

Cardio-obstetrics: A Potential Global Development in the Reduction of Maternal Mortality

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ABSTRACT

Maternal mortality remains a global health concern, particularly in areas with limited access to quality healthcare. An innovative strategy known as cardio-obstetrics is gaining popularity because it has the potential to lower maternal mortality by emphasizing the complex interactions between cardiovascular health and obstetric outcomes. An overview of the developing area of cardio-obstetrics and its contribution to reducing maternal mortality globally is given in this abstract. The utilization of cutting-edge diagnostic technologies, risk assessment techniques, and individualized treatment strategies based on each patient's particular medical history are essential to the effectiveness of cardio-obstetric therapies. The field of cardio-obstetrics is aware of the crucial connection between poor fetal and maternal outcomes and pre-existing cardiovascular problems. It emphasizes how crucial it is for obstetricians and cardiologists to work together to provide complete treatment to expectant mothers with cardiovascular risk factors. By detecting and controlling these risks early in pregnancy, cardio-obstetrics seeks to prevent problems including thrombo-embolic events, heart failure, and hypertensive disorders, which are significant causes of maternal death. Cardio-obstetrics has a tremendous deal of potential to reduce maternal mortality, but to achieve fair worldwide adoption, problems such as unequal access to healthcare, lack of infrastructure, and the need for continued professional development must be addressed. Cardio-obstetrics is a progressive and all-encompassing approach to reducing maternal mortality. Recognizing the complex relationship between cardiovascular health and maternal outcomes allows healthcare systems to collaborate to implement strategies that save lives and improve maternal well-being around the world. This abstract highlights the importance of cardio-obstetrics as a developing discipline and its potential to make significant contributions to achieving the Sustainable Development Goals for maternal health.

Keywords: Adverse maternal outcomes, Cardio-obstetrics, Cardiovascular disease in pregnancy, Cardiovascular monitoring, Maternal health.

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INTRODUCTION

In India, approximately, 1.38 lakh women die on account of pregnancy-related complications.¹ Heart disease complicates between 0.3 and 3.5% of all pregnancies and constitutes 15% of pregnancy-related mortality.² Cardiac failure is a one of the most common complication in pregnancy usually leading to maternal death. Due to the physiological and anatomical stress that every organ system experiences throughout pregnancy, labor, and delivery, pregnant women are especially vulnerable to cardiac problems.³ Since pregnancies at higher age and typical risk factors including smoking, chronic hypertension, diabetes, and obesity as shown in Figure 1, is increasing, the risk of cardiovascular disease (CVD) has only increased.⁴ Late referral for cardiac evaluation has led to a greater risk of adverse cardiac outcomes during gestation.^{5,6} Early diagnosis and management of chronic diseases are essential for prevention as risk elements for CVDs continue to rise. For women susceptible to CVD, pregnancy is a natural stress test that presents uncommon opportunities to not only identify disease but also to put into practice efficient and long-lasting preventive measures.⁷

A multidisciplinary team-based approach to maternity care that involves cardiovascular medicine, the field of anesthesia neonatology, healthcare, social care, and pharmacy is referred to as cardio-obstetrics.⁸ Cardio-obstetric programs offer an essential role in identifying and assessing outcomes linked to various forms of maternal CVD.⁹

Gestational Physiological Changes

The intricate process of pregnancy results in substantial changes in the circulatory system. They are the alterations developed by

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the body to provide sufficient circulation between the uterus and placenta for development and growth of the fetus as well as to accommodate the increased metabolic demands of the fetus and mother.¹⁰

Pregnancy causes dilatation of the systemic vasculature which starts around 5 weeks and leads to full placental development and the establishment of the circulation between uterus and placenta.¹¹ Cardiac output rises throughout gestation.¹² In the early stages of pregnancy, it is likely that the increase in stroke volume will mediate cardiac output, but in the later stages, the increase will be attributed to heart rate. Stroke volume gradually rises throughout gestation till the end of the 2nd trimester, after which it either stays the same or starts to fall until the end of the pregnancy. During gestation, the blood pressure drops out of which diastolic blood pressure

