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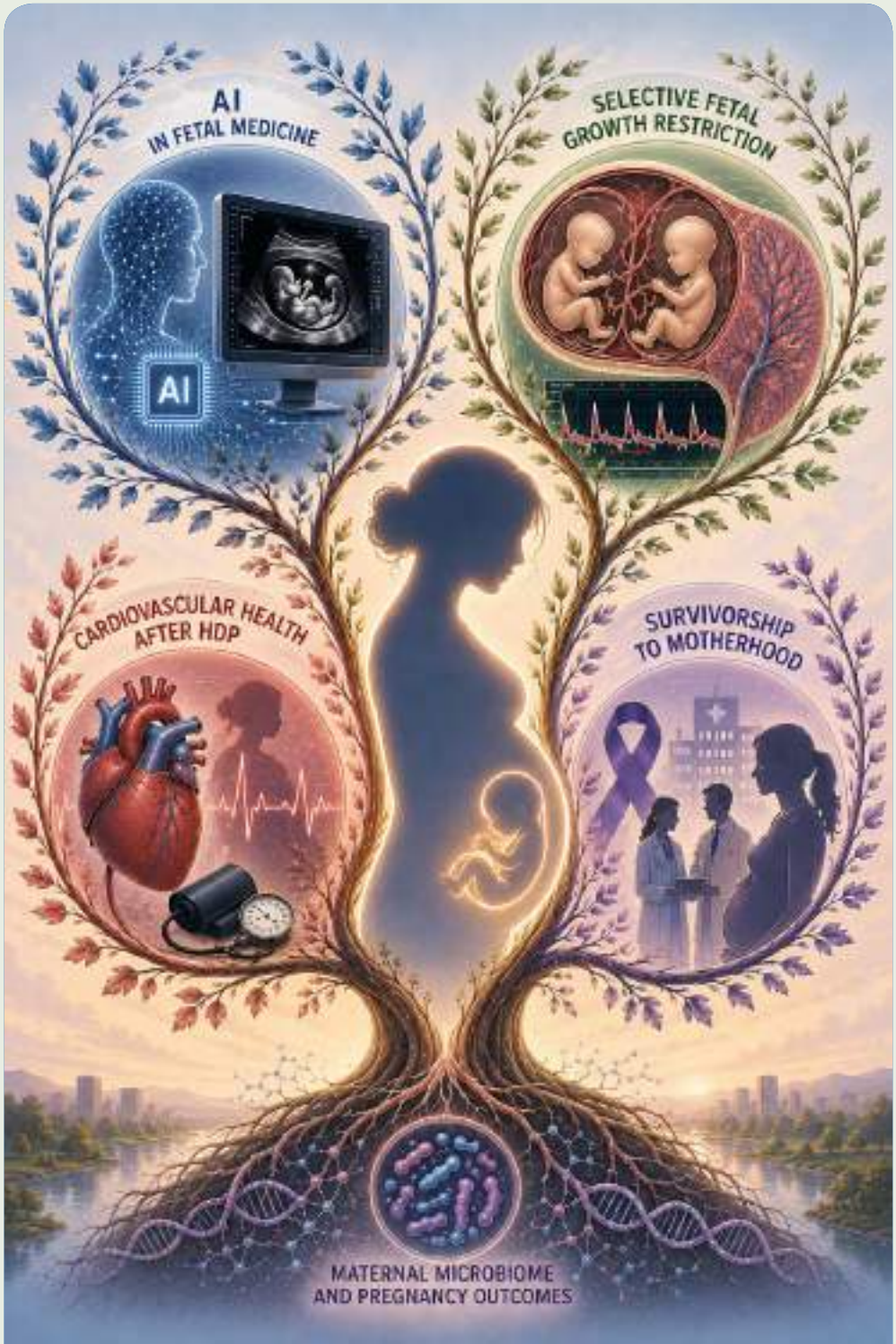

KERALA FEDERATION OF OBSTETRICS & GYNECOLOGY

KFOG JOURNAL

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PRESIDENT'S *message*

Dear KFOG Family,

It brings me immense pride and joy to address you all through this second issue of our KFOG Journal of the year, being released alongside our flagship mid-term conference, GESTICON 2026. I extend my heartfelt gratitude to the Kottayam Obstetrics and Gynecological Society (KOGS) for hosting this prestigious event in the scenic **"Land of Letters, Lakes, and Latex".**

Dr. Fessy Louis T
President,
KFOG 2026-27

As we deliberate during the 3rd International Obstetric Conclave, our focus remains sharp on our scientific goal: "Guidelines to Ground Reality: Strengthening Obstetric Practice". True professional care extends beyond standard reading; it requires translating complex, global academic frameworks into actionable, clinical maneuvers at the bedside. By addressing the gaps between theory and day-to-day practice, we reinforce patient safety and elevate the baseline of maternal and neonatal health care across Kerala. This journal issue serves as an indispensable tool, archiving valuable research and updates meant to help our clinical fraternity navigate everyday medical challenges with precision.

As we engage in this high-caliber academic feast, we are also on the cusp of celebrating Onam, our state's most cherished festival of harmony and prosperity. Onam reminds us of equity, dedication, and the joy of serving others. As gynecologists and obstetricians, we manage the very origins of human life, welcoming thousands of 'Mahabalis' into this world with safety and care. Let us take this festive season to rejuvenate our spirits, appreciate our mutual professional bonds, and reinforce our commitment to safe motherhood.

I congratulate the editorial team and the contributors to this journal. May the spirit of Onam bring peace, health, and fulfillment to your professional and personal lives.

Happy Onam!

Yours in service,
Dr. Fessy Louis T.,
President, KFOG

SECRETARY'S *message*

Dear Senior Colleagues and friends ,

It gives me immense pleasure to present the second Edition of the KFOG Journal,2026, a special issue dedicated to some of the most relevant and rapidly evolving areas in obstetrics.

This edition brings together insightful contributions from distinguished experts who have shared their knowledge on topics that have significant implications for contemporary clinical practice.

From the long-term cardiovascular health of women following hypertensive disorders of pregnancy, complexities of selective fetal growth restriction in twins , the influence of the maternal microbiome on pregnancy outcomes, and the expanding role of artificial intelligence in fetal medicine and to the management of pregnancy in cancer survivors , each article offers valuable evidence-based perspectives for clinicians and academicians alike.

I sincerely thank Dr. Bindu V. K, Dr. Basil Mathews, Dr. Dencymol, Dr Swapna C S and Dr.Shaheen Banu for their scholarly contributions and for enriching this edition with their expertise.

My heartfelt appreciation also goes to the Editorial Team under the hardworking and dedicated Editor, Dr Sangeetha D G for her dedication in bringing out yet another high-quality publication under the banner of KFOG. I hope this issue serves as a useful resource, stimulates academic discussion, and ultimately contributes to improving maternal and fetal care.

HAPPY READING..
Dr. Subhash Mallya
Secretary, KFOG

EDITOR'S *note*

Dear Seniors & Colleagues,

It is with immense gratification and profound honor ,that I welcome you to this second edition of KFOG journal for the year 2026.

