2025, Volume 25, January, Issue 09

AOGD BULLETIN

Shared Decision Making - Enhancing Women Emancipation

Theme
Critical Care in Obstetrics

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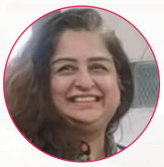

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Message from the President

President

Dear AOGDians,

Namaskar,

A Very Happy New Year to All!

Under the stewardship of AOGD, the previous year witnessed multiple academic and non-academic activities including webinars, CMEs, awareness weeks, Yoga Day celebration, the 5-day AOGD conference and workshops. We wish and request you to continue extending your support in our subsequent endeavours and upcoming events.

The journey of pregnancy and childbirth can at times present unforeseen challenges that demand swift, precise, and multidisciplinary responses. The complexities of managing critically ill obstetric patients require a unique blend of obstetric expertise, critical care acumen, and the ability to adapt to rapidly changing clinical scenarios. With this idea we are releasing our current issue on Critical Care in Obstetrics.

The challenges faced by obstetricians and critical care specialists are further compounded by resource disparities, particularly in low-resource settings. This issue includes a focus on strategies to optimize care in such environments, emphasizing on lifesaving interventions, as well as making readers aware of the advancements in the area.

With the conclusion of AICOG 2025, we are now shifting our focus and energy toward preparing for AICOG 2026. Building on the achievements and lessons learned from this year's event, our aim is to elevate the upcoming conference to even greater heights. Let us work together to ensure AICOG 2026 surpasses expectations and becomes a landmark event.

Dr. Ashok Kumar MD, PhD, FICMCH, FICOG, FAMS
President, AOGD
Organising Chairperson, AICOG 2026
Vice Chairperson, ICOG, an Academic Wing of FOGSI
National Corresponding Editor, Journal of Obstetrics & Gynaecology of India

Director Professor & Head
Department of Obstetrics & Gynecology,
Atal Bihari Vajpayee Institute of Medical Sciences &
Dr. Ram Manohar Lohia Hospital, New Delhi

Message from the Hon. Secretary

Hon. Secretary

Dear AOGD members,

Warm greetings to all from the AOGD secretariat at ABVIMS & Dr RML Hospital

After the successful and well-received 46th AOGD annual conference, December was appreciated by all as a moment of respite. The cohesion amongst all the members and the co-operation was admirable and the team cannot wait to start preparations for the AICOG 2026 in full force.

This month's theme for the bulletin is "Critical care in Obstetrics". It is a vital topic that needs more awareness and knowledge. The coming to the fore of obstetric critical care was only a matter of time. This issue deals with some burning issues meaningfully. The complicated questions that crop up in our mind have been dealt with quite simply and I am sure a lot of you will find that these situations arise frequently in our practices.

This is also the start of the new year 2025. At the start of anything new, we look towards Ganesha. We want him to remove obstacles from our lives, and usher in prosperity. We have been conditioned to see his big belly "lambodara" as a symbol of wealth. This is also the symbol of contentment: for the snake around his belly does not chase the rat at his feet, who in turn does not nibble the modaka that Ganesha holds in his hand. Contentment is the route to our happiness. So, I wish you all days of endless wonder, inspiring dreams and new adventures and quite moments of reflection!

As we embark on 2025, we begin to walk towards another huge task of organizing AICOG 2026. Seeking your continuous support and cooperation towards this journey.

Happy New Year!!!

Left to Right: *Dr Vandana Agarwal, Dr Kamna Datta, Dr Geetanjali Nabiyal, Dr Neha Pruthi Tandon*

4th December 2024

Baarah Ka Naara – Doctor Group Meeting, FOGSI Initiative Along with AOGD

17th December 2024

CME Handson Session on "Saving Mothers: A Mission to End Preventable Maternal Mortality" At ESI Basaidarapur Under the AEGIS of AOGD, Safe Motherhood Subcommittee

17th December 2024

First AICOG 2026 Organizing Committee Meeting, Hotel EROS 1–5 Pm

20th December 2024

CME on Empowering Providers on Advances in Birth Spacing – Community Health and Public Awareness Sub Committee

21st December 2024

JOGO Workshop – Urogynae Subcommittee of AOGD and DGF Central

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On 21st December 2024 at SGRH, Auditorium HALL – B

