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Study of Delivery Modalities in Women with Heart Disease: A Series of 30 Cases

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Abstract **Original Research Article**

In response to the increased metabolic demands of both the mother and the fetus, pregnancy is accompanied by numerous physiological, hemodynamic, and cardiovascular changes. A normal heart adapts to these changes; however, the presence of an underlying cardiac condition may create a maternal–fetal risk situation. This risk depends on the type of heart disease and its degree of severity. This is a retrospective descriptive epidemiological study conducted over a six-year period from January 2016 to December 2022, including 30 cases of cardiac patients who delivered in the emergency department and the Gynecology and Obstetrics I Department at Hassan II University Hospital in Fez. The objective of our study is to establish the epidemiological profile of cardiac parturients managed in the Gynecology and Obstetrics I Department of Hassan II University Hospital in Fez, to specify the particular aspects of managing cardiac parturients during pregnancy in preparation for delivery, to identify the different decisive parameters influencing the mode of delivery according to the underlying heart disease, and to compare our results with data from the literature. Thus, among 24,192 deliveries, 50 women had pre-existing or newly diagnosed cardiac disease (0.2%), of whom 30 were included in the analysis. The mean maternal age was 31 years. Valvular heart disease was the most common etiology (53.3%), followed by congenital heart disease (20%) and ischemic cardiomyopathy (10%). Cesarean delivery was performed in 56.6% of cases. Although 75% of patients had preserved left ventricular ejection fraction, significant maternal complications occurred in 13% of cases, including one maternal death, one ischemic stroke, and one pulmonary embolism.

Keywords: pregnancy; heart disease; epidemiology; mode of delivery; type of anesthesia; contraception; prognosis.

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I – INTRODUCTION

Pregnancy leads to several significant physiological changes to meet the increased needs of both the mother and the fetus. Among these changes, hemodynamic and cardiovascular adaptations play a crucial role. The main modifications observed include:

- ➢ An increase in cardiac output and heart rate.
- ➢ A decrease in systemic vascular resistance.
- ➢ An increase in the body's oxygen consumption.

A normal heart adapts to these changes; however, the presence of an underlying cardiac condition may create a maternal–fetal risk situation. This risk depends on the type of heart disease and its degree of severity.

In general, heart disease complicates 0.2% to 4% of pregnancies [1] and represents the leading cause of non-obstetric maternal mortality [2,3]. These conditions constitute a particularly heterogeneous group, which justifies a specific analysis according to the type of heart disease and its tolerance. Rheumatic valvular diseases remain predominant and continue to be a public health problem in developing countries.

Therefore, delivery planning is indeed a crucial step in the management of pregnant women with cardiac conditions. This category of parturients requires a multidisciplinary approach involving close collaboration between cardiologists, intensivists, and obstetricians in order to determine the mode of delivery and postpartum management, taking into account both maternal and fetal risks [4].

Based on these considerations, the aim of this study was to describe the clinical characteristics and maternal outcomes of pregnant women with cardiac disease managed, focusing on the mode of delivery, indications for the route of delivery, management during

labor and postpartum, as well as disease outcomes within the Moroccan population. This will provide a foundation for improved clinical management of this particular group.

II – MATERIALS AND METHODS

1. Type and Duration of the Study:

This is a retrospective descriptive study conducted in the Department of Gynecology and Obstetrics I at Hassan II University Hospital in Fez, over a six-year period from January 2016 to December 2022.

2. Study Population:

We analyzed 30 cases of parturients who were hospitalized in the Department of Gynecology and Obstetrics or in the Obstetric and Gynecological Emergency Unit for the management of high-risk pregnancies in the setting of congenital or acquired heart disease, diagnosed before or during pregnancy.

These patients delivered at term or preterm, either by cesarean section or vaginal delivery, experienced uncomplicated or complicated postpartum courses, and gave birth to live or stillborn newborns, whether premature or full-term.

3. Data Collection:

A standardized data collection form was used to gather information from medical records.

Patient files, clinical data, medical history, and outcomes were collected from the archives of the Department of Gynecology and Obstetrics, as well as from the central archive of Building G at Hassan II University Hospital in Fez. Data were also retrieved from the Hosix computerized system.

4. Data Analysis:

The statistical analysis was carried out in collaboration with the Laboratory of Epidemiology, Clinical Research, and Community Health at the Faculty of Medicine and Pharmacy of Fez. A simple statistical analysis was performed using Excel software.

Descriptive statistics were used to summarize patient characteristics, including age, sex, medical history, and disease duration.

Frequencies were used to describe qualitative variables, while means and standard deviations were calculated to represent quantitative variables.

III – RESULTS

The Department of Gynecology and Obstetrics I recorded a total of 24,192 deliveries in the Obstetric and Gynecological Emergency Unit at Hassan II University Hospital in Fez. Among these patients, 50 were followed for heart disease, corresponding to a frequency of 0.2%. Only 30 cases were included in our study, as the remaining records were excluded due to missing data.

The age of cardiac parturients ranged from 19 to 41 years, with a mean age of 31 years. There was a predominance in the 30–35 and 35–40-year age groups (Figure 1).