The landscape of obstetrics is evolving rapidly, driven by remarkable advances in technology, molecular sciences, and multidisciplinary care. Today's obstetrician is expected not only to ensure safe childbirth but also to anticipate lifelong maternal health, optimize fetal outcomes, and integrate innovations into everyday clinical practice. This edition has been thoughtfully curated to reflect these changing paradigms.

Within these pages, our esteemed contributors explore five contemporary themes ranging from the transformative role of Artificial Intelligence in Fetal Medicine, to evidence-based management of Selective FGR, from understanding the long-term cardiovascular consequences of hypertensive disorders in pregnancy, to guiding women from cancer survivorship to successful motherhood, and finally unraveling the complex relationship between the maternal microbiome and pregnancy outcomes.Though diverse, these topics are united by a common goal—to improve the health of women before, during and beyond pregnancy.

My heartfelt gratitude to all the authors for sharing valuable insights, and to the President & Secretary General,KFOG,for their unwavering support in bringing this issue to fruition. As you turn these pages, I hope this edition stimulates thought and encourages discussion.

I also would like to wish you all an enriching academic experience at Gesticon 2026 at Kottayam.

Happy Reading!

Dr. Sangeetha D G
Editor, KFOG

01

HDP: A WINDOW TO FUTURE CARDIOVASCULAR HEALTH

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ABSTRACT

Pregnancy functions as a physiological cardiovascular stress test, and Hypertensive Disorders of Pregnancy (HDP) may either unmask an underlying predisposition to CVD or induce persistent vascular and metabolic dysfunction. Women with a history of HDP have a twofold increased risk of ischemic heart disease, stroke, and cardiovascular mortality, and an approximately fourfold higher risk of heart failure. This narrative review with evidence from current literature and international guidelines highlights the long-term cardiovascular and systemic consequences of HDP and emphasize the importance of postpartum surveillance and preventive care. HDP should be regarded as an early warning sign for lifelong cardiovascular disease rather than an isolated obstetric complication.

INTRODUCTION:

Hypertension is a frequent health problem during pregnancy, occurring in 5% to 10% of pregnancies, and is a contributing factor to maternal mortality in industrialized countries. The incidence of hypertension during delivery hospitalizations are rising owing in part to the increasing incidence of cardiovascular and metabolic illness in reproductive age, and advanced age of pregnancy, obesity, excessive weight gain being added risk factors. Hypertensive disorders of pregnancy (HDP) are no longer viewed as conditions confined to pregnancy. Instead, they are increasingly recognized as early independent markers of future cardiovascular disease (CVD) and other chronic illnesses.

Key Long-Term Health Risks

They are at an increased risk of early all-cause mortality and some cause-specific mortality (ischemic heart disease, stroke, diabetes).

Accelerated Aging: Pregnancy acts as a natural physiological "stress test". HDP indicates an underlying predisposition or can directly cause endothelial dysfunction, vascular damage, and accelerated arterial stiffening.

Hypertension & Metabolic Syndrome: Women who experience HDP are much more likely to develop chronic high blood pressure, type 2 diabetes, and hyperlipidaemia within 5 to 10 years postpartum. American Heart Association (AHA) and American College of Cardiology endorse preeclampsia as a risk-enhancing factor for hypercholesterolemia.

Coronary Artery Disease: Women with an HDP history face a roughly doubled risk of Ischaemic Heart disease, stroke, and overall cardiovascular mortality, as well as a fourfold higher risk of heart failure later in life and also linked to Peripheral Artery Disease and Atrial fibrillation.

Valvular Heart Disease: Emerging research indicates a link to accelerated valvular changes, including aortic stenosis and mitral regurgitation, later in life.

Cardiomyopathy: Preeclampsia is a known risk factor for cardiomyopathy, both peripartum and years after giving birth. These patients were at increased risk of cardiomyopathy for >5 years after giving birth compared with patients without such a history.

POSSIBLE AETIOLOGY:

Pregnancy is considered a cardiovascular stress test and metabolic stress test. Failure of appropriate cardiovascular adaptation during pregnancy (i.e., development of HDP) leads to the unmasking of physiological susceptibility to and risk of future Cardiovascular Disease (CVD). Epidemiologic data suggest that the increased risk of late cardiovascular morbidity/mortality in a previously preeclamptic patient can be attributed to underlying genetic factors and risk factors that are common to both disorders (obesity, metabolic abnormalities, dyslipidaemia, insulin resistance, hypercoagulable state).

In another model, pregnancy acts as a metabolic stress test for future development of diabetes. Preeclampsia induces physiologic and metabolic changes associated with CVD, such as endothelial dysfunction, insulin resistance, sympathetic overactivity, proinflammatory activity, abnormal lipid profile ,and cardiac remodelling that persist after giving birth, leading to late CVD and other disorders associated with these abnormalities.

Some of the proposed theories

Persistent Endothelial Dysfunction

Endothelial injury is central to preeclampsia. Although blood pressure normalizes after delivery in most women, endothelial dysfunction may persist for years, leading to:

- Impaired vasodilatation
- Accelerated atherosclerosis
- Vascular stiffness
- Microvascular dysfunction

Chronic Inflammation

Women with previous HDP demonstrate persistent elevation of inflammatory mediators including CRP, IL-6, TNF-alpha. This chronic inflammatory milieu contributes to accelerated vascular aging.

Cardiac Remodelling (Preeclampsia induced):

- Left ventricular hypertrophy
- Impaired diastolic function
- Increased ventricular stiffness
- Myocardial fibrosis

Some of these changes persist postpartum, increasing the future risk of heart failure.

Therefore, pregnancy and the postpartum period provide a unique early window of opportunity to estimate a woman's lifetime cardiovascular risk and consider intervention.

ADDITIONAL HEALTH HAZARDS:

- Patients with a history of preeclampsia, particularly with severe disease, appear to be at increased long-term risk for developing a mental health disorder, including post-traumatic stress disorder and depression.
- Patients with a history of a hypertensive disorder of pregnancy, particularly preeclampsia, were at increased risk of cognitive decline later in life, including vascular and young-onset dementia.
- Patients with a history of pregnancy-induced hypertension had a higher long-term risk of autoimmune diseases, particularly SLE and VTE compared with normotensive pregnancies.
- Women with a history of HDP are at increased risk of chronic kidney disease (CKD) and end-stage kidney disease (ESRD) 1.5 and 9 fold increased risk for women with gestational hypertension respectively, and a 2-3fold and 14 fold increased risk for women with pre-eclampsia, respectively, compared with normotensive women.

The future risk of cardiovascular morbidity and mortality appears to be related to the severity of preeclampsia, the gestational age when delivery was required, and the number of disease recurrences. Patients with early-onset severe preeclampsia with preterm birth are at highest risk of CVD later in life. The risk is particularly high if two or more pregnancies were affected or early-onset preeclampsia necessitated delivery before 34 weeks, or traditional risk factors are present.