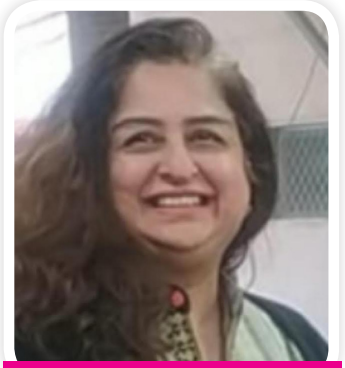
MOC: Dr.Sharmistha Garg **Time: 09:00 am to 02:00 pm**

Time	Topic	Speaker	Chairpersons
9:00 – 9:15 am	Registration & introduction to JOGO		
9:20 – 9:40 am	Post-Partum Pelvic Floor Dysfunction – An Overview	Dr.Geeta Mediratta	Dr.Achla Batra, Dr. J. B. Sharma, Dr.Sonal Bathla
9:40 – 10:10 am	Medical Management Of Urinary Incontinence	Dr.Mrinal Pahwa	Dr.Vipin Tyagi, Dr.Sudhir Chadha, Dr. Uma Rani Swain, Dr. Amita Jain,
10:10 – 10:30 am	Anorectal Physiology & Role Of Anorectal Manometery	Dr. Srihari Anikhindi	Dr. Anil Arora, Dr. Monika Gupta, Dr.Harsha Khullar, Dr.Ranjana Sharma
10:30 – 11:00 am	**TEA BREAK**		
11:00 – 11:20 am	Unlocking The Power Of Digital Therapeutics In Rehabilitation	Dr.Ruchi Shah	Dr.KarishmaThariani, Dr. Mala Srivastava, Dr.Geetika Arora, Dr. K. Gujral, Dr.Renuka Brijwal
11:20 – 12:00 pm	Role of JOGO EMG Biofeedback Therapy In Pelvic Floor Dysfunctions Demonstration of JOGO Device	Ms. Uma Venkatesa	Dr. Rajesh Kumari, Dr.Jyoti Bali, Dr.Shivani Sabharwal, Dr. Sandhya, Dr.Kanika Jain, Dr.LaxmiMantri, , Dr.Ambika Sharma
12:00 – 01:00 pm			
1:00 pm – 2:00 pm	**LUNCH**		

Forthcoming Events "for the month of January"

- 18th – Physical CME By Oncology Subcommittee
- 31st – Monthly Clinical Meeting – VMMC & SJH

From the Editors Desk



Chief Editor

Wishing everyone a happy, peaceful and healthy New Year !

As obstetricians we are all well aware that a pregnant woman can develop life threatening complications with little or no advance warning. Of all maternal deaths 60% have been reported preventable, thereby making early identification of high-risk patients, timely referrals, and multidisciplinary planning vital in the management of critically ill pregnant patients.

In recent years, multiple comorbidity-based screening tools have been developed. One such tool being point-of-care ultrasonography (POCUS). Used as an adjunct to clinical assessment, POCUS can enhance diagnostic speed and accuracy, thereby guiding treatment more effectively especially in setting of pre-eclampsia complicated by pulmonary edema and even life-threatening emergencies such as septic shock, amniotic fluid embolism, or cardiac arrest.

Major obstetric hemorrhage remains a leading cause of intensive care unit admission. Even though blood transfusion may be a life-saving procedure, a working knowledge of the indications and complications associated with blood product replacement is extremely important in determining life and death of the patient. Similarly, maternal sepsis is a common direct cause of maternal death. Timely identification and initiation of treatment within the first hour of diagnosis can contribute to reducing the burden of infection as an underlying cause of maternal as well as fetal morbidity and mortality. Owing to the unique physiological changes in pregnancy including existing respiratory alkalosis, the ideal ventilator settings and optimal oxygen and CO2 targets remain a major obstacle to an obstetrician while dealing with respiratory failure in such patients. We are going to talk about all this and more in this current issue on Critical Care in Obstetrics.

We are continually grateful to all authors for providing a good collection of academic articles every month and welcome any feedback.

Stay safe, stay healthy!

Dr. (Prof) Renuka Malik

Editor

Professor and Senior Consultant, ABVIMS & RML Hospital

Editorial Team: (Left To Right) Dr. Kanika, Dr. Preeti, Dr. Renuka, Dr. Kavita.
(Second Row Left To Right) Dr. Seema, Dr. Niharika

Thought for the month: Life is like a bicycle. To keep your balance, you must keep moving.

