified World Health Organization (WHO) Risk Scale published in 2018 by the WHO[8-10] *(Table 1)*. It considers 5 categories, each of which gives a range of risk.

2. Evaluation of the functional class

Functional class (FC) is an independent risk factor for maternal-fetal mortality. Women in FC I have a mortality of less than 1%, while those in FC IV reach up to 15%. For its part, the fetal risk is 20 to 30% in FC IV, in addition to increased morbidity due to prematurity, low birth weight, spontaneous abortion, and congenital heart disease.

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FC can be evaluated with a stress test or the measurement of natriuretic peptides (BNP or NT-proBNP). An NT-proBNP concentration > 128 pg/mL at 20 weeks of gestation predicts late events during pregnancy.[11,12]

3. Cardiovascular risk factors

Pregestational CVRFs increase maternal-fetal risk during pregnancy and for the rest of a woman's life. Furthermore, increasing maternal age is associated with a higher prevalence of CVRFs. The cumulative burden of CVRFs is associated with a higher risk of maternal cardiovascular complications, premature birth, and fetal death. Therefore, in the postpartum period, it is relevant to evaluate all women in the risk category in the puerperium and at 6 to 12 months postpartum. Instructions must be given about lifestyle changes, and implementing treatment of CVRFs has to be

Table 1: Modified World Health Organization risk scale.

Class	Pathology	Maternal event rate (%)
I No increased risk of mortality Low morbidity	• Small or mild uncomplicated injury including pulmonary stenosis, patent ductus arteriosus, or mitral valve prolapse Repaired simple lesions: atrial or ventricular septal defects, ductus arteriosus, and anomalous pulmonary vein return Isolated ventricular or supraventricular extrasystoles	2.5-5
II Slight increase in mortality risk A moderate increase in morbidity risk	• Unrepaired atrial or ventricular septal defect Repaired Tetralogy of Fallot Arrhythmias	5.7-10.5
II–III Intermediate increase in mortality risk	• Mild deterioration of the LVEF (> 45%) Hypertrophic cardiomyopathy Native valve disease not considered class I or IV Marfan syndrome without aortic dilatation Bicuspid aortic valve with dilated aorta < 45 mm Repaired coarctation of the aorta	10-19
III Significant increase in maternal mortality or serious morbidity	• LVEF deterioration (30-45%) Previous peripartum cardiomyopathy Mechanical prosthesis Systemic right ventricle Fontan circulation Cyanotic heart disease (unrepaired) Other complex congenital disease Moderate aortic dilatation: 40-45 mm in Marfan, 45-50 in the bicuspid valve, < 50 in Fallot	19-27
IV High risk or contraindicated pregnancy	• Pulmonary hypertension of any cause Severe LV dysfunction (LVFE < 30% or FC III-IV) Previous peripartum cardiomyopathy with impaired residual LVEF Severe obstruction of the left cavities (aortic valve area < 1 cm^2 or peak gradient > 50 mmHg or mitral valve area < 1.5 cm^2) Marfan syndrome with aortic dilatation > 45 mm. Bicuspid aortic valve with aortic dilatation > 50 mm Severe coarctation of the aorta severa Ehler Danlos and severe re-coarctation	40-100

LVEF = left ventricle ejection fraction.

Table 2: PAHO/WHO recommendations for the elimination of mother-to-child transmission (MTCT).

Moment	Interventions
Pregnancy	Routine screening in all pregnant women
	Care and follow-up in seropositive
Delivery	Parasitological tests in neonates of infected mothers (umbilical cord blood)
Maternal and child care	Treatment of mothers after childbirth
	Serological tests in children from 8 months
	Treatment in children before the year and serological follow-up
Other interventions	Diagnosis and treatment in girls and women of childbearing age
	Screening in newborn siblings with Chagas disease

done, informing about the implications for a future pregnancy and the increase in CVD risk.[13-16]

4. The obstetric history

The history of adverse evolution in previous pregnancies confers a higher risk of new events or complications, such as abortion or stillbirth, preeclampsia, gestational diabetes, placental abruption, or peripartum cardiomyopathy. At the other extreme, the absence of complications in previous pregnancies could indicate good tolerance to the stress of pregnancy.

5. Maternal age

Maternal age is not considered in the scales that assess the risk of cardiovascular complications in patients with heart disease. However, evidence shows that pregnancies in women over 35 are associated with more significant direct obstetric complications. In mothers over 40 years of age, the risk of cardiovascular complications increases markedly by preeclampsia, stroke, and coronary artery dissection.

PRE-PREGNANCY CONSULTATION

Pre-pregnancy evaluation in patients with heart disease allows:

1. To assess the maternal-fetal risk linked to heart disease.
2. To optimize the pre-gestational conditions of the risk factors.
3. To detect heart disease plausible for surgical correction.
4. To establish the interdisciplinary cardio-obstetrics team.
5. To define the level of complexity of the care center for the mother and the newborn.
6. To perform maternal treatment for Chagas disease.

Contact with the health system in these conditions is an ideal time to recommend lifestyle changes that will impact the mother and the offspring.

Likewise, it allows modifying contraindicated medication during pregnancy, such as angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin II receptor antagonists (ARBs), opting for drugs of proven innocuousness.

CHAGAS DISEASE AND PREGNANCY

Given the high prevalence of this entity in Latin America and its growing detection in North America and Europe due to migratory currents, research is imperative to reduce vertical transmission and congenital Chagas[4,17] *(Table 2)*.