Cardiovascular risk in women who have had a hypertensive disorder of pregnancy (adapted from NICE guideline ,2023

Risk of future cardiovascular disease	Any hypertension in current or previous pregnancy	Pre-eclampsia in current or previous pregnancy	Gestational hypertension in current or previous pregnancy	Chronic hypertension in current or previous pregnancy
Major adverse cardiovascular event	Risk increased (up to approximately 2 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.5 to 3 times)	Risk increased (approximately 1.7 times)
Cardiovascular mortality	Risk increased (up to approximately 2 times)	Risk increased (approximately 2 times)	(no data)	(no data)
Stroke	Risk increased (up to approximately 1.5 times)	Risk increased (approximately 2 to 3 times)	Risk may be increased	Risk increased (approximately 1.8 times)
Hypertension	Risk increased (approximately 2 to 4 times)	Risk increased (approximately 2 to 5 times)	Risk increased (approximately 2 to 4 times)	(not applicable)

RECOMMENDED PREVENTIVE MANAGEMENT

Current Guideline Recommendations

Major professional organizations including ACOG,AHA,ACC,ISSHP now recognize hypertensive disorders of pregnancy as important cardiovascular risk markers.

The American College of Cardiology/American Heart Association (ACC/AHA) guidelines on management of hypertension and hyperlipidaemia utilize the individual's predicted CVD risk in their recommendations. Beyond the traditional risk factors that have been incorporated into standard risk calculators, preeclampsia is one of the "risk-enhancing" factors that may significantly alter risk and may inform the clinician-patient discussion of ASCVD risk and primary prevention therapies.

Routine Screening: All primary care physicians must be aware of a patient's HDP history. Annual screenings for blood pressure, fasting lipid panel, and blood glucose (HbA1c) are critical.

Lifestyle Modifications: Maintaining a healthy body weight, exercising regularly, and consuming a heart-healthy low-sodium diet, cessation of smoking, stress reduction, adequate sleep etc are foundational to mitigating risks.

Proactive Interventions: Depending on one's overall risk profile, providers may recommend low-dose aspirin or closer monitoring of blood pressure trajectories, especially if hypertension persists postpartum.

The development of HDP is a way of identifying women with underlying, though often unrecognized, cardiovascular risk who are not involved in such a program but who would benefit from intervention and close clinical follow-up.

The Role of the Obstetrician

Obstetricians are uniquely positioned to initiate lifelong cardiovascular prevention.

Every woman discharged following an HDP-affected pregnancy should receive counselling regarding:

- Her increased cardiovascular risk
- The need for regular medical follow-up
- Lifestyle modification
- Communication of pregnancy history to future healthcare providers

CONCLUSION:

The development of HDP is a way of identifying women with underlying, though often unrecognized, cardiovascular risk who are not involved in any screening program but who would benefit from intervention and close clinical follow-up. The new guideline from the American College of Cardiology (ACC)/AHA recommends that all women aged 20 years and older should be assessed for cardiovascular risk factors at least every 4–6 years. Increased awareness about their CVD risk may increase the patient's motivation to reduce modifiable risk factors, if present. So this sector of patients provide as a potential sector of preventable cardiovascular morbidity and mortality and warrants more research in the area.

02

Selective Fetal Growth Restriction in Twins: Evolving Strategies in Diagnosis and Management

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Introduction

Selective fetal growth restriction (sFGR) in twins presents one of the most nuanced challenges in fetal medicine. While fetal discordance is common, not all cases are pathological. True sFGR—defined by estimated fetal weight (EFW) <10th centile with intertwin discordance ≥25%—implies underlying pathology and portends increased perinatal risks, especially in monochorionic (MC) twins. While it affects approximately 10% of dichorionic (DC) twins with 3.5% mortality, 20% of MC twins are affected by sFGR with twice as much mortality (7.5%).

Understanding Etiology and Risk

sFGR may stem from intrinsic fetal issues (genetic anomalies, infections, structural defects) or extrinsic placental factors like unequal placental sharing or discordant cord insertions.

MC twins are uniquely vulnerable due to shared vasculature, which complicates hemodynamic balance and risk of co-twin injury in the event of demise. It could be part of underlying twin twin transfusion syndrome (TTTS) or twin anemia polycythemia syndrome (TAPS) or even rarer post zygotic mutation.

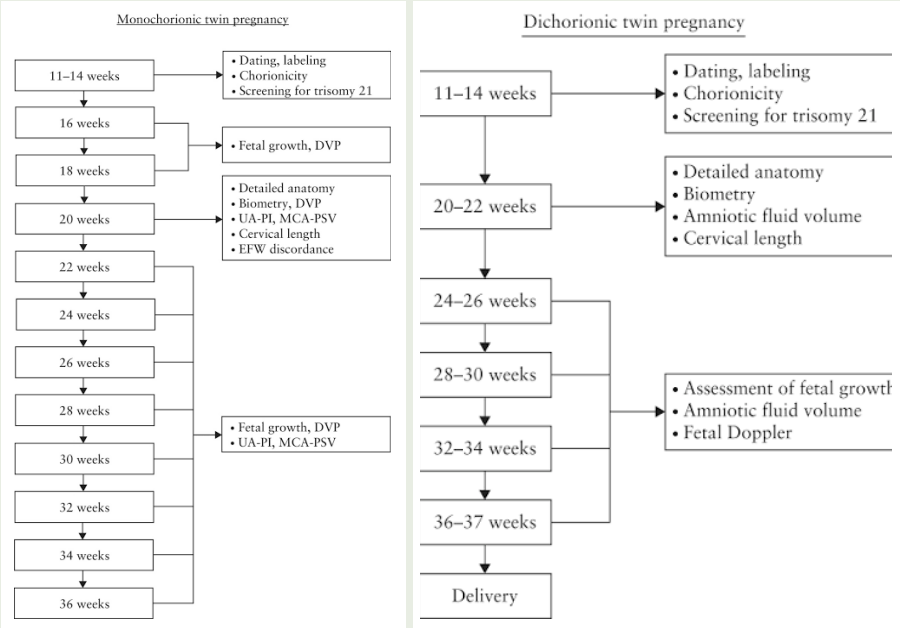
Workup

Suspicion of Discordant growth should follow a detailed biometry and doppler study to confirm the diagnosis. After confirmation a thorough ultrasound to rule out structural anomalies and possibility of congenital infections and associated conditions like TTTS and TAPS in MC twins.

Screening for sFGR in Twins:

Women with an uncomplicated DC twin pregnancy should have a first-trimester scan, a second trimester anomaly scan and scans every 4weeks thereafter. Uncomplicated MC twins should have a first-trimester scan and be scanned every 2weeks after 16 weeks, in order to detect TTTS in a timely manner.

Screening schedule in Twins (ISUOG guidelines 2025)



Diagnosis

Solitary criterion : Estimated fetal weight (EFW) of one twin falls below the 3rd centile.