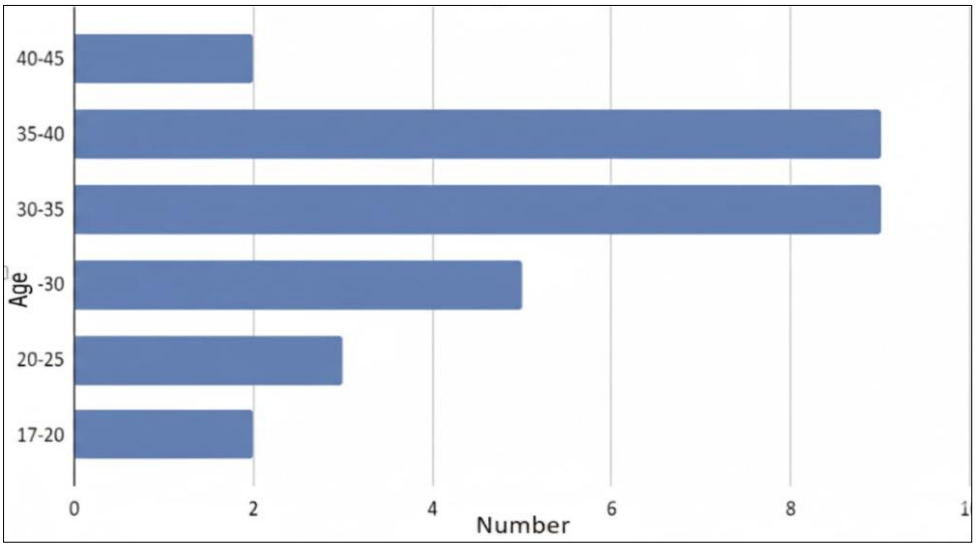


Figure 1: Age distribution of cardiac parturients

Valvular heart diseases were the most frequent, accounting for 53.3% of cases. Congenital heart diseases represented 20% of cases, ischemic heart disease 10%, cardiomyopathies 6.7%, isolated rhythm disorders 6.7%, and cardiothyreosis 3.3% (Figure 2).

Sixty percent (60%) of the patients were known to have heart disease prior to conception, whereas in 40% of cases the diagnosis was made during the ongoing pregnancy, often following acute decompensation, most commonly presenting as left-sided heart failure.

Sixteen-point five percent (16.5%) of the patients underwent invasive cardiovascular intervention, either cardiovascular surgery or endoscopic procedures. One patient underwent surgery for atrial septal defect during pregnancy. Seventy-five percent (75%) of patients had preserved ejection fraction (EF), while 25% had impaired EF.

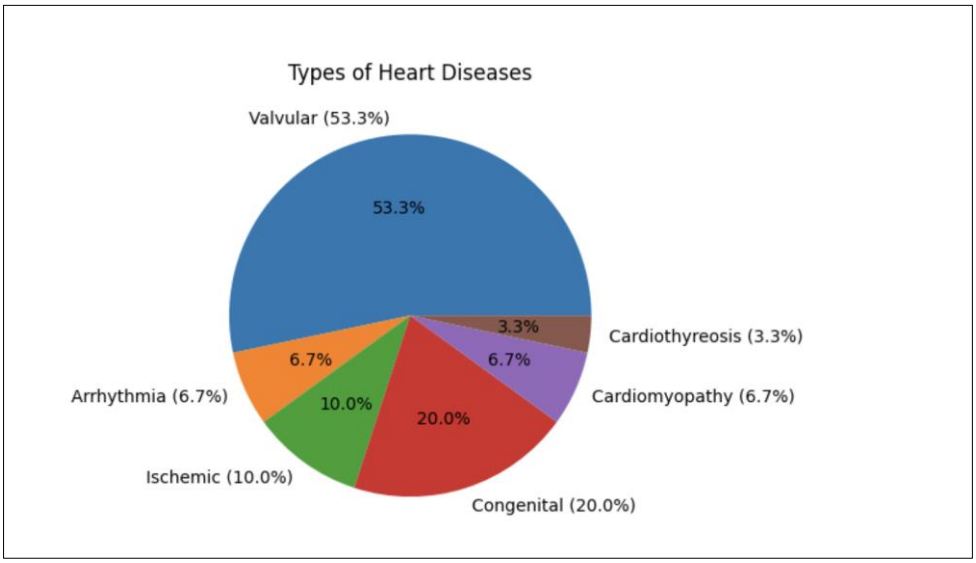


Figure 2: Types of heart disease

On transthoracic echocardiography, two patients had a well-functioning, non-stenotic mechanical mitral valve prosthesis in place.

Thirty percent (30%) of patients had mitral stenosis, four of which were classified as severe. Two patients (6.6%) presented with isolated mitral regurgitation, and four patients (13.33%) had combined mitral valve disease.

Regarding the aortic valve, 20% of patients had aortic regurgitation, including two cases classified as grade III, and one patient had combined aortic valve disease. No abnormalities of the aortic valve were found in 76.6% of cases.

Concerning the tricuspid valve, 40% of patients had no abnormalities, whereas 60% presented with moderate tricuspid regurgitation (grade II), including two patients with severe tricuspid regurgitation (grade III) (Table 1).

Valve	Condition	Number of Cases (%)
Mitral valve	**Mitral stenosis (MS)**	**9 cases (30%)**
	Mitral regurgitation (MR)	2 cases (6.6%)
	Mixed mitral valve disease	4 cases (13.33%)
	Mechanical valve prosthesis	2 cases (6.6%)
Tricuspid valve	Tricuspid regurgitation (TR)	18 cases (60%)
Aortic valve	Aortic regurgitation (AR)	6 cases (19.8%)
	Aortic valve disease	1 case (3.3%)
Valve prosthesis (overall)		2 cases (7.4%)

TABLE 1: Distribution of patients with valvular heart disease.

Note: a patient may have several types of valvular heart disease; the total number of patients with valvular heart disease is 16.

Three patients had ischemic heart disease: one with a history of circumferential myocardial infarction, one with a history of extensive anterior myocardial infarction, and one case of heart failure secondary to ischemic heart disease.

There were two cases of dilated cardiomyopathy, one case of supraventricular tachycardia, one case of Wolff–Parkinson–White syndrome, and one case of cardiothyreosis.

Regarding cardiac chamber status, right atrial dilation was observed in 20% of cases, while left atrial dilation was found in 50%. The right ventricle was dilated in 26.6% of cases. The left ventricle was dilated in five parturients, hypertrophied in two cases, and not dilated in the remaining 23 cases.

Two cases showed global hypokinesia, four cases had heterogeneous contractility, and twenty-four cases had homogeneous contractility. Ejection fraction was impaired in five cases. Filling pressures were elevated in 10% of cases, low in 3.3%, and normal in 86.7%.

Thirteen patients had pulmonary arterial hypertension (PAH), including seven with severe PAH. One case presented with a patent ductus arteriosus (PDA) with bidirectional shunt. Another case had dilation of the descending aorta associated with a large PDA. Two cases had severe coarctation of the ascending aorta with mild dilation of the descending aorta. Two cases had large atrial septal defects (ASD).