Approach to Maternal Sepsis – Indicators and Management

Dr. Sheeba Marwah[1], Dr. Avinika Agarwal[2], Dr. Shreya Singh Kushwaha[3]

Associate Professor[1], Senior Resident[2], FNB resident[3] (Maternal-Fetal medicine),

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INTRODUCTION

Sepsis was acknowledged by the World Health Assembly (WHA) in 2017 as posing a major threat to patient safety and public health worldwide.[1] A systematic analysis conducted in 2014 including 115 countries, reported a total of 60,799 maternal deaths; with sepsis accounting for 10.7% of those instances.[2] It ranks as the third most frequent reason for maternal fatalities. Sepsis accounts for 8–12% of obstetric patients' hospitalizations to intensive care units (ICUs).[3] Maternal sepsis has an extremely high case fatality rate when compared to other pregnancy problems.[3] The reasons to explain this high mortality and morbidity in maternal sepsis are mainly related to delays in the identification of cases and non-standardized management. Undetected or poorly managed maternal infections can lead to sepsis, death, or disability for the mother, as well as an increased likelihood of early neonatal infection and other adverse outcomes.

DEFINITION

The first definitions of the spectrum of sepsis were created in 1991 by the Society of Critical Care Medicine (SCCM) and the American College of Chest Physicians (ACCP). Since then, the definition has kept on evolving and the evidence-based update of these concepts was presented in 2016 as The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).[4] It dropped the words SIRS and severe sepsis and focused more on indicators of organ dysfunction than infection. It defined sepsis as a life-threatening organ dysfunction caused by a dysregulated host response to infection.[4] Septic shock is now identified by the requirement of vasopressors to maintain a mean blood pressure ≥65 mmHg and/or the presence of serum lactate > 2 mmol/L (>18 mg/dL) in the absence of hypovolemia. In 2021, the new SSC guidelines provided up-to-date, evidence-based guidance for clinicians treating adult patients with sepsis or septic shock.[5]

Although this provided a standard definition and a set of identification criteria to help identify adults with sepsis, it specifically did not mention pregnant women. To address this, maternal sepsis has been defined by WHO as "a life-threatening condition defined as an organ dysfunction caused by an infection during pregnancy, delivery, puerperium, or after an abortion".[6] The Clinical Signs and Symptoms for sepsis are shown in Table 1.

Table 1: Clinical Signs And Symptoms Suggestive Of Sepsis During Pregnancy: (RCOG GTG no-64)

RED FLAGS (recommended immediate management)	
Objective evidence of altered mental state	GCS <15
Respiratory rate	>= 25 breaths/min
Oxygen saturation	<94% on room air
Heart rate	>130bpm
Blood pressure	Systolic <90mmhg
Urine output	Not passed urine in >12 hours(<0.5ml/kg/hr)

AMBER FLAGS (Senior clinical review within 1 hour)	
Behavioural / mental status change	
Acute deterioration in functional ability	21-24 breaths/ min
Respiratory rate	100-130 beats/ min or new dysrythmia
Heart rate	91-100 mm hg
Systolic BP	0.5-1ml/kg/hr
Urine output	< 36deg Cel or >38 deg Cel
Has had invasive procedure in last 6 weeks	Prolonged close contact
Impaired immune system	18-24 hours
Temperature	
Current diabetes or Gestational diabetes	
Close contact with group A streptococci	
Prolonged rupture of membranes	
Prolonged vaginal bleeding and abdominal pain post birth	
Offensive vaginal discharge	

Sepsis in pregnancy has been linked to a number of risk factors[7] (Table 2).

Table 2: Risk factors for the maternal sepsis

MATERNAL	OBSTETRIC
Obesity	Prolonged Rupture of membranes
Diabetes in pregnancy	Caesarean birth
Iron deficiency anemia	Vaginal trauma
Maternal age >35 years	Retained pregnancy issue
Impaired immunity/ Immunosuppressant medication	Amniocentesis and other invasive procedures
Women of ethnic minority	Multiple gestation
Renal/ Cardiac/ Liver disease	Cervical cerclage
History of pelvic infection	
Contact with invasive group A beta-hemolytic Streptococcus	
Intravenous drug use	

PATHOPHYSIOLOGY

Sepsis results from a dysregulated host response to infection resulting in organ damage, and virtually any organ system can be affected (Table 3). Multiple factors are play during sepsis which leads to intravascular hypovolemia, tissue hypoxia, ischemia, mitochondrial malfunction, organ dysfunction and can also result in death. This is due to release of proinflammatory mediators, peripheral vasodilation, intravascular hypovolemia and disseminated intravascular coagulation.