ISUOG and Delphi guidelines outline contributary criteria that include :

Dichorionic Twins: 2 out of 3

- EFW <10th centile in one twin
- Intertwin EFW discordance ≥25%
- Umbilical artery pulsatility index (UA-PI) of smaller twin >95th centile.

Monochorionic Twins: 2 out of 4

- EFW <10th centile in one twin
- Intertwin EFW discordance ≥25%
- Umbilical artery pulsatility index (UA-PI) >95th centile
- Abdominal circumference of one twin <10th centile.

Discordance = EFW Larger Twin-EFW smaller twin/EFW larger twin

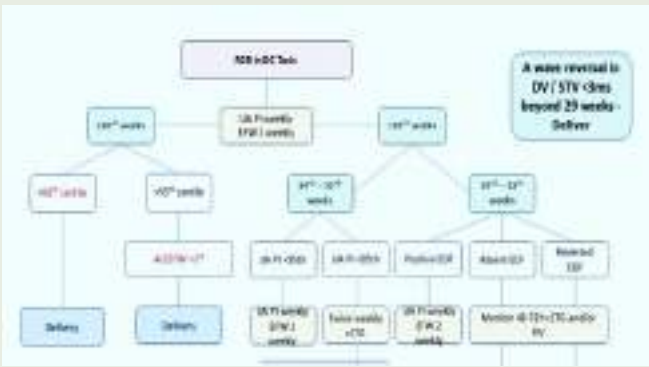
Early vs Late onset Fetal Growth Restriction in twins

Like singleton pregnancy, 32 weeks is taken as gestational age demarcation of early vs late FGR in DC twins, while in MC pair, it is 24 weeks.

Chorionicity-Specific Management

- Dichorionic Twins (DCDA):

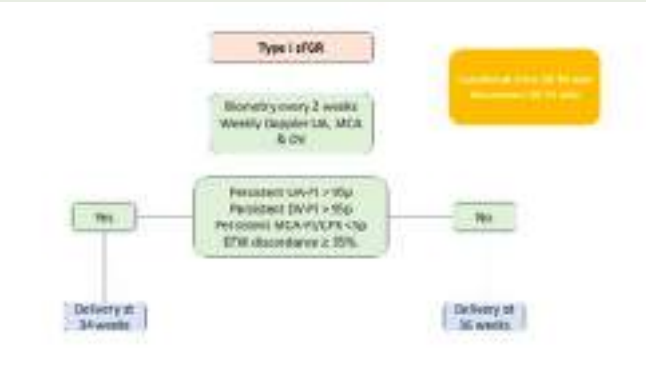
Although the incidence and mortality is half of MC twins, 80% of the twin cohort is DC pair, making it being the commonest scenario. Emphasis is on attaining salvageability of the larger twin at early gestation. Since they have separate placentas, their management mirrors that of singletons.The smaller twin is monitored for worsening Doppler trends; the larger twin is at risk from prematurity. Delivery decisions are guided by Doppler and gestational age thresholds—typically by 36 weeks if stable, earlier if AEDF/REDF or DV abnormalities arise.



- Monochorionic Twins (MCDA):

Here, classification by UA Doppler waveform is critical:

- Type I (persistent EDF): Favourable outcome, managed expectantly with delivery at 34–36 weeks.
- Type II (persistent AREDF): High risk of IUD and neurodevelopmental injury; consider early delivery or fetoscopic laser surgery.
- Type III (intermittent AREDF): Unpredictable course; associated with large arterio-arterial anastomoses. Consider intervention based on evolving doppler trends and gestational age.



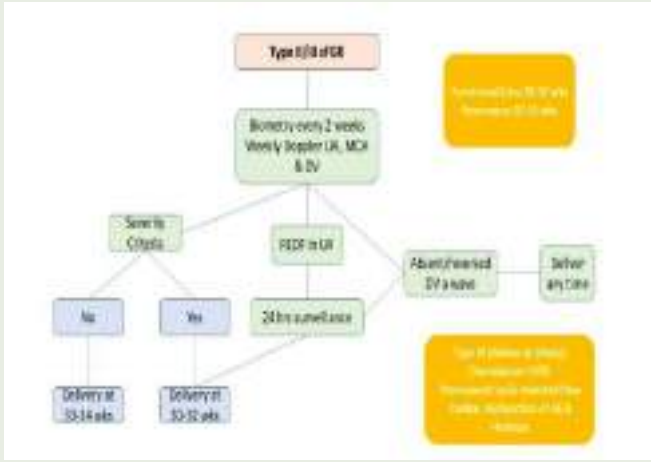
Management of Early onset FGR (TYPEII/III)

Fetal Surveillance and Delivery Timing

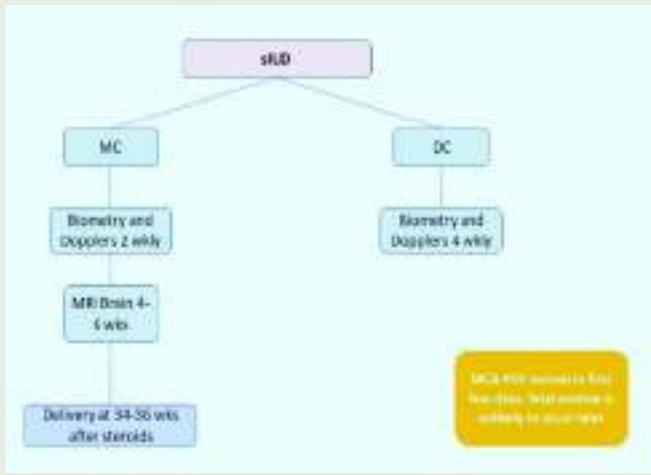
- Biometry every 2 weeks
- Doppler (UA, MCA, DV) weekly or twice weekly depending on severity
- Functional echocardiography (28–30 weeks) and neurosonography (30–32 weeks) recommended in high-risk cases
- Delivery: Based on type, gestation, and Doppler. Type II/III sFGR often warrant delivery at 30–34 weeks; Type I can be safely continued till 36 weeks with close monitoring.

Management Strategies

- Expectant Management: In Type I and some late-onset sFGR, to prolong pregnancy.
- Laser Ablation: In early-onset Type II/III sFGR, especially if TTTS is coexistent.
- Selective Feticide: Considered in severe early-onset sFGR where survival of the co-twin is jeopardized.
- Corticosteroids: For fetal lung maturity if preterm delivery is anticipated.



Management of MC twins with co twin demise



Delivery in Intervention:

- Cord occlusion / sIUD of FGR fetus after laser treatment: Obstetric guided mode of delivery by 36-37 weeks, or earlier if maternal-fetal complications.
- Laser treatment with survival of both fetuses: elective caesarean section

Single Intrauterine Demise (sIUD) in Twins

- sIUD in MC twins is a major concern due to shared circulation. Risk of neurologic injury to the survivor ranges from 15–20%. Prompt delivery is not always beneficial; conservative management with close follow-up and postmortem MRI at 4–6 weeks is often appropriate.
- Historically, sIUD in DC twin pregnancies was considered to pose minimal risk to the surviving co-twin, given the absence

of placental vascular anastomoses and the presence of separate placental circulations. However, emerging evidence indicates increased risks of adverse perinatal outcomes, including preterm birth, co-twin demise, and neurodevelopmental impairment in survivors. These findings underscore the importance of vigilant surveillance and timely intervention in DC twin pregnancies complicated by sFGR.