From an obstetrical perspective, one pregnancy was nonviable. In 26 cases (86.7%), delivery occurred at term, while 13.3% were preterm deliveries: two cases in a maternal rescue context (one due to cardiothyreosis and the other due to respiratory distress with cardiogenic shock in the setting of ASD), and two cases due to threatened preterm labor (Figure 3).

In 13 cases (43.3%), delivery was achieved vaginally, whereas 17 patients (56.6%) underwent cesarean section (Figure 4). Among cesarean deliveries, 35.3% were performed as emergency procedures. These were distributed as follows:

- Three cases of acute fetal distress (one in the context of intrauterine infection),
- One case of acute decompensation of dilated cardiomyopathy,
- One cesarean for maternal rescue in the setting of cardiothyreosis,
- One cesarean due to acute respiratory distress associated with ASD.

Regarding scheduled cesarean sections (Table 3), the indication was severe to very severe mitral stenosis in seven cases, coarctation of the aorta in two cases, and a multi-scarred uterus in two cases.

Among patients who underwent cesarean section, 64.7% received general anesthesia, while 35.3% had spinal anesthesia. Postoperative outcomes were uncomplicated in 83.3% of cases. However, 16.8% experienced postoperative complications, including one case of respiratory distress, one case of cardiogenic shock, and one case of delayed recovery from anesthesia.

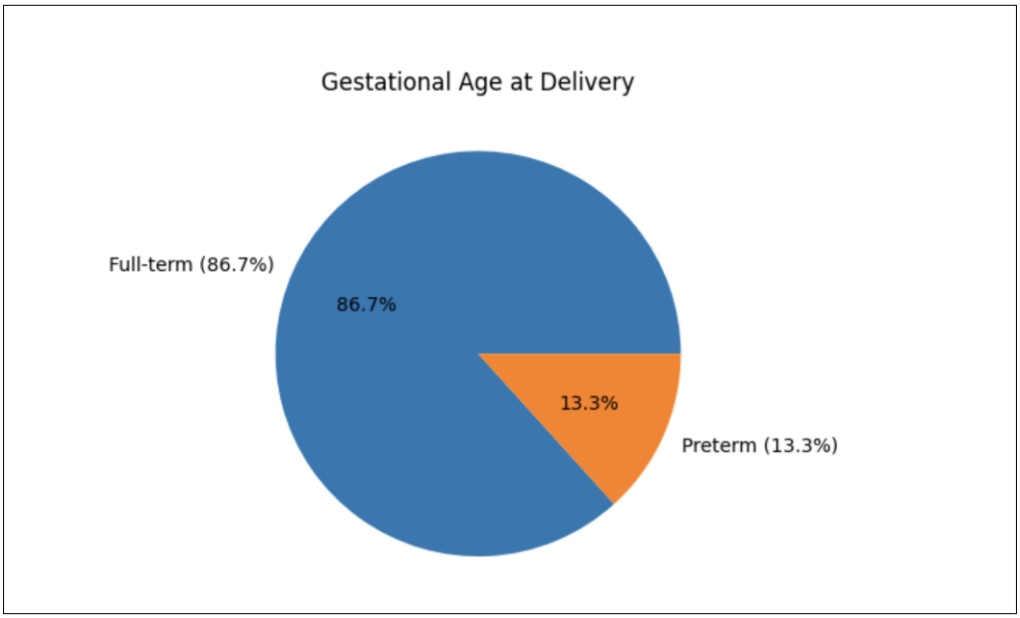


Figure 3: Gestational age at delivery

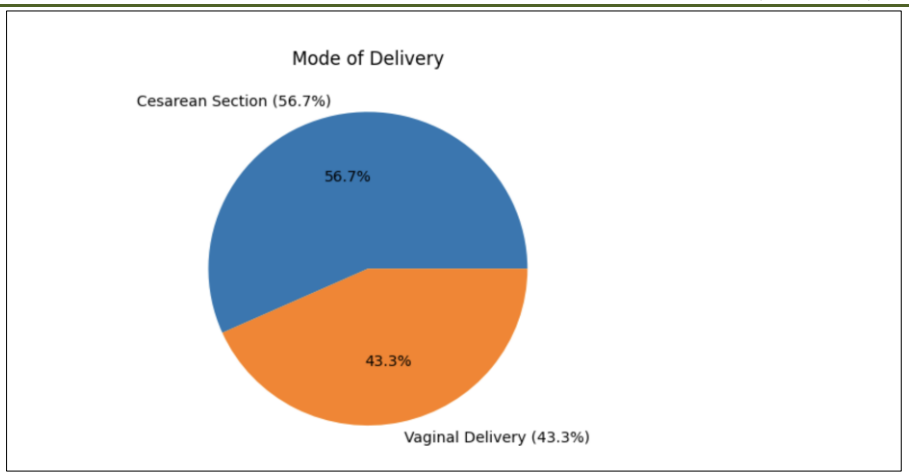


Figure 4: mode of delivery

Planned Cesarean Section in Our Series			
Frequency	64.7% (11 cases)		
Indications	Underlying Condition	Cardiac Indication	Obstetric Indication
	Mitral stenosis (7 cases)	+	N/A
	Wolff–Parkinson–White (WPW) syndrome	N/A	U2C
	Aortic coarctation (2 cases)	+	N/A
	Valve replacement	N/A	U3C

TABLE 2: Planned Cesarean Section in Our Series.

U2C / U3C = uterus with two / three previous cesarean scars

Postpartum outcomes were unremarkable in 27 parturients, with normal postnatal examinations and no cardiac complications.

One maternal death was recorded in the context of cardiothyreosis and severe preeclampsia after a 33-day stay in the intensive care unit.

One case of ischemic stroke involving the left terminal carotid territory occurred on postpartum day 8, resulting in right-sided hemiplegia associated with mutism and complicated by status epilepticus. The patient was transferred to the intensive care unit on postpartum day 8 and required neurosurgical intervention (decompressive craniectomy), with a favorable outcome.

One case of pulmonary embolism was also reported, with a favorable outcome (Figure 5).