Table 3 : Organ damage caused by sepsis

SystemDescription of damage	
• Central nervous system	Altered mental status
• Cardiovascular system myocardial dysfunction	Hypotension from vasodilation and third-spacing;
• Pulmonary system	ARDS
• Gastrointestinal system	Paralytic ileus
• Hepatic system	Hepatic failure or abnormal transaminases
• Urinary system	Oliguria or acute kidney injury
• Hematologic system coagulopathy	Thrombocytopenia or disseminated intravascular
• Endocrine system	Adrenal dysfunction and increased insulin resistance

None of the existing definitions of sepsis account for the physiological alterations of normal pregnancy which are very similar to pathophysiological changes in sepsis. Maternal morbidity may be overestimated due to the physiologic changes in pregnancy, which mimic the changes in the setting of sepsis. For example, decreases in blood pressure and increases in heart rate and white blood cell count are just a few of the changes that can be difficult to distinguish from pathologic changes in a patient at risk for sepsis. Alternatively, it may obscure signs and symptoms of infection and sepsis resulting in a delay in the recognition and treatment of sepsis.

SOURCE OF SEPSIS

The source of infection in maternal sepsis can be either obstetric or non-obstetric. Common obstetric causes include:

- Septic abortion
- Chorioamnionitis
- Postpartum endometritis
- Retained products of conception
- Wound infection
- Mastitis

Non-obstetrical causes include respiratory infections, urinary tract infections/pyelonephritis or gastrointestinal perforation. In 30% of cases, no source is identified. The most frequently isolated organisms in maternal sepsis are Escherichia coli and group A and group B Streptococcus. Staphylococci, gram-negative and anaerobic bacteria, and many other organisms have also been reported 15% cases have mixed infections.

EARLY WARNING SYSTEMS

Sepsis screening tools are designed to promote early identification of sepsis and consist of manual methods or automated use of the electronic health record (EHR). There is wide variation in diagnostic accuracy of these tools.[8–11] A variety of clinical variables and tools are used for sepsis screening, such as systemic inflammatory response syndrome (SIRS) criteria, vital signs, signs of infection, and warning scores (Table 4).[12,13] The most common score used is the Sequential Organ Failure Assessment (SOFA) (originally the Sepsis-related Organ Failure Assessment). The task force of Sepsis-3 recommended using a change in the baseline of the total SOFA score of ≥2 points to represent organ dysfunction. The baseline SOFA score should be assumed to be 0 unless the patient is known to have pre-existing (acute or chronic) organ dysfunction before the onset of infection. Moreover, another score called qSOFA (quick SOFA), identified that two of any of the following three clinical variables - Glasgow Coma Scale score of <15, systolic blood pressure of <100 mm Hg and respiratory rate >22/min offered a predictive validity similar to that of the full SOFA score outside the ICU. Another criterion that has been studied in cases of sepsis is the Shock Index (SI), a ratio between heart rate and systolic blood pressure. An elevated SI (>0.9) is associated with higher mortality secondary to haemorrhagic and septic shock (Figure 1).

However, these scores do not address the physiological changes inherent to pregnancy. Of the SOFA criteria, those most affected by pregnancy are creatinine and MAP cutoffs. Also, sepsis cutoffs for respiratory rate, heart rate, partial pressure of CO2, and white blood cell count overlap with

the normal range for pregnancy, labor, and the early postpartum period. Hence, scores with cutoff adjustments as per pregnancy were devised like Modified Early Obstetric Warning System (MEOWS), Sepsis in Obstetrics Score (SOS), obstetric-modified SOFA (omSOFA).

Table 4: Various Scoring systems for sepsis.