Key Controversies and Evolving Insights

- Delphi criteria vs traditional thresholds: Recent evidence suggests Delphi augmentation over the conventional diagnostic criteria identifies primarily "late-onset sFGR." without altering the management/outcome but increasing the sFGR burden and of surveillance.
- Discordancy cut-off 25%: Optimal cutoff of EFW discordance for prediction of sIUD varies with gestation (48% at 28 +0 –30 +6 weeks; 20% at 31 +0 –33 +6 weeks; 14% at 34 +0 –36 +6 weeks). Adopting 25% as uniform cut off might underdiagnose and gestational age may be added as a variable in diagnosis.
- Twin-specific growth charts: A decline in fetal growth velocity is typically observed after 30–32 weeks in twin pregnancies, more prominently in MC than DC pairs. Whether this represents a physiological adaptation or early placental insufficiency remains debated. Canadian guidelines currently endorse singleton growth charts, which may over diagnose sFGR in twins. In contrast, twin-specific charts may better reflect normal growth patterns and help avoid unnecessary interventions.
- Changing Doppler patterns: Contrary to earlier beliefs, umbilical artery Doppler patterns may evolve with advancing gestation in a subset of cases. A transition from type I to type II Doppler in late gestation, particularly in the context of sFGR, should be interpreted as disease progression. This highlights the need for heightened surveillance and timely intervention.

Conclusion

Management of sFGR in twins requires a nuanced, individualized approach that integrates chorionicity, gestational age, Doppler findings, and evolving fetal status. With evidence-based surveillance and timely intervention, outcomes for both twins can be optimized while minimizing unnecessary interventions.

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03

Maternal Microbiome and Pregnancy Outcomes

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Abstract

The maternal microbiome plays a pivotal role in pregnancy by regulating immune function, metabolism, placental health, and fetal development. Physiological changes during pregnancy alter microbial communities across the gut, cervicovaginal tract, oral cavity, urinary tract, and other body sites. Dysbiosis has been associated with gestational diabetes mellitus (GDM), preeclampsia, preterm birth, fetal growth restriction (FGR), and adverse neonatal outcomes. Advances in microbiome research have highlighted the complex interactions between maternal microbes, host immunity, and fetal development, offering opportunities for personalized preventive and therapeutic strategies to improve maternal and neonatal health.

Introduction

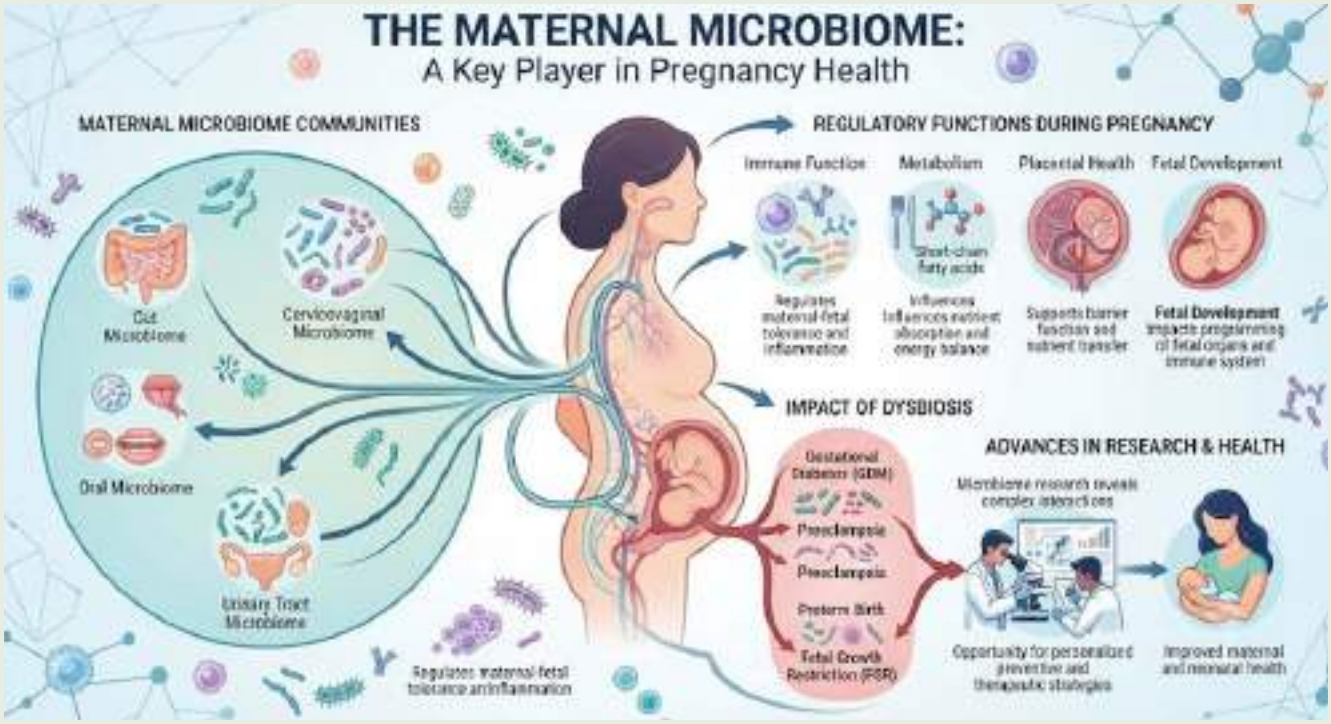
The human microbiome comprises trillions of bacteria, viruses, fungi, and other microorganisms that inhabit various body sites and interact closely with the immune, metabolic, and endocrine systems. During pregnancy, profound hormonal, metabolic, and immunological adaptations influence the composition and function of these microbial communities. A healthy maternal microbiome contributes to immune tolerance, nutrient metabolism, pathogen resistance, placental function, and fetal development. Conversely, microbial dysbiosis has been linked to pregnancy complications such as GDM, hypertensive disorders, preterm birth, FGR, and recurrent pregnancy loss. Increasing evidence suggests that maternal microbial communities function as interconnected ecosystems whose influence extends beyond maternal health to long-term offspring wellbeing.

Maternal Microbiome During Pregnancy

Pregnancy induces significant alterations in microbial composition across multiple body sites. These changes are influenced by hormones, genetics, diet, antibiotic exposure, obesity, environmental factors, and lifestyle. Each microbial niche performs specialized functions while communicating with other microbial communities through immune and metabolic pathways. A balanced microbiome promotes immune homeostasis, prevents pathogen colonization, supports nutrient metabolism, and facilitates normal fetal growth, whereas dysbiosis may increase susceptibility to obstetric complications.