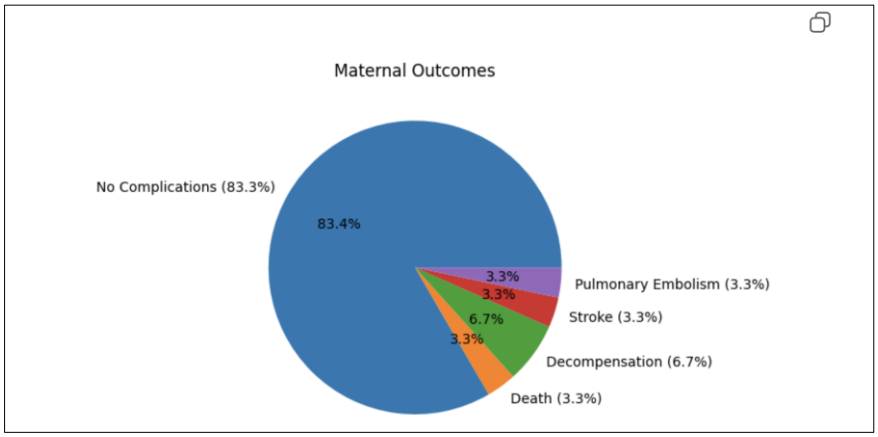


Figure 5: Postpartum outcomes

IV – DISCUSSION

In general, and according to data from the literature, the incidence of heart disease during pregnancy has significantly decreased over recent decades and currently averages around 1.5% (between 1% and 2%, with more recent estimates ranging from 0.1% to 1.4%) [1]. This decline is mainly attributable to advances in prevention as well as improvements in medical and surgical management of cardiac diseases.

In our series, the frequency of cardiac parturients relative to the total number of deliveries in our institution was approximately 0.2%. This is consistent with data from the Tunis series [7], which also reported a proportion of 0.2%, and is comparable to findings from the London [5] and French series [8], where the frequency was below 1%.

In our study, the mean age was approximately 31 years, which is consistent with findings in the literature: a mean age of 30 years in the Ait Idar study [6], 32 and 33 years in Algerian studies [9], 28 years in French studies [8], and similar findings in Senegalese studies [10].

Acute rheumatic fever (ARF), an inflammatory disease secondary to upper respiratory tract infection with group A beta-hemolytic streptococcus, is responsible for autoimmune joint, neurological, and especially cardiac involvement, particularly valvular damage. It remains a major cause of valvular heart disease, especially in developing countries. Its incidence varies according to the socioeconomic level of countries. In the United States, the incidence of ARF was 100 per 100,000 inhabitants at the beginning of the 20th century, 65 per 100,000 between 1949 and 1960, and less than 2 per 100,000 since the 1970s [12].

In our study, four patients had a history of ARF, representing 13% of the total sample. This proportion is markedly higher than the 4.7% reported as the Moroccan hospital incidence, which may be explained by the characteristics of the population studied.

We observed a clear predominance of rheumatic valvular heart disease, with a frequency of 53.3%. This finding is consistent with the literature, particularly in developing countries. Similar predominance has been reported in the Ait Idar series [6] (Marrakech, Morocco), Fattouma Bourguiba [13] (Monastir), Tunis [7] (Tunisia), Tlemcen [9] (Algeria), and Diao *et al.,*[10] (Dakar, Sub-Saharan Africa), with respective frequencies of 80.24%, 81%, 62%, 61%, and 92%.

In contrast, the Clermont-Ferrand and Lyon study [8] (France) also reported a predominance of rheumatic valvular disease but at a lower proportion of 41.6%. Frequencies do not exceed 13% in the London series [14] (United Kingdom), 10.8% in the German series by Verena [34], and 3.81% in the English series by Stephanie [14].

Indeed, rheumatic valvular disease remains a public health concern in developing countries, unlike in developed countries, where effective ARF prevention programs have led to its eradication or at least a significant reduction in its incidence.

In terms of frequency, congenital heart disease ranked second in our series. A predominance of congenital heart disease was reported in the London series [14], with a frequency of 69%. In fact, improved diagnostic accuracy and advances in medical and especially surgical treatment have allowed most patients with congenital heart disease to reach reproductive age and carry pregnancies with lower morbidity and mortality rates [15]. This explains the increasing frequency and predominance of congenital heart disease in developed countries, where reported frequencies range between 3.7% and 20% depending on the series.

Pregnancy represents a period of cardiac stress due to the hemodynamic changes that accompany it, which are necessary to ensure adequate fetal perfusion. Thus, previously well-controlled heart disease may decompensate and be revealed during pregnancy, as was the case in 40% of our patients (Table 3).

Table 3: Circumstances of Diagnosis

	Our study		**Ait Idar [6]**	
Circumstances of Diagnosis	Acute heart failure	80%	ICA	67,9%
	Chest pain	10%	Other : Stroke, cardiogenic shock – 24.69%	24,69%
	Palpitations	10%	Palpitations	4,93%

The choice of mode of delivery and anesthetic technique in cardiac parturients represents a real challenge for the healthcare team. In principle, vaginal delivery remains the preferred mode of delivery in most cases, unless there are specific obstetrical indications or worsening cardiac function secondary to the hemodynamic changes that intensify during labor or to blood loss associated with delivery.

In our series, cesarean section was predominant, with a frequency of 56.6%. These results are consistent with data from the European ROPAC registry [17], which included 1,262 parturients and reported a cesarean rate of 57.52%. Similar findings were reported in the Tunis [49], Oran [53], and Tlemcen [9] series, with respective frequencies of 60.71%, 64%, and 65%.

The rate of cesarean section for cardiac indications is relatively high, as observed in our series, as well as in the Tunis [7] and ROPAC [17] series. This may be explained by the tendency to schedule cesarean deliveries in cardiac patients as a precautionary measure, in order to avoid the hemodynamic changes associated with labor and their impact on cardiac function. These decisions are often based on clinical experience, in the absence of comparative studies evaluating maternal–fetal outcomes according to the mode of delivery (vaginal vs. cesarean).

In our series, cardiac indications for cesarean section included one case of cardiothyreosis, cases of acute decompensation in atrial septal defect (ASD) and dilated cardiomyopathy (DCM), two cases of coarctation of the aorta, and seven cases of severe mitral stenosis. Obstetrical indications included three cases of acute fetal distress and two cases of scarred uterus.