	S.O.S	MEOWS	MEWS	SOFA	omSOFA
Full name	Sepsis in Obstetrics Score	Modified Early Obstetric Warning System	Modified Early Warning System	Sepsis related organ failure assessment score	Obstetrically Modified SOFA score
Specific for obstetric population	Yes	Yes	No	No	Yes
Evaluated Parameters	• Temperature • Systolic blood pressure (SBP) • Heart rate • Respiratory rate • SpO2 • White Blood Cell Count • % Immature neutrophils • Lactic Acid	• Temperature • SBP • Diastolic blood pressure (DBP) • Heart rate (HR) • Respiratory rate (RR) • State of consciousness • % of oxygen required to maintain SatO2 >95%	• Temperature (ºC) • SBP • Heart rate (HR) • Respiratory rate (RR) • State of consciousness	• PaO2/FiO2 • Platelets • Bilirubin • Mean arterial pressure • Glasgow Coma Scale score • Creatinine • Urine output	• PaO2/FiO2 • Platelets • Bilirubin • Mean arterial pressure • Central nervous system • Creatinine

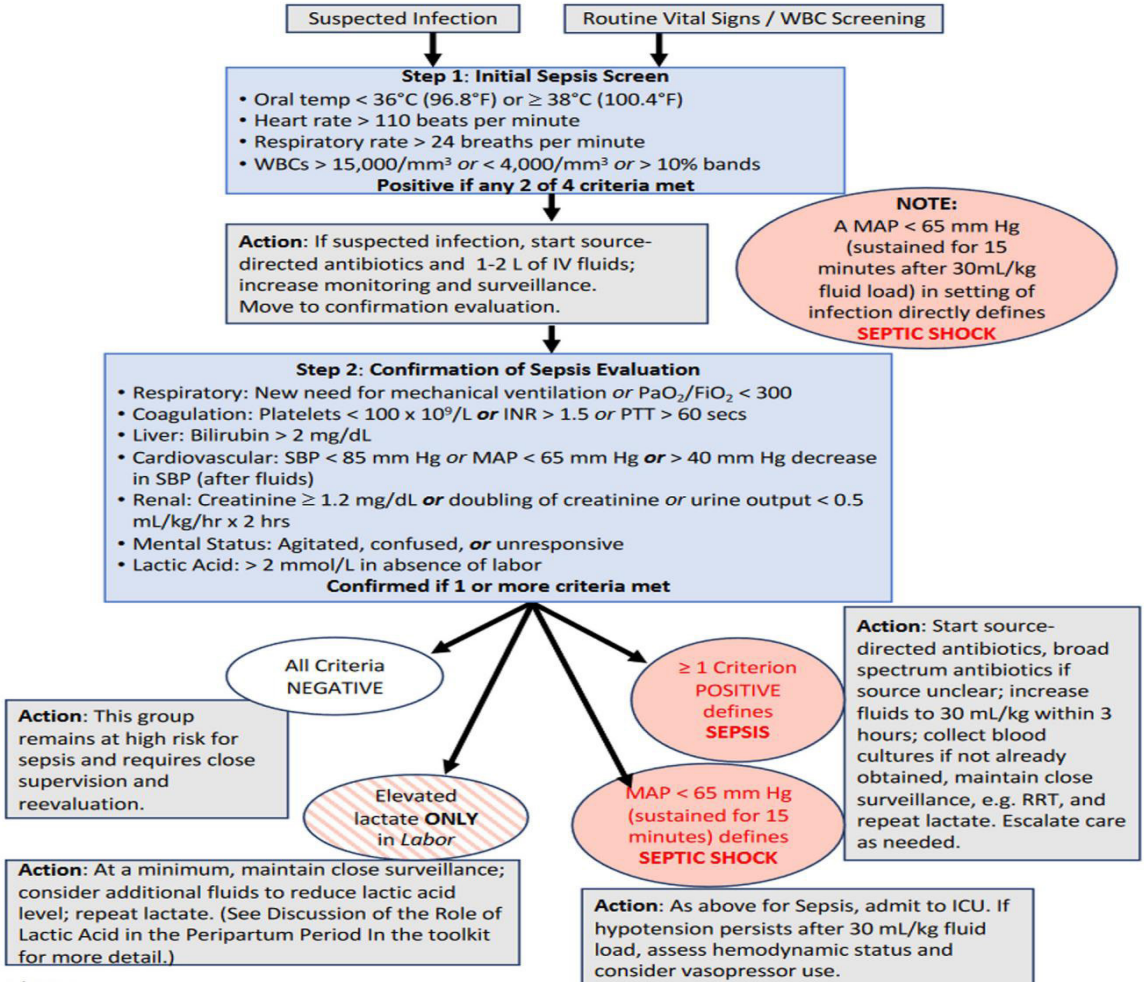

Figure 1: Diagnosis of maternal Sepsis-2 step system
(adapted from Society for Maternal-Fetal Medicine Consult Series)