Gut Microbiome

The gut microbiome is the most extensively studied maternal microbial community. Pregnancy, particularly during the third trimester, is asso-



ciated with changes that enhance energy harvest and nutrient storage to meet fetal demands. Gut bacteria produce metabolites, including short-chain fatty acids and secondary bile acids, that regulate glucose metabolism, lipid homeostasis, immune responses, intestinal barrier integrity, and placental function.

Alterations in gut microbial composition have been associated with GDM, maternal obesity, hypertensive disorders, systemic inflammation, and altered neonatal metabolic programming. Since microbial metabolites circulate throughout the body, the gut microbiome exerts systemic effects that extend well beyond the gastrointestinal tract.

Cervicovaginal Microbiome

The cervicovaginal microbiome plays a central role in reproductive health. In healthy pregnancy, Lactobacillus species predominate, producing lactic acid that maintains an acidic vaginal environment, suppresses pathogenic organisms, and supports local immunity. Pregnancy generally enhances Lactobacillus dominance and reduces microbial diversity.

Loss of Lactobacillus dominance with overgrowth of anaerobic bacteria results in dysbiosis, including bacterial vaginosis, which has been associated with spontaneous miscarriage, preterm birth, premature rupture of membranes, chorioamnionitis, postpartum infections, and neonatal morbidity. Host genetics, ethnicity, environmental factors, and socioeconomic conditions also influence microbial composition and pregnancy outcomes.

Urinary and Oral Microbiomes

The urinary tract is now recognized to possess its own resident microbiome. Pregnancy-related anatomical and physiological changes predispose women to urinary tract infections, making this microbial ecosystem increasingly relevant. Beneficial urinary microbes may prevent pathogen colonization through competitive inhibition and immune modulation, whereas dysbiosis has been associated with asymptomatic bacteriuria, recurrent urinary tract infections, pyelonephritis, preterm labor, and hypertensive disorders. Despite its potential clinical importance, the urinary microbiome remains relatively underexplored.

Hormonal changes during pregnancy also alter the oral microbiome, increasing susceptibility to gingivitis and periodontal disease. Chronic periodontal inflammation permits oral bacteria and inflammatory mediators to enter the circulation, potentially preterm birth, low birth weight, and preeclampsia, although definitive causality has yet to be established. Good oral hygiene and timely periodontal care may reduce systemic inflamma-

tion during pregnancy.

Respiratory and Upper Reproductive Tract Microbiomes

The respiratory microbiome has received comparatively little attention. Respiratory microbial communities interact with the host immune system, and respiratory infections during pregnancy may contribute to systemic inflammation that adversely affects fetal growth.

Similarly, the uterus and fallopian tubes, once considered sterile, have been shown to contain microbial DNA using molecular sequencing techniques. Current evidence suggests that microbial metabolites and bacterial components, rather than viable bacteria, may reach the placenta through maternal circulation and influence placental development and fetal immune programming.

Microbial Cross-talk and Immune Regulation

Current evidence indicates that maternal microbial communities function as an integrated network rather than isolated ecosystems. Communication occurs through microbial metabolites, extracellular vesicles, cytokines, and other immune mediators. For example, short-chain fatty acids produced by gut bacteria regulate immune responses in distant reproductive tissues, while inflammatory mediators arising from oral infections may influence placental function.

Pregnancy requires a delicate balance between maternal immune tolerance toward the fetus and protection against infections. The maternal microbiome contributes to this balance by regulating immune cell maturation, cytokine production, epithelial barrier integrity, and inflammatory signalling. Dysbiosis may promote chronic inflammation, contributing to complications such as preeclampsia, spontaneous preterm birth, FGR, GDM, and recurrent pregnancy loss.

Influence on Fetal Development

The effects of the maternal microbiome extend beyond pregnancy to influence fetal immune maturation, metabolic programming, and organ development. Microbial metabolites can cross the placental barrier even without direct microbial colonization of the fetus. These early developmental influences may affect susceptibility to allergies, obesity, autoimmune diseases, and metabolic disorders later in life. Optimizing maternal microbial health therefore has implications for both immediate pregnancy outcomes and lifelong offspring health.

Clinical Implications and Future Directions

Maternal microbial composition is shaped by numerous factors, including diet, obesity, antibiotic exposure, smoking, environmental pollutants, stress, socioeconomic status, ethnicity, and healthcare access. These determinants contribute to variations in microbial communities and may partly explain disparities in pregnancy outcomes across populations.

Although microbiome research has expanded rapidly, important knowledge gaps remain regarding causality, standardization of analytical methods, and translation into clinical practice. Microbiome-based interventions—including dietary modification, probiotics, prebiotics, synbiotics, postbiotics, and targeted microbial therapies—show considerable promise but currently lack sufficient evidence for routine obstetric use. Future studies integrating microbiological, immunological, metabolic, and clinical data are expected to facilitate precision obstetric care and improve maternal and neonatal outcomes.

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04

SURVIVORSHIP TO MOTHERHOOD: EVIDENCE BASED MANAGEMENT OF PREGNANCY AFTER CANCER

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Abstract

With advances in cancer diagnosis and therapy, survival after childhood and young adult cancers has improved markedly. Obstetric outcomes have become an increasingly important part of these survivors' long-term health sequelae. Although fertility preservation has become an integral component of cancer care, many survivors conceive spontaneously or through assisted reproductive technologies after successful treatment. Pregnancy following cancer presents unique clinical challenges, including concerns regarding fertility, maternal health, fetal outcomes, recurrence risk, and psychosocial well-being. Current evidence suggests that, for most cancer survivors, pregnancy is both feasible and safe when appropriately planned and managed

Introduction

Worldwide, approximately two million adult women of reproductive age (15–49 years) are diagnosed with cancer each year. As a growing population of children and young adults survive their disease, the focus of oncology has necessarily broadened from developing a cure alone to encompass survivorship and quality of life. The long-term medical, psychological, and social sequelae of cancer are increasingly recognized as integral components of post-treatment care. Among these, the ability to conceive and bear children has emerged as a defining contributor to emotional well-being, particularly as many individuals in long-term remission reach reproductive age and begin to consider family building as an essential marker of recovery and normalcy, hence, early referral to reproductive medicine specialists enables informed decision-making.

Various organ specific complications, pregnancy related risks also mitigate the need for targeted preconception counselling, vigilant individualized antenatal monitoring, and interdisciplinary survivorship care integrating oncology, obstetrics, and reproductive medicine.