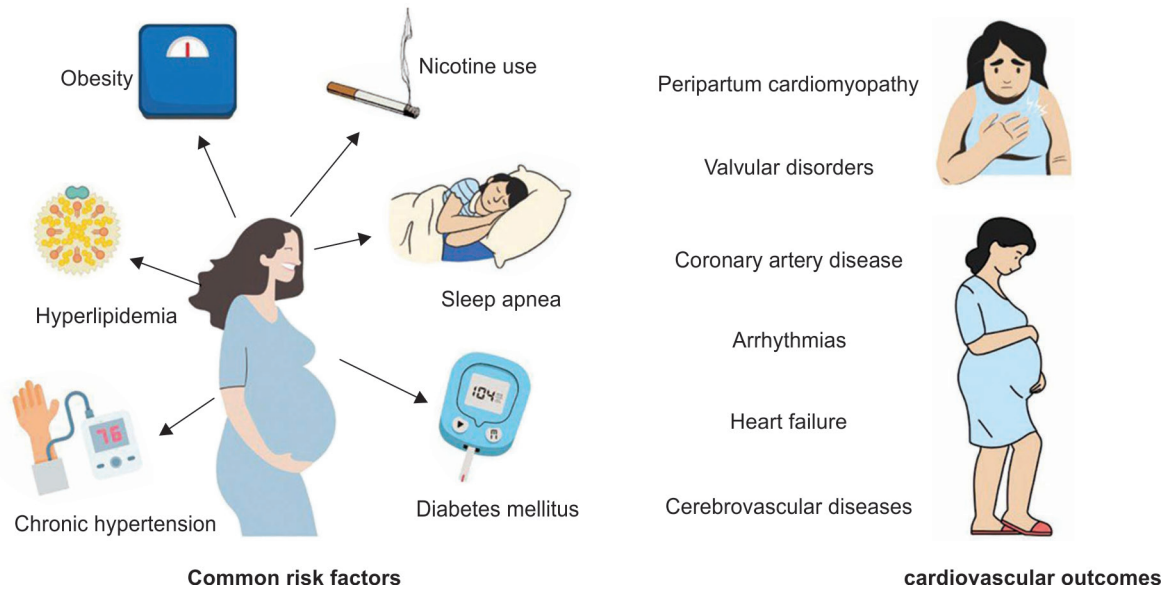


Fig. 1: Common risk factors and various outcomes of cardiovascular disease in pregnancy

and mean arterial pressure fall more than SBP.¹³ Throughout the pregnancy, the heart rate rises by 20–25% above normal levels.^{13,14} Vasodilatation and elevated levels of estrogen and progesterone are related; these levels undoubtedly grow significantly during pregnancy. During pregnancy, the corpus luteum produces the relaxin, a peptide hormone which is circulated throughout the body. It can be found during the secretory phase of ovulatory cycle. Serum concentrations reach a peak towards the final week of the first trimester after conception and gradually decline until midway through pregnancy.¹⁵ It has been demonstrated that this hormone acts as an endothelium-dependent vasodilator, affecting small arterial resistance arteries during pregnancy.¹⁶

The left ventricle's (LV) mass increases by 52% and wall thickness increases by 28%, above prepregnancy levels, among other structural alterations.¹⁷

Renin–angiotensin–aldosterone system (RAAS) activation and hormonal oscillations during pregnancy also aid in the body's increased plasma volume and decreased vascular resistance, in addition to the LV structural modifications. Essential fluid movements during delivery cause labile peripartum blood pressure, which frequently rise before birth and then falls within a week.^{10,18}

Pregnancy-related physiological can cause signs and symptoms that might be mistaken for CVD. Palpitations, shortness of breath, exhaustion, chest discomfort, and dizziness are typical signs of pregnancy. It takes a thorough way to distinguish cardiovascular symptoms from typical pregnant symptoms. It is not unexpected that symptoms were assigned to other diagnoses in the majority of women who died from CVD during pregnancy and/or the postpartum period and no one believed they had a cardiac illness.¹⁹

Women who have a confirmed elevated risk of developing CVD need to be recognized, followed up on, and treated when required. It is crucial for cardiologists, obstetricians, primary care physicians, and patients to communicate effectively, but more study is needed to determine the best way to follow and manage these patients over the long term.