TREATMENT

After an adequate diagnostic approach, the next goal is to achieve stabilization, with an emphasis on limiting cell dysfunction by enhancing tissue perfusion and attempting to halt the progression from sepsis to septic shock. Therefore, at the beginning of the treatment, all patients with maternal sepsis must receive resuscitation standards for critical patients ensuring the ABCD sequence. Once the venous accesses are secured (at least one with iv canula number 16 or 18), laboratory tests must be taken to clarify sepsis diagnosis and severity of the condition according to multiorgan dysfunction. In the absence of evidence-based management recommendations regarding sepsis and septic shock during pregnancy, the best option likely is to follow the guidelines of general population management. In 2018, the recommendation for the implementation of an intervention's package during the first hour of management was published and called Hour-1 Bundle.[14] These recommendations are also advocated by Society for Maternal-Fetal Medicine (SMFM) 2023.[15] The recommended interventions during this period are:

- **Measure maternal blood lactate concentration:** Death rates are correlated with lactate concentrations of less than 2 mmol/L (15%), 2-4 mmol/L (25%), and >4 mmol/L (40%).[15] Furthermore, the guidelines recommend resuscitation in patients with increased lactate concentrations as a sign of tissue hypoperfusion in order to normalize lactate concentrations.
- **Obtain blood cultures before administering antibiotics:** Cultures can be sterilized minutes to hours after the initial dosage of the prescribed antibiotic, but in severely ill patients, antibiotic therapy shouldn't be postponed. Patients with suspected sepsis or septic shock should have blood cultures as well as cultures of the suspected focus of infection, which includes wounds, drains, and catheters.
- **Administer broad-spectrum antibiotics:** The survival rate of patients suffering from sepsis and septic shock drops by 7% for every hour when antibiotics are not administered promptly.[16] A wide enough first selection of antibiotics must be made in order to treat every potential pathogen. The patient's medical history (e.g., recent antibiotic use, prior organisms), comorbidities, immune deficiencies (e.g., HIV), clinical context (e.g., community or hospital infection), suspected infection location, presence of invasive devices, Gram stain data, local prevalence, and resistance patterns are just a few of the many factors that will influence this decision. Table 5 summarizes some options for empiric antibiotic coverage for common infections that occur during pregnancy.[15]
- ***Begin rapid administration of 30 mL/kg crystalloid in case of hypotension or maternal blood lactate concentration ≥4 mmol/L***: Being one of the key strategies, its objective is to achieve rapid organ perfusion. The use of balanced crystalloid solutions as the preferred fluid for initial rehydration is recommended alongside the subsequent intravascular volume replacement in patients with sepsis and septic shock. Dynamic measurements of preload employing pulse-pressure fluctuation, passive leg lifting, or echocardiography should direct the patient's response to fluid resuscitation.

Table 5: Proposed broad-spectrum empiric antibiotic coverage in sepsis complicating pregnancy

Source infection	Recommended antibiotics
Community-acquired pneumonia	Cefotaxime, ceftriaxone, ertapenem, or ampicillin plus azithromycin, clarithromycin, or erythromycin
Hospital-acquired pneumonia	Low-risk patients may be treated with ceftriaxone, ampicillin-sulbactam, ertapenem, meropenem, imipenem, or cefepime. Patients at high risk of mortality may need double coverage for Pseudomonas (beta lactam plus an aminoglycoside or a quinolone) and MRSA coverage with vancomycin or linezolid
Chorioamnionitis	Ampicillin plus gentamicin. Add anaerobic coverage with clindamycin or metronidazole if cesarean delivery required
Endomyometritis	Ampicillin, gentamicin, and metronidazole (or clindamycin). Alternatively, may use cefotaxime or ceftriaxone plus metronidazole
Urinary tract infections	Gentamicin with ampicillin Alternatively, may use monotherapy with a carbapenem or piperacillin-tazobactam
Abdominal infections	Ceftriaxone, cefotaxime, ceftazidime, or cefepime plus metronidazole. Complicated cases may require monotherapy with a carbapenem or piperacillin-tazobactam
Skin and soft tissues (necrotizing)	Vancomycin plus piperacillin-tazobactam. If group A Streptococcus or Clostridium perfringens are present, use penicillin G plus clindamycin.