Pre-pregnancy counselling

- Fertility preservation and genetic counselling are important topics to discuss with cancer survivors.
- Systematic review and meta-analysis demonstrate that female cancer survivors also face an increased risk of preeclampsia, gestational diabetes, and miscarriage, likely

mediated by persistent immunologic, vascular, metabolic, and psychosocial alterations induced by cancer and its treatment, with effects that may persist post-oncologic remission

- Women are advised to defer pregnancy until after the period of highest recurrence risk ; hence a 2-year waiting period post-treatment is recommended to minimize recurrence risk during pregnancy. Ensure adequate folic acid supplementation.
- Those with cardiotoxicity before pregnancy carry an increased risk of cardiac failure during or shortly after childbirth. It is recommended to have a cardiomyopathy investigation with echocardiography.
- Thyroid function tests (TFTs) are recommended annually for survivors who received radiotherapy to the neck, spine, or brain, especially in childhood.
- Pulmonary function tests (PFTs) are recommended in those treated with bleomycin, or chest or total body irradiation
- Thromboprophylaxis should be based on the individual risk assessment.
- Cisplatin causes nephrotoxicity, renal function tests and urinalysis before pregnancy are recommended.
- Liver function and enzyme tests should be assessed before pregnancy.
- The psychological journey toward parenthood following cancer is often complex. Survivors frequently experience anxiety regarding recurrence, fear of infertility, concerns about transmitting hereditary cancer predisposition, and uncertainty regarding long-term parenting . Comprehensive psychosocial support, involving psychologists, reproductive specialists, oncologists, and obstetricians, significantly improves quality of life and facilitates informed reproductive decision-making
- Current international guidelines recommend discussing fertility preservation with all reproductive-age patients before initiating gonadotoxic therapy.

Available some of the fertility preservation strategies include:

- ◇ Embryo cryopreservation
- ◇ Oocyte cryopreservation
- ◇ Ovarian tissue cryopreservation
- ◇ Ovarian transposition before pelvic radiotherapy
- ◇ Gonadotropin-releasing hormone agonists during chemotherapy in selected patients

- Female cancer survivors who have undergone stem cell or bone marrow transplantation are at risk of developing graft-versus-host disease (GVHD) during pregnancy. GVHD is managed through immunosuppression and should be well controlled before planning pregnancy.

Cancer	Eligible patients	Fertility-preserving option	Key recommendations
Endometrial cancer	Stage IA, grade 1 endometrioid carcinoma	LNG-IUS ± oral progestins	Close endometrial surveillance every 3–6 months
Ovarian cancer	Stage IA unilateral epithelial (selected), malignant germ cell, sex cord stromal tumors	Unilateral salpingo-oophorectomy with staging	Completion surgery after childbearing if indicated
Cervical cancer	IA1–IB1 (selected)	Conization or radical trachelectomy with lymph node assessment	Individualized according to stage, tumor size and LVSI

- Cancer and its treatment impacts nutritional absorption, emphasize the need for nutritional counselling to ensure both maternal and foetal health during pregnancy.
- **All recurrences at any stage in pregnancy should be managed as active cancer .**

Antenatal care surveillance

- Obstetric review in first trimester
- Discuss options – continuation vs. termination of pregnancy, especially if unplanned pregnancy or conceived within 2 years of treatment.
- Detailed history at booking and risk assessment for nutrition, venous thrombotic events (VTEs), pre-eclampsia, gestational diabetes, and mental health assessment.
- Consider low-dose aspirin if high risk for pre eclampsia.
- Routine first-trimester combined screening and monthly scans for foetal wellbeing in third trimester
- No contraindication to cell-free DNA testing, if no suspicion of recurrence
- Foetal echocardiography if recent exposure to chemotherapy; consider foetal medicine review for anatomy scans if conceived on or within 3 months of cytotoxic treatment
- Cervical length assessment (2- to 4-weekly) in second trimester and consider progesterone/ cerclage if length <25 mm
- Current advice in breast cancer survivors is to be off tamoxifen for 9 months prior to conception. Discuss resuming tamoxifen post-delivery.
- Consider the duration of trastuzumab (Herceptin®) treatment, pausing during peri-conception given its potential embryotoxicity, and resuming treatment post-delivery in cancer breast survivors.

Intrapartum care

- Offer vaginal delivery where appropriate
- No absolute indication for induction of labour
- Caesarean section for obstetric indications or previous or extensive radiotherapy
- Obstetric anaesthetic review especially if known cardiorespiratory changes due to cytotoxic drugs or radiotherapy
- No evidence of increase in postpartum haemorrhage
- Cover with intravenous steroids if ongoing steroid treatment in pregnancy.

Postnatal care

- Breastfeeding: encourage unless there is a contraindication to this.
- Contraception: individualize options, intra-uterine devices can be offered immediately postpartum
- VTE prophylaxis
- Offer psychological and mental health support

Conclusion

Pregnancy following cancer is increasingly common and, in most women, can be safely achieved with appropriate planning and multidisciplinary care. Although cancer therapies may compromise fertility and increase certain obstetric risks, current evidence indicates that pregnancy does not generally worsen cancer prognosis nor substantially increase adverse fetal outcomes. Early fertility counselling, individualized preconception assessment, and coordinated obstetric-oncology management are fundamental to optimizing maternal and neonatal outcomes.

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ARTIFICIAL INTELLIGENCE IN FETAL MEDICINE: CURRENT APPLICATIONS AND FUTURE PERSPECTIVES

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ABSTRACT

The ultrasound scan is ubiquitously used for fetal surveillance in contemporary practice. It not only detects fetal abnormalities but also helps for tailored care to optimize maternal and neonatal outcomes. However its performance is reduced sometimes by the factors like fetal mobility or position and maternal factors like excessive thickness or the presence of post-surgical scars of the maternal abdominal wall. Artificial Intelligence (AI) powered tools has revolutionized prenatal care by early diagnosis of congenital anomalies, prediction of pregnancy complications and automated monitoring. Despite strong retrospective performance, most tools remain investigational due to limited external validation, lack of explainability and poor integration.

INTRODUCTION

Fetal medicine is an advanced subspeciality which primarily focuses on the development of unborn baby to optimize neonatal outcomes. The key components are genetic screening, detection of congenital anomalies, management of fetal diseases and assessment of fetal well-being. Ultrasound imaging is standard technique used for fetal surveillance. AI in fetal medicine is an emerging frontier reshaping the landscape of prenatal care and diagnosis. Fetal medicine which traditionally depends on specialists' discerning eyes and expertise , is now being augmented by AI's powerful ability to analyze complex data with precision.