MATERIALS AND METHODS

A detailed search was done on PubMed, Google scholar and Elsevier databases. Keywords such as cardio-obstetrics, cardiovascular prevention, maternal mortality, maternal and fetal outcome, CVDs in pregnancy, and physiological changes in pregnancy were used interchangeably and in combination to retrieve relevant studies which explicitly reported on cardio-obstetrics. The inclusion criteria consisted of all articles that were published in the last 5 years for which PubMed or the publisher provided open access. The articles that were excluded were not retrievable or discussed either the congenital heart diseases or the bleeding-related disorders. A total of 499 articles were found but only 33 of them were chosen to be included because it was determined that they were pertinent. These were selected following the Preferred Reporting Items for Systemic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive outline for the section method is given in Figure 2.

Risk Assessment

Several techniques for estimating mortality as well as morbidity risk in pregnancy with heart illness have been developed.

The risk score created in 1997 for the Cardiac Disease in Pregnancy Study has been validated in various retrospective investigations and is extensively used. The score categorizes risk assessing the presence of cyanosis, arrhythmias, past cardiovascular events, left heart blockage, and ejection fraction less than 40%. It is relevant to pregnant women with cardiac disease present since birth or developed later in life.²⁰

In 2018, the CARPREG II research improved predicted accuracy by combining general features with lesion-specific risk estimations like peripartum cardiomyopathy with unresolved left ventricular damage.

Based on a study on pregnancies, the Pregnancy in Women with a Congenital Heart Defect (ZAHARA) risk score was created in 2010.²¹ It varies from the original CARPREG score in that it incorporates more precise characteristics of prenatal cardiac illness, such as valvular heart disorders and cardiac medicines.

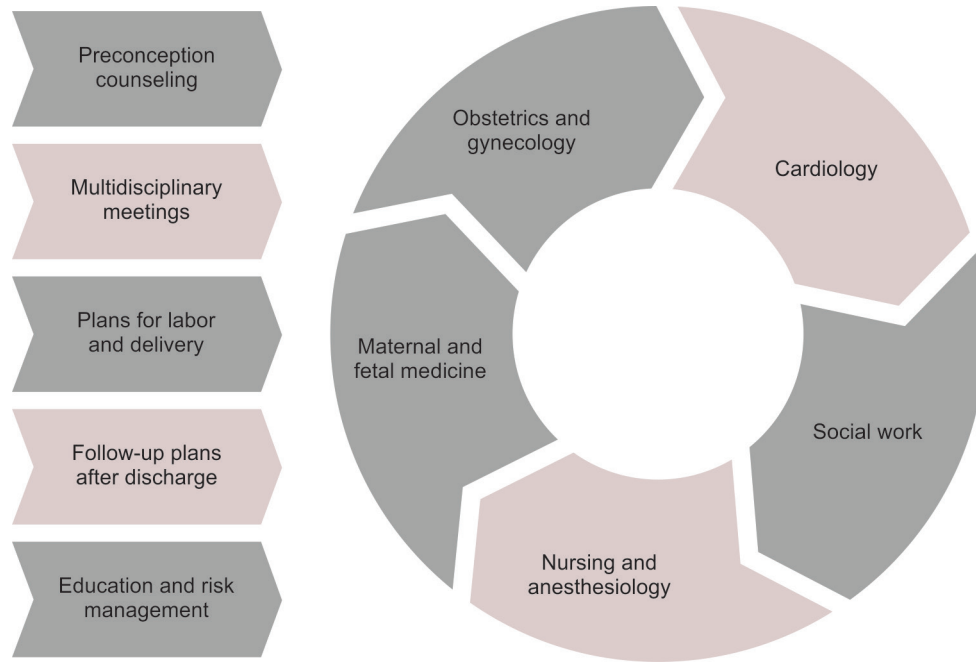


Fig. 2: PRISMA flowchart for selection of review materials for the article

The World Health Organization risk classification, developed by the European Society of Cardiology’s Task Force on the Management of CVD during Pregnancy, the Task Force on Pregnancy and Contraception, and others, blends information on comorbidities and inherited and acquired CVD. It may be more effective if it reflects on the wide range of pregnant women who are at danger. The WHO score has very poor predictability for cardiovascular incidents for class I patients, stating that the risk of pregnancy is equivalent to that in the general population.²²

Team-based Care

A team of devoted people pledged to providing care for this expanding female population is needed for cardio-obstetrics. Many facilities hold frequent multidisciplinary meetings when labor and delivery strategies are discussed for all expectant women who have any form of cardiovascular illness. Experts from cardiology, obstetrics, maternal-fetal medicine, anesthesia, and nursing are expected to be involved. The primary goal of this team is to carry out and plan for a safe pregnancy and safe delivery of the baby.