- Apply vasopressors if hypotension during or after fluid resuscitation to maintain MAP ≥65 mmHg: MAP is the pressure that favours tissue perfusion as perfusion turns to be linearly dependent on blood pressure. Therefore, the guidelines recommends a target MAP of 65 mmHg in patients with septic shock requiring treatment with vasopressors. Yet this threshold in expectant mothers has not been evaluated enough. The length of hypotension in sepsis patients raises mortality. It is therefore advised to utilize vasopressors as soon as possible. The first choice is norepinephrine, especially because it increases MAP due to its vasoconstrictor effect, with little change in heart rate and less increase in systolic volume compared to dopamine. Dopamine therapy should only be considered in highly selected patients (e.g., patients with low risk of tachyarrhythmias and absolute or relative bradycardia).Fetal monitoring during pregnancy may be a precise indicator of the mother's and fetus's reaction to vasopressors

and the preservation of perfusion. Post-infection myocardial dysfunction occurs in a subset of patients with septic shock. In this situation, dobutamine is the inotropic agent of choice. Intravenous corticosteroids administration should be considered in patients with septic shock who continue to require vasopressor therapy.

After the first hour, complementary measures must be initiated. Controlling the focus is crucial in order to quickly identify the infection and ascertain whether it can be managed with abscess drainage, debridement of infected necrotic tissues, extraction of a potentially infected object, and the definitive control of a continuous source of microbial contamination.

Some other important recommendations have been advised by SMFM 2023.[15] Pharmacologic venous thromboembolism prevention is advised for pregnant and postpartum patients in septic shock due to the elevated risk of venous thromboembolism in sepsis and septic shock. Stress ulcer prophylaxis is recommended for patients in septic shock with risk factors for gastrointestinal bleeding. When a critically ill patient with sepsis has a glucose level greater than 180 mg/dL, insulin therapy should be initiated. Survivors of sepsis and septic shock are more likely to experience mental, emotional, and physical health issues; for this reason, pregnant and postpartum sepsis survivors, as well as their families, require continuous, all-encompassing assistance. The management protocols are summarised in figure 2.

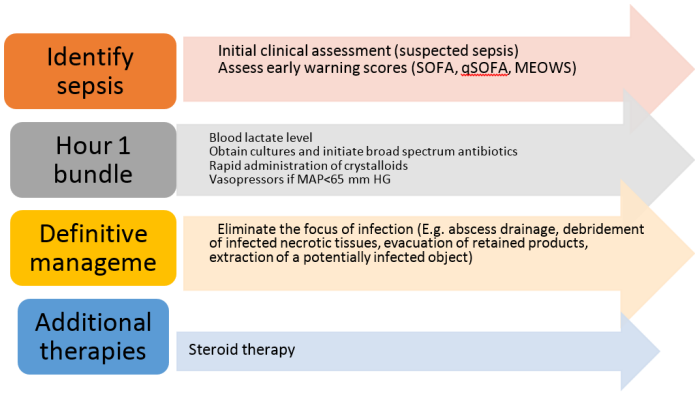

Figure 2: Initial management in sepsis:

PREGNANCY CONSIDERATIONS

Sepsis-affected pregnant individuals, even if the illness is not intra-amniotic, are at significant risk for perinatal problems, including abortion, preterm birth, and fetal death. Unless there is an imminent risk of fetal death, alteration in the tests of fetal wellbeing performed at the time of admission do not indicate that the pregnancy should be terminated before the patient is stabilized. In the context of an unbalanced septic condition, pushing a patient to a state of greater stress—such as terminating their pregnancy—significantly raises the risk of maternal death. Unless the underlying cause of sepsis is the obstetric focus (e.g.chorioamnionitis), the presence of sepsis itself is not an indication for pregnancy termination. Specific treatment of obstetric conditions must not be delayed by resuscitation in sepsis.