Most women of childbearing age with positive serology are asymptomatic. In those with heart disease, the entity does not differ from other populations with rhythm disturbances or conduction disorders, dilated cardiomyopathy, ventricular dysfunction, and apical aneurysm with a thromboembolic risk. Neonatal congenital Chagas is usually asymptomatic, and early detection allows a cure rate close to 100%.

The indicated screening will be:

1. In the mother: 2 quantitative reagent tests IIF, ELISA, HAI, or particle agglutination.
2. In children: identify the parasite with micro hematocrit in the newborn and search for antibodies with serological tests from 10 months of life.

Follow-up during pregnancy of the patient with heart disease

The design of the follow-up and treatment plan will be marked by the type of maternal heart disease and the obstetric and fetal-neonatal conditions, for which the integration of a multidisciplinary team is valuable *(Table 3)*. On the other hand, the level of complexity of the health center where the mother and child are cared for will be assessed, considering adequate neonatology for extremely premature infants.[8]

Timing and mode of termination of pregnancy in patients with heart disease

The delivery time will depend on the maternal-fetal conditions trying to reach fetal maturity without putting the mother's life at risk by

Table 3: Follow-up strategies according to WHO category.

Clase	I	II	II-III	III	IV
Prenatal care Minimal follow-up visits Ending	Low complexity One or two during the current gestation Delivery in a high complexity center	Low complexity Once quarterly Delivery in a low complexity center	Referral center Bimonthly Delivery in a referral center	High complexity Monthly or bimonthly Delivery in a high-complexity center	High complexity Monthly Delivery in a high-complexity center

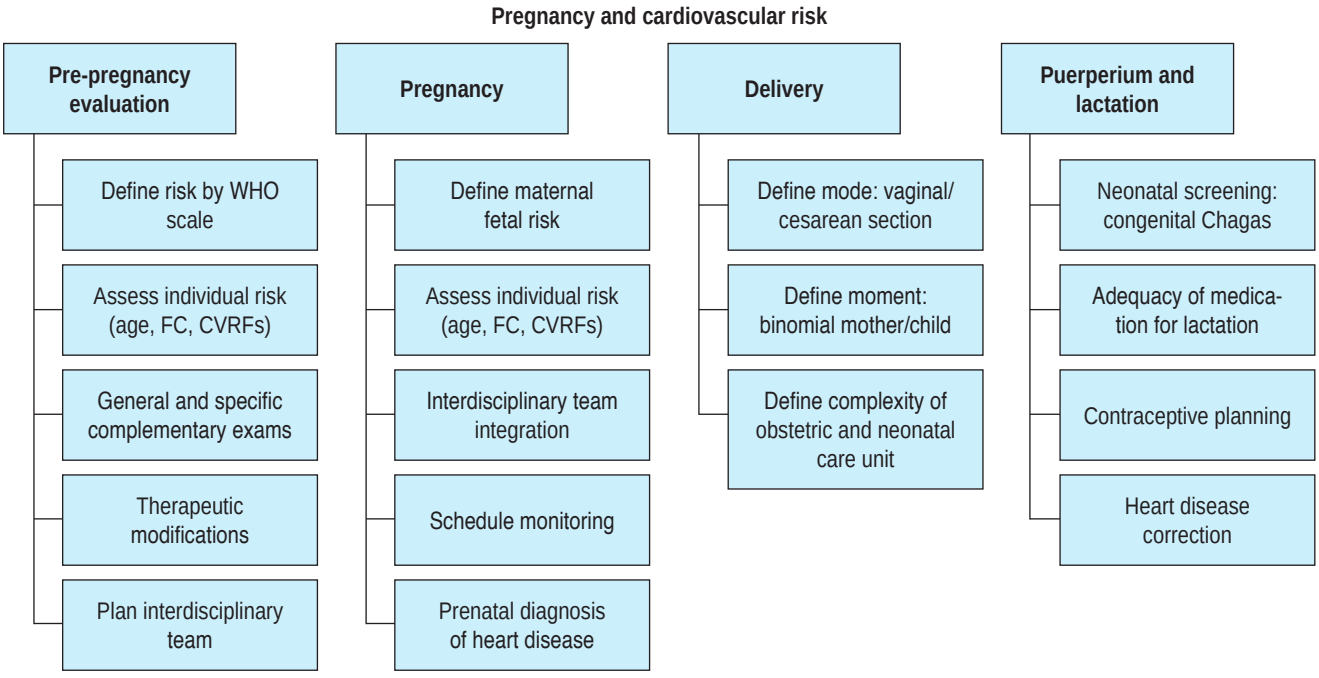

Figure 1: Conceptual framework of pregnancy and cardiovascular risk.
FC = functional class. CVRFs = cardiovascular risk factors.

prolonging the pregnancy. Vaginal delivery is always preferred, resulting in less blood loss and a lower risk of infection and venous thromboembolism. Elective cesarean section is of no benefit to the mother and should be considered when:

1. There is an obstetric indication for fetal distress.
2. In women taking oral anticoagulants.
3. In the presence of heart failure or hemodynamic decompensation.
4. Severe symptomatic aortic or mitral stenosis.
5. Severe forms of pulmonary hypertension.
6. Bicuspid aortic valve with an aortic root greater than 45 mm in diameter.
7. Marfan syndrome with an aortic root greater than 40 mm in diameter.

CONCLUSIONS

Pregnancy in women with heart disease challenges the treating team. It requires an individualized evaluation and interdisciplinary follow-up that, in the ideal scenario, should begin in the pre-gestational stage. In addition, pregnancy provides a valuable opportunity to indicate lifestyle modifications that will impact maternal and offspring cardiovascular health *(Figure 1)*.

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