However, European recommendations restrict the use of cesarean section to the following situations:

- Use of anticoagulants in preterm patients when labor has already begun.
- Patients with Marfan syndrome and an aortic diameter greater than 45 mm (or even greater than 40 mm).
- Chronic or acute aortic dissection.
- Heart failure that cannot be controlled by medical treatment.

In other situations, the European Society of Cardiology recommends planned vaginal delivery under epidural anesthesia.

In cases of valvular heart disease, vaginal delivery under epidural anesthesia should be the rule, as it helps prevent the harmful hemodynamic effects of pain and uterine contractions. However, in patients with Marfan syndrome, cesarean delivery under general anesthesia is considered safer to prevent hypertensive surges during labor due to the risk of acute aortic dissection.

For patients with prosthetic heart valves, vaginal delivery should be preferred, with mandatory intravenous antibiotic prophylaxis to prevent infective endocarditis, even though official recommendations consider it optional [18].

In congenital heart disease, vaginal delivery should generally be preferred, and cesarean section in stable patients is usually indicated only for obstetrical reasons [24]. Labor should not be induced unless there is an obstetrical indication, as spontaneous labor is typically shorter and more likely to result in successful vaginal delivery. Prolonged labor should be avoided. Epidural anesthesia is recommended to minimize stress related to labor and delivery [19].

In Eisenmenger syndrome, definitive contraception is essential. If pregnancy occurs, early medical termination is recommended. If pregnancy continues, cesarean section should generally be avoided because it significantly increases maternal mortality [21], although this remains debated [22].

In primary pulmonary arterial hypertension, vaginal delivery is recommended under oxygen therapy and hemodynamic monitoring. Administration of prostacyclin (epoprostenol) and nitric oxide has shown effectiveness in some cases, although further confirmation is needed [27,28].

In coarctation of the aorta, hemodynamic evaluation should be performed before and during pregnancy, and beta-blocker therapy should be prescribed. Blood pressure control is delicate, as lowering upper limb pressure may lead to substructural hypotension, potentially compromising fetal development. In our series, two patients with coarctation of the aorta delivered by cesarean section, consistent with literature recommendations suggesting that cesarean delivery may be safer in these patients [27,28]. The current widespread use of stenting may reduce these concerns.

Women with a small patent ductus arteriosus (PDA) generally tolerate pregnancy well, as reported by Perloff [37]. However, in cases of significant shunt, heart failure may occur. Percutaneous closure during pregnancy is possible. In all cases, there remains a risk of infective endocarditis during delivery, justifying antibiotic prophylaxis. In our study, two patients delivered vaginally without complications.

In cases of atrial septal defect (ASD) or ventricular septal defect (VSD), pregnancy is generally well tolerated, and vaginal delivery is recommended.

In ischemic heart disease, the mode of delivery depends on the severity of cardiac involvement. The delivery plan should be discussed by the end of the second trimester. According to ESC recommendations [29], spontaneous labor and vaginal delivery are preferred, with epidural anesthesia and slow oxytocin infusion rather than bolus administration to avoid hypotension [38]. Delivery may be assisted using forceps or vacuum extraction, depending on maternal condition.

In hypertrophic cardiomyopathy, the choice of delivery mode depends on left ventricular size. In principle, rapid vaginal delivery is recommended if the patient's hemodynamic status allows it; otherwise, cesarean section is indicated.

Strict hemodynamic monitoring is always required during labor, including continuous electrocardiographic monitoring and pulse oximetry, and

occasionally invasive blood pressure monitoring. The use of forceps is frequent, sometimes systematic, in order to reduce maternal expulsive efforts.

Antibiotic prophylaxis is optionally recommended, especially in high-risk cardiac conditions, whereas it is not routinely recommended in lower-risk conditions [25]. However, due to the difficulty of predicting delivery-related complications and the potential consequences of infective endocarditis, intravenous antibiotic prophylaxis (amoxicillin ± gentamicin) is administered in most cases in practice.

Uterotonic agents such as oxytocin and ergometrine, which enhance uterine contraction, also have significant hemodynamic effects. Oxytocin may induce vasodilation and hypotension, while ergometrine may cause hypertension. These cardiovascular effects can be catastrophic if administered rapidly or at high doses; therefore, uterotonic drugs should be given as a continuous infusion at the lowest effective dose [20].

The early postpartum period is also potentially hazardous due to the hemodynamic impact of hemorrhage. Blood losses must therefore be promptly compensated [18,36].

After delivery, close in-hospital monitoring is required for at least two weeks. Even if pregnancy has progressed without complications, the postpartum period remains a high-risk phase.

Thromboprophylaxis with low-molecular-weight heparin (LMWH) is of major importance before and after delivery and should be continued depending on the mode of delivery and the specific underlying heart disease.

There is a significant causal relationship between the presence of underlying heart disease and the risk of both maternal and fetal complications [26]. This was demonstrated in the prospective comparative study by Siu *et al.,*[30], which evaluated neonatal and cardiovascular complications in 572 pregnancies (302 cardiac and non-cardiac controls). Complications were significantly higher in the cardiac group (18%) compared to the non-cardiac group (7%).

Maternal risks depend on the type of heart disease and its functional tolerance prior to conception, ranging from ventricular dysfunction to heart failure and even death. The highest mortality rates (25–50%) are observed in patients with pulmonary arterial hypertension, cyanotic congenital heart disease, and severe left-sided obstructive lesions (valvular or hypertrophic) [30].

Maternal prognosis mainly depends on the New York Heart Association (NYHA) functional class. Maternal mortality is estimated at less than 1% for patients in class I or II before pregnancy, and 6–7% for those in class III or IV [31].

In our study, the complication rate was 13%, which is comparable to the ROPAC series [17] (15%) and the German Verena series [34] (12.9%). The most frequent complications include thromboembolic events (pulmonary embolism, ischemic stroke), hemorrhagic complications related to anticoagulant therapy [32], heart failure, arrhythmias, and infective endocarditis.