Cardio-obstetrics teams also offer assistance for planning of pregnancy. The interdisciplinary team counsels women with heart illness, past pregnancy problems, and risk factors, sometimes in collaboration with genetics counselors. Estimates of issue recurrence, preferred mode of delivery, as well as intensity of intrapartum examination and follow-up are reviewed with patients and their relatives. This type of planning enables collaborative decisions on conception planning.²³

The cardio-obstetrics team’s purpose is to offer complete maternity care. As shown in Figure 3, preconception guidance for women with already existing medical conditions, weighing referral vs co-management possibilities, promotion of treatment recommendations for high-risk maternal patients, and multidisciplinary case discussions where complicated situations can be discussed with a various care providers should all be included.^{5,24} There are also on-site mental health treatments easily accessible.

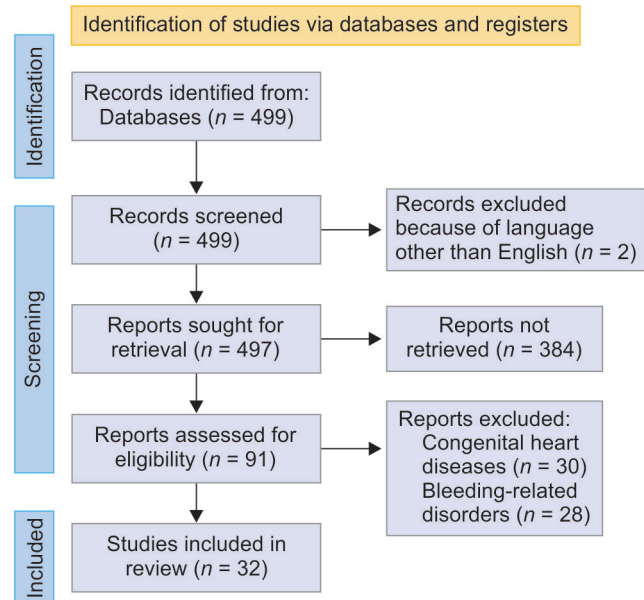


Fig. 3: The key factors of cardio-obstetrics team

Timing of Delivery

The cardio-obstetrics team should collaborate with the patient to develop a thorough, tailored delivery plan. Early delivery plans, generally in 20–28 weeks of pregnancy, should be established and recorded in the patient’s medical file. All health care experts engaged in the woman’s care should have easy access to the plan. This document ought to have suggestions for the place, time, and style of birth, intrapartum evaluation, dealing with problems, along with required resources, and a postpartum surveillance plan.²⁵ A coronary care unit may provide postpartum treatment for those women who are at high risk of experiencing complications after giving birth.



In the absence of spontaneous labor or recommended delivery before term, planned induction of labor may be attempted at 39 weeks of gestation for pregnant women with stable heart illness, with cesarean delivery normally reserved for obstetric grounds.^{26,27} Women with certain high-risk situations, such as significant cardiac problems or hemodynamic instability, may benefit from an earlier delivery. In accordance with the amount of risk, pregnant women with CVD should give birth at a hospital that offers sufficient maternal and newborn care.²⁸ Prior to delivery, the delivery plan should anticipate, specify, and document the resources needed to lessen mother and child health issues. In well-equipped hospitals where assistance is provided and care is overseen by an interdisciplinary cardio-obstetrics team, mothers with moderately to severely complex heart illness should give birth.^{18,28}