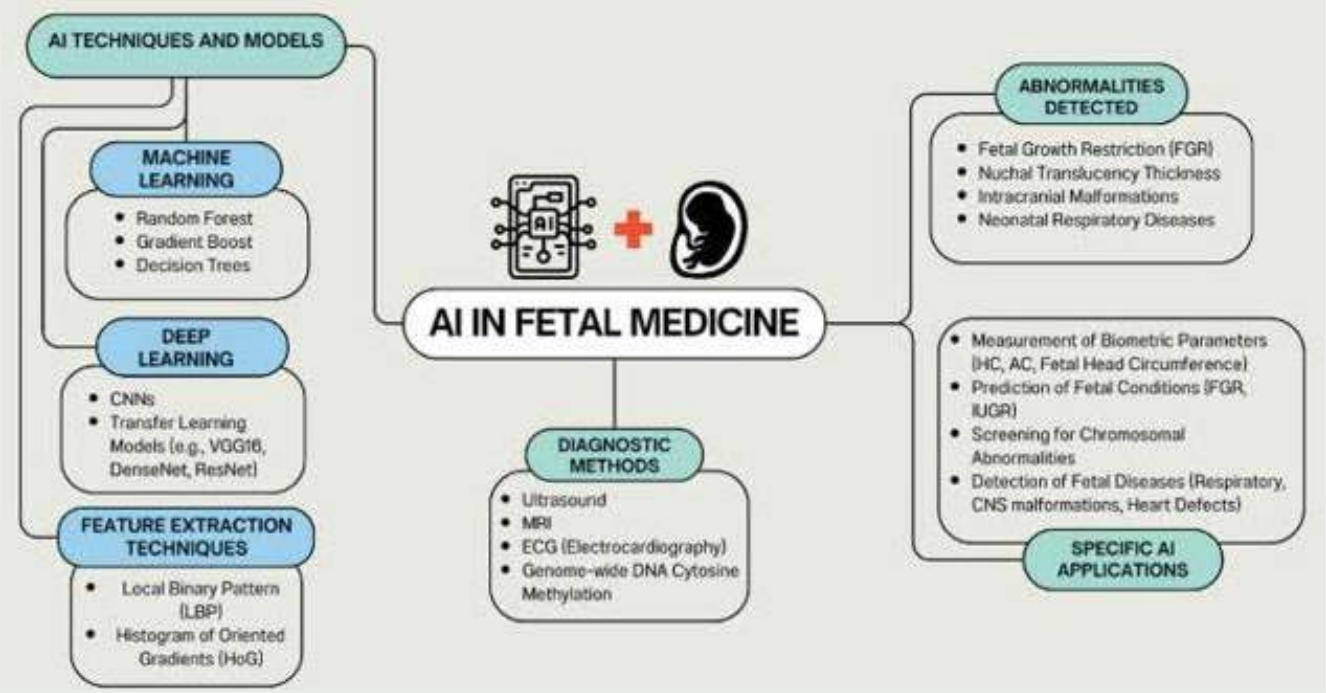
APPLICATIONS OF AI TECHNIQUES: underlying techniques are used in fetal medicine.

- Machine learning algorithms
- Deep learning models
- Natural language processing
- Computer vision
- AI driven algoritms.

CLINICAL IMPLICATIONS :

AI IN FIRST TRIMESTER:

The first trimester of pregnancy is the most critical period of fetal development. An early pregnancy scan not only confirms viability and location of pregnancy but also determines the period of gestation. AI technology using contrast enhancement and morphological reconstruction significantly enhance the efficiency and accuracy by filtering false regions.



DETECTION OF ANOMALIES:

Congenital malformations occur is about 3% of pregnancies and are leading cause of neonatal morbidity and mortality. Antenatal detection improves postpartum intervention and neonatal outcomes. Congenital heart diseases are the most common followed by central nervous system abnormalities and about 90% of these anomalies occur in low-risk population. AI- assisted ultrasound assessment has improved detection rates and precision with accuracy rates exceeding 90% in recognizing these anomalies. The advanced computer-based algorithms not only have the potential to detect subtle cues but also help in prognosticating and guide delivery planning through multidisciplinary collaboration.

PLACENTAL IMAGING:

Placenta previa occurs in approximately 0.5% (1 in 200) pregnancies at term and carries a significant risk of life-threatening maternal haemorrhage and preterm birth. Automatic placenta localization using predefined segmentation model has a sensitivity of 81% and a specificity of 82% and thus assist in identifying high risk pregnancies and timely referral to tertiary care centre for safe delivery.

AI IN FETAL BIOMETRY AND GROWTH ASSESSMENT :

Artificial intelligence (AI) method for estimating fetal weights based on the gestational weeks and fetal biometry outperform traditional formulas. Deep learning algorithms automatically recognizes anatomical structures and accurately calculate fetal weights which reduces inter-observer variability especially for extreme fetal weights. Placenta has a vital role in fetal growth. Fetal size evaluated according to standardized charts during routine second trimester ultrasound is time-consuming operator-dependent task. Computer-assisted techniques facilitate in automating the fetal biometry computation process. Semi-automated 3D ultrasound evaluation of placental volume and mass empowers early prediction of fetal growth disorders. Placental mass estimated by diameter and thickness is significantly reduced in SGA as compared to AGA fetus. Abnormal placental shape (placental thickness > 4cm or >50% of placental length) and small placental size (linear placental length <10cm) is a proven risk factor for FGR.

PREDICTION OF MATERNAL DISEASES: PRE ECLAMPSIA AND GDM:

Every pregnancy is unique and the maternal-fetal outcomes are shaped by multiple parameters. Medical complications like gestational diabetes and pre-eclampsia are globally recognised to have similar risk factors and pathophysiologic changes.

Machine Learning models in Shapley value analysis created the highest-performing predic-

tion algorithm based on the maternal factors like – Maternal age, Nulliparity, pre-pregnancy BMI, previous pregnancy with prior PE, family history of hypertension, and pre-existing hypertension and diabetes with acceptable discrimination. XG Boost algorithm was based on the maternal parameters like pre-pregnancy BMI, mode of conception, number of pregnancies, smoking, mean arterial pressure and alpha-fetoprotein levels and has superior disease prediction ability of Early-Onset PreEclampsia (EOPE)

The traditional glucose tolerance tests typically performed in second trimester of pregnancy lack the ability to identify the risk of Gestational diabetes mellitus (GDM) in early pregnancy. GDM risk prediction model constructed on maternal parameters (maternal age, BMI, family history of diabetes mellitus), ultrasonographic markers (placental volume, vascularization index) and haematological parameters assists in determining the risk of GDM in early pregnancy which enables us to take appropriate proactive multidisciplinary interventions. Neural network algorithm helps us to predict adverse perinatal outcomes among pregnancies complicated by gestational diabetes.

PREDICTION OF PRETERM BIRTH:

Preterm birth accounts for approximately 12-13% of live births and the leading cause of neonatal deaths. The complex pathogenesis of preterm birth is multifactorial. Multifactorial predictive model based on the clinical and ultrasonographic variables is a realistic possibility for screening spontaneous preterm birth < 35 weeks and improving the performance of short cervix with a low false-positive rate.

LIMITATIONS:

Though advent of AI has opened new doors in the field of fetal medicine, it has limitations which include need for large validated datasets, algorithm bias, lack of external validation, cost factor, data privacy and ethical concerns, explainability of AI, medicolegal issues and need for clinical oversight as AI is an aid .

CONCLUSION:

AI is poised to become an indispensable adjunct in fetal medicine, enhancing diagnostic accuracy, workflow efficiency, and individualised prenatal care. However AI should complement and not replace clinical expertise. Rightly used, it can bridge the gap in clinical care and access. Future progress will depend on robust validation, ethical implementation and seamless integration into routine obstetric practise.

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