This risk of complications can be predicted using the CARPREG score (Table 4)

Predictive Factors (1 point each)	
History of arrhythmia or prior cardiovascular event (heart failure, stroke, or transient ischemic attack before pregnancy)	**1 point**
NYHA functional class III or IV, or cyanosis (oxygen saturation < 90%)	1 point
Systemic ventricular outflow obstruction (subaortic atrioventricular valve area < 2 cm², aortic valve area reduced, or peak left ventricular outflow tract gradient > 30 mmHg)	1 point
Subaortic ventricular ejection fraction < 40%	1 point

Total CARPREG Score	**Estimated Maternal Cardiovascular Risk**
0 points	**5%**
1 point	27%
>1 point	75%

TABLE 4: CARPREG Risk Score and Estimated Maternal Cardiovascular Risk

Thus, the risk of maternal cardiac complications during pregnancy increases significantly with the number of predictive factors present.

The maternal mortality rate in our study was estimated at 3%, occurring in a patient with cardiothyreosis. This finding is close to the ROPAC data [16], which reported a mortality rate of approximately 1.8%. No maternal deaths were reported in the Oran study [11] or in the Saudi Arabian series [35].

Regarding fetal prognosis, the risk of preterm delivery is higher in cardiac parturients, mainly due to the risk of acute cardiac decompensation requiring cesarean section for maternal rescue.

In cases of congenital heart disease, the risk of recurrence of cardiac defects in the fetus is higher than in the general population and should be carefully assessed through prenatal echocardiography.

The risk of fetal growth restriction (FGR) and low birth weight is increased in the presence of pulmonary hypertension, gestational hypertension, or when certain medications are used during pregnancy, such as vitamin K antagonists (VKAs), beta-blockers, aspirin, and amiodarone.

No cases of fetal growth restriction were identified in our series. However, the literature reports several cases. For example, the study by Malhotra [36] showed that the rate of intrauterine growth restriction (IUGR) increased from 1.5% in non-cardiac patients to 5.7% in cardiac patients**.**

Pregnancy planning is mandatory in women with underlying heart disease. It allows determination of the optimal time for conception according to the patient's clinical and therapeutic status. It also helps prevent pregnancy when it is contraindicated.

For this reason, hormonal or mechanical contraception, and in some cases definitive sterilization, should be considered. However, objective data on the safety of different contraceptive methods in these patients remain limited, and many women do not receive adequate counseling.

Eligibility criteria for contraceptive methods have been defined by the HAS (French National Authority for Health) recommendations (Figure 6,7).

Categories of medical eligibility criteria for contraceptive use:

Category	Clinical Interpretation
🟢 **Category 1**	A condition for which there is **no restriction** for the use of the contraceptive method.
🟢🟡 **Category 2**	A condition for which the **advantages generally outweigh the theoretical or proven risks**.
🟠 **Category 3**	A condition for which the **theoretical or proven risks usually outweigh the advantages** of using the method.
🔴 **Category 4**	A condition that represents an **unacceptable health risk** if the contraceptive method is used.

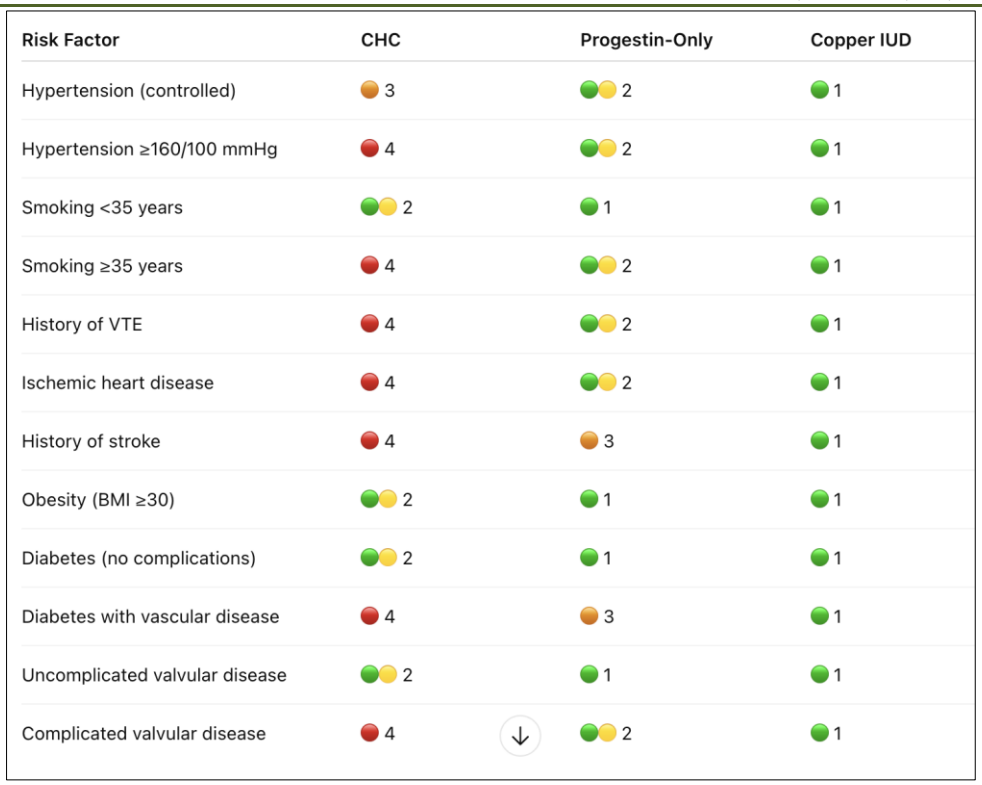
Color Code:

Green = Safe

Light green/yellow = Generally safe

Orange = Use with caution

Red = Contraindicated



Risk Factor	CHC	Progestin-Only	Copper IUD
Hypertension (controlled)	3	2	1
Hypertension ≥160/100 mmHg	4	2	1
Smoking <35 years	2	1	1
Smoking ≥35 years	4	2	1
History of VTE	4	2	1
Ischemic heart disease	4	2	1
History of stroke	4	3	1
Obesity (BMI ≥30)	2	1	1
Diabetes (no complications)	2	1	1
Diabetes with vascular disease	4	3	1
Uncomplicated valvular disease	2	1	1
Complicated valvular disease	4	2	1

Figure 6 et 7: Eligibility criteria for contraceptive methods have been defined by the HAS recommendations

Cu-IUD: Copper intrauterine device
POP: Progestin-only pill
LNG-IUD: Levonorgestrel-releasing intrauterine device
COC: Combined oral contraceptives
IVR: Intravaginal ring

V – CONCLUSION

The occurrence of pregnancy in women with underlying heart disease represents a high-risk situation for both maternal and fetal complications.