Preconception Cardiovascular Counseling

Many nulliparous women are unaware of the health dangers of pregnancy. Whether the patient is actively trying for a baby or not, all reproductive-age women should get preconception counseling. Women with CVD risk factors, on the other hand, should get prenatal counseling from specialized multidisciplinary cardio-obstetrics teams.^{8,9} Preconception counseling allows for preconception screening, elementary CVD mitigation and management of chronic health problems, which can be critical in betterment of mother, baby, and further children outcomes.²⁹ Nutritional inspections and reconciliation of medications before conception can enhance CVD management and lower the probability of teratogenic consequences. Because risk elements fluctuate with time, they should be reassessed before conception and during pregnancy.⁷

Intrapartum Cardiovascular Monitoring

A pulse oximeter should be used to check for maternal bradycardia, tachycardia, or hypoxemia in laboring women who have substantial heart illness. Women with increased risk of severe arrhythmias should be monitored with telemetry. Arterial lines are normally used only when blood pressure is high or low necessitating quick diagnosis and treatment (for example, severe valvular defects after cesarean section). Central venous access is seldom utilized during labor; however, it may be explored for women with severe cardiac failure who may need vasopressor support.

Delivery in Women Having Cardiovascular Diseases

With rare exceptions, vaginal birth with sufficient anesthesia is linked with lesser maternal problems and is the recommended method of delivery.¹⁸ Women with Marfan syndrome having dilated aorta greater than 45 mm and some other life-threatening aortic disorders, women who have had either a recent or recurring aortic dissection, women who take vitamin K antagonists for therapeutic anticoagulation, putting the baby in danger for intracranial hemorrhage during vaginal delivery, women with acute decompensated heart failure require immediate delivery.²² For severe cases of mitral and aortic stenosis, a cesarean birth should also be taken into account. Otherwise, vaginal birth is favored since it is linked to a shorter hospital stay and a lower risk of hemorrhaging, peripartum infections, and abrupt death.^{27,30} The cardio-obstetrics team has crucial duties regarding the time and manner of delivery. This choice is made easier if one is aware of the hemodynamic changes, physiology, and effects different stages of labor on the mother's particular state.

Postpartum Prevention and Counseling

Women with underlying illnesses are more likely to develop adverse pregnancy outcomes, and as a result, CVD later in life. Thus, for woman with cardiovascular risks or adverse pregnancy outcomes, regular check-up, evaluation, and coordinated care throughout the "fourth trimester" are critical. The 3 months following birth provide to ensure treatment continuation and strengthening of appropriate primary and secondary preventative approaches.⁷ All females are recommended to consult their obstetricians during the first 3 weeks after giving birth in order to develop an initial evaluation of specific requirements. These visits provide a chance to advise women whose pregnancies have been complicated by adverse outcomes of pregnancy about the higher chance of relapse in subsequent pregnancies, as well as the overall higher chances of cardiovascular illnesses.

Targeted interventions like Telemedicine have proven to assist women maintain exclusive breastfeeding, control mental disturbances after childbirth, and continue BP monitoring. Telemedicine can also assist close the social factors that influence the health gap by increasing health literacy and lowering the cost of routine examinations.³¹

The establishment of postnatal follow-up opens the possibility to further medicines to minimize cardiovascular risk, such as medication, comprehensive lifestyle modification, and patient and healthcare provider education, particularly about future pregnancy planning and CVD risk.³²

CONCLUSION

Over the last few decades, there has been a steady rise in cardiovascular risk factors, especially in reproductive females. Each of these risk factors raises the probability of a woman developing adverse pregnancy outcomes, experience greater rates of maternal morbidity and death, and have unfavorable fetal outcomes. Nonetheless, commencing right after birth, the cumulative unfavorable events raise a woman's lifetime risk of CVD. Women from rural regions are more at risk for acquiring cardiovascular risk factors and eventual illnesses due to their lack of access to care, inadequate insurance coverage, and poorer socioeconomic position.

Cardiovascular risk factor primary prevention and risk minimization should start before conception and continue during pregnancy. In the fourth trimester, 3 months after birth, continued follow-up can aid in the early detection of CVD; unfortunately, many women skip their postpartum checkups. During this critical time period, health system measures such as enhanced care coordination, patient awareness, and expanded online health services may enhance access to care and risk reduction. Appropriate disease detection and treatment can significantly enhance maternal and fetal outcomes throughout pregnancy and lower the overall CVD mortality rates.

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