The hemodynamic changes accompanying pregnancy, labor, delivery, and the postpartum period expose patients to the risk of acute decompensation of the underlying cardiac condition. This risk is directly related to the type of heart disease and its degree of severity.

The management of pregnancy in women with heart disease is a real challenge. It begins in the preconception period, with proper counseling, planning, and preparation for pregnancy.

During pregnancy, careful and regular follow-up is essential, with monitoring tailored to the type and severity of the underlying cardiac condition.

This management requires close and coordinated collaboration between cardiologists, intensivists, obstetricians, and neonatologists, and should ideally be provided in a tertiary (level III) care center.

The choice of mode of delivery must be optimized to minimize the risk of complications and acute decompensation related to hemodynamic changes during pregnancy and labor, thereby improving both maternal and fetal outcomes.

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REFERENCES

1. Klein LL, Galan HL. Cardiac disease in pregnancy. Obstet Gynecol Clin North Am 2004 ;31 :429—59.222 J. Faivre et al.
2. Siu SC, Sermer M, Colman JM, Alvarez AN, Mercier LA, Morton BC, *et al.,* Prospective multicenter study of pregnancy outcomes in women with heart disease. Circulation 2001 ;104 :515—21.
3. Siu SC, Colman JM. Heart disease and pregnancy. Heart 2001; 85:710—5.
4. Expert consensus document on management of cardiovascular diseases during pregnancy. Eur Heart J 2003; 24:761—81.
5. PATRICK O'BRIEN AND MICHAEL DE SWIET Heart diseases and pregnancy London, UK Volume 30, issue 7, 2002, 1p july 2002, 195-198p, 2002 Elsevier.
6. Ait Idar, 2016, La prise en charge des parturientes cardiaques en réanimation A propos de 81 cas disponible sur

(http://wd.fmpm.uca.ma/biblio/theses/annee-htm/FT/2016/these91-16.pdf) Pan African Medical Journal. 2015; 21:140, doi:10.11604/pamj.2015.21.140.5915

7. This article is available online at: http://www.panafrican-med-journal.com/content/article/21/140/full/ © Khaled Khemiri *et al.,*The Pan African Medical Journal - ISSN 1937-8688. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
8. Arthur Flipo. Cardiopathie et Grossesse : Étude rétrospective de morbi-mortalité bi-centrique de 2011 à 2017. Sciences du Vivant [q-bio]. 2019. ffdumas-02445514.
9. Benzerdjeb Tlemcen, 2014, cardiopathie et grossesse, disponible sur : (http://dspace.univ-tlemcen.dz/bitstream/112/8310/1/cardiopathie-et-grossesse.pdf)
10. M. Diao. Pregnancy in women with heart disease in sub-Saharan Africa Archives of cardiovascular disease (2011) 104, 370—374
    Faiza Benatta, 2014, valvulopathies mitrales et grossesse. Oran
11. Frank PF, Stollerman GH, Miller LF. Protection of a military population from rheumatic fever. JAMA 1995 ;193 :775-81.
12. Article original Prise en charge du rétrécissement mitral durant la grossesse au centre hospitalo-universitaire d'Oran : à propos de 83 cas Management of mitral valve stenosis during pregnancy at the Oran university hospital center : About 83 cases N.F. Benatta ∗, D.D. Batouche, M.A. Djazouli, S.A. Zelmat, T. Merzouk, L. Hammou Faculté de médecine, Oran, Algérie Rec¸u le 11 juillet 2017 ; accepté le 24 avril 2021.
13. Stephanie L. Curtis a, Joanna Marsden-Williams b, Charlotte Sullivan b, Susan M. Sellers b, Johanna Trinder b, Mark Scrutton b, A. Graham Stuart Current trends in the management of heart disease in pregnancy International Journal of Cardiology 133 (2009) 62–6916. M. Malhotra*, J.B. Sharma, R. Tripathii, P. Arora, R. Arora
14. Yap SC, Drenthen W, Pieper PG. Outcome of pregnancy in women after pulmonary autograft valve replacement for congenital aortic valve disease. J Heart Valve Dis 2007; 16:398-403.
15. De Caterina R, Husted S, Wallentin L. Anticoagulants in heart disease: current status and perspectives. Eur Heart J 2007; 28:880-913.
16. Stout K, Otto C. Pregnancy in women with valvular heart disease. Heart 2007 ;93:552-8.
17. Rafik I, Rekhraj S, Parthasarathy H, Freeman L, Stanley K. Single- centre university hospital pregnancy outcomes in patients with cardiac conditions. Heart 2008;94(supplII): A89.
18. Bonnin M, Mercier FJ, Sitbon O. Severe pulmonary hypertension during pregnancy. Mode of delivery and anesthesic management of 15 consecutive cases. Anesthesiology 2005; 102:1133-7. Am J Obstet Gynecol 1999; 180:1045-6.
19. Weiss BM, Zemp L, Seifert B, Hess OM. Outcome of pulmonary vascular disease in pregnancy: a systematic overview from 1978 through 1996. J Am Coll Cardiol 1998; 31:1650-7.
20. Rosenthal E, Nelson-Piercy C. Value of inhaled nitric oxide in Eisenmenger syndrome during pregnancy. Am J Obstet Gynecol 2000 ; 183 :781-2.
21. Lust KM, Boots RJ, Dooris M, Wilson J. Management of labor in Eisenmenger syndrome with inhaled nitric oxide. Am J Obstet Gynecol 1999 ;181 :419-23.
22. Weiss BM, Hess OM. Pulmonary vascular disease and pregnancy: current controversies, management strategies, and perspectives. Eur Heart J 2000; 21:104-15.
23. Whittemore R, Hobbins JC, Engle MA. Pregnancy and its outcome in women with and without surgical treatment of congenital heart disease. Am J Cardiol 1982 ;50 :641-51.
24. Metcalfe J, McAnulthy JH, Ueland K. Heart disease and pregnancy. Physiology and management. Boston: Little Brown, 1986
25. Zuber M, Gautschi N, Oechslin E, Widmer V, Kiowski, Jenni R. Outcome of pregnancy in women with congenital shunt lesions.Heart 1999; 81: 271-275
26. Fernandes SM, Arendt KW, Landzberg MJ, Economy KE, Khairy P. Pregnant women with congenital heart disease: cardiac, anesthetic and obstetrical implications. Expert Rev Cardiovasc Ther 2010; 8:439—48.
27. Ahmad WAW, Khanom M, Yaakob ZH. Heart failure in pregnancy: an overview. Int J Clin Pract 2011 ;65:848—51.
28. Society of Cardiology (ESC). Eur Heart J 2011; 32:3147—97.
29. Tzemos N, Silversides CK, Carasso S, Rakowski H, Siu SC. Effect of pregnancy on left ventricular motion (twist) in women with aortic stenosis. Am J Cardiol 2008;101:870-3.
30. LAUDENBACH V. Cardiopathies et grossesse Conférences d'actualisation 2004, p.13-26.
31. B.Iung Valvulopathies et grossesse. La lettre de cardiologie Septembre 2008 ; n°417.
32. M. Malhotra*, J.B. Sharma, R. Tripathii, P. Arora, R. Arora Maternal and fetal outcome in valvular heart disease International Journal of Gynecology and Obstetrics 84 (2004) 11–16
33. Verena Stangl, Johanna Schad, Gabriele Gössing , Adrian Borges, Gert Baumann et Karl Stangl Maternal heart disease and pregnancy outcome: A single-centre experience Oxford journals, Volume 10, Issue 9 p 855-860.
34. Faiz SA, Al-Meshari AA, Sporrong BG. Pregnancy and valvular heart disease. Saudi Med J

2003;24(10):1098–101.
35. M. Malhotra*, J.B. Sharma, R. Tripathii, P. Arora, R. Arora Maternal and fetal outcome in valvular heart disease International Journal of Gynecology and Obstetrics 84 (2004) 11–16
36. Perloff JK, Koos B. Pregnancy and congenital heart disease: the mother and the fetus. In: Perloff JK, Child JS, editors. Congenital heart disease in adults. Philadelphia: WB Saunders; 1998. p. 144-64.
37. Pearson GD, Veille JC, Rahimtoola S, Hsia J, Oakley CM, Hosenpud JD, *et al.,* Peripartum cardiomyopathy: National Heart, Lung and Blood Institute and Office of Rare Diseases (National Institutes of Health) workshop recommendations and review.

VI – LIST OF ABBREVIATIONS

AAP: Antiplatelet agents
ACFA: Atrial fibrillation
ATL: Percutaneous transluminal angioplasty
AVK: Vitamin K antagonists
APGAR: Appearance, Pulse, Grimace, Activity, Respiration
AG: General anesthesia
ARB: Angiotensin II receptor blockers
AVCI: Ischemic stroke
ATCD: Medical history
LBBB: Left bundle branch block
AVB: Atrioventricular block
bpm: Beats per minute
CAV: Atrioventricular canal
CPB: Cardiopulmonary bypass
CDD: Circumstances of diagnosis
CHU: University Hospital Center
ASD: Atrial septal defect
VSD: Ventricular septal defect
DCM: Dilated cardiomyopathy
HCM: Hypertrophic cardiomyopathy
OCM: Obstructive cardiomyopathy
RCM: Restrictive cardiomyopathy
HD: Heart disease
IHD: Ischemic heart disease
COC: Combined oral contraceptives
CO: Cardiac output
Cu-IUD: Copper intrauterine device
LNG-IUD: Levonorgestrel intrauterine device
ARDS: Acute respiratory distress syndrome
ECG: Electrocardiogram
PE: Pulmonary embolism
PAC: Premature atrial contraction
PVC: Premature ventricular contraction
ESC: European Society of Cardiology
TTE: Transthoracic echocardiography
AF: Atrial fibrillation
HR: Heart rate
CVRF: Cardiovascular risk factors
EF: Ejection fraction
ABG: Arterial blood gases
SMFP: Singleton ongoing pregnancy
HAS: French National Authority for Health
LMWH: Low molecular weight heparin
FH: Fundal height
AR: Aortic regurgitation
AHF: Acute heart failure
ACEI: Angiotensin-converting enzyme inhibitor
MI: Myocardial infarction
IUI: Intrauterine infection
TOP: Termination of pregnancy
MR: Mitral regurgitation
INR: International Normalized Ratio
PPI: Proton pump inhibitor
LAD: Left anterior descending artery
LVF: Left ventricular failure
AD: Aortic disease
PTL: Preterm labor
IUFD: Intrauterine fetal death
MS: Mitral stenosis
RDS: Respiratory distress syndrome
CBC: Complete blood count
NO: Nitric oxide
NYHA: New York Heart Association
O_2: Oxygen
APE: Acute pulmonary edema
RA: Right atrium
LA: Left atrium
Limb edema: Lower limb edema
ENT: Ear, nose and throat
BP: Blood pressure
DBP: Diastolic blood pressure
SBP: Systolic blood pressure
CP: Cephalic presentation
POP: Progestin-only pill
BP (Breech): Breech presentation
SA: Spinal anesthesia
ARF: Acute rheumatic fever
IUGR: Intrauterine growth restriction
SVR: Systemic vascular resistance
AFD: Acute fetal distress
ACS: Acute coronary syndrome
GA: Gestational age
TAVI: Transcatheter aortic valve implantation
aPTT: Activated partial thromboplastin time
SVT: Supraventricular tachycardia
JVD: Jugular venous distension
CS: Cesarean scar
RV: Right ventricle
SV: Stroke volume
LV: Left ventricle
EDV: End-diastolic volume
ESV: End-systolic volume
WPW: Wolff–Parkinson–White syndrome