CONCLUSION

Because of the physiological changes that occur during pregnancy, maternal sepsis is a condition with a high mortality rate that is exceedingly difficult to diagnose, delaying the start of key interventions for the reduction of mortality. The most significant factor influencing the decrease in maternal mortality will be the implementation of the management protocol during the first hour of treatment.

KEY POINTS

1. Maternal sepsis is the third most common cause of maternal mortality.
2. Separate sepsis scores for pregnant females should be used due to physiological changes during of pregnancy, labor and puerperium.
3. Move fast during the "golden hour" to save lives: implement sepsis bundles to facilitate rapid escalation of care.

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AOGD Risk Management Support (ARMS) Group

One of the ways to ensure stress-free work environment and optimal patient care is mutual support among professional colleagues. An advisory group was set up last year so that they can be contacted if any of us is caught in a complex clinical dilemma/dealing with aggressive clients or is apprehensive about how to document or effectively troubleshoot a potential problem. The same group will continue to provide timely advice and is led by

Convener – Dr. Vijay Zutshi – 9818319110

Co-convener – Dr. Aruna Nigam – 9868656051

We invite suggestions from all members regarding functioning of this cell which will guide us forming the SOPs. Please mail to aogd.ucmsgtbh2023@gmail.com

Blood and Blood Products in Obstetric Haemorrhage: Perspective of Gynaecologist and Anaesthetist

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INTRODUCTION

Obstetric Haemorrhage: Obstetric haemorrhage is the leading cause of pregnancy-related deaths contributing to 70,000 maternal deaths globally each year. The haemorrhage may occur in the antenatal period (Placenta Praevia or Placental Abruption) or in the postpartum period. Loss of 500 to 1000 ml is labeled as a minor haemorrhage while loss of more than 1000 ml is called a major haemorrhage.

DISCUSSION

Challenges in Diagnosis and Management in Pregnant Patient[1]

Physiological changes in pregnancy

The disproportionate increase in plasma volume (50%) and red cell mass (20-30%) help the patient stay haemodynamically stable with the normal blood loss during the antenatal period and delivery. A hypercoagulable state also occurs due to high levels of fibrinogen and coagulation factors (VII, VIII, and IX) superseding the rise in the natural anticoagulants (Protein A, Protein C, and Antithrombin III). Also, a high uteroplacental blood flow in pregnancy can lead to rapid blood loss.

Risk to foetus

The well-being of the foetus also needs to be considered while managing acute haemorrhagic emergencies (Prevent infections and avoid Haemolytic Disease of the Foetus and Newborn).

Difficulty in assessment of blood loss

Visual estimation of peripartum blood loss is inaccurate and clinical signs and symptoms should be included in the assessment of haemorrhage (RCOG 2016)[2]. Quantitative methods of measuring blood loss are more accurate than visual estimation (ACOG 2019).[3] The increased maternal plasma volume makes the assessment of blood loss by monitoring of vital signs unreliable. Due to physiologic changes in pregnancy, changes in clinical and vital signs that result from haemorrhage appear late. FIGO (2022) recommends the use of the shock index in the diagnosis and management of PPH. Values greater than 0.9 indicates hemodynamic instability.[4]

OBSTETRIC HEMORRHAGE BUNDLE[5]

ACOG (2020) recommends the use of obstetric haemorrhage bundles for efficient management.

Key elements of the bundle include:

1. RECOGNITION & PREVENTION (every patient)
   - Risk assessment: Suspected Placenta praevia/ accreta/increta/percreta; Prior classical caesarean, Prior myomectomy;multiple gestation; >4 prior births; prior postpartum haemorrhage; large myomas; EFW>4 kg; haematocrit<30%; platelet count<70,000; active bleeding; known coagulopathy; chorioamnionitis; prolonged oxytocin >24 hours; prolonged second stage; use of magnesium sulphate Prepregnancy BMI > 50; other significant medical /surgical risk factor
   - Universal active management of 3rd stage of labour
2. READINESS (every unit)
   - Blood bank (massive transfusion protocol)
   - Cart & medication kit
   - Haemorrhage team with education & drills for all stakeholders
3. RESPONSE (every haemorrhage)
   - Checklist
   - Support for patients/families/staff for all significant haemorrhages
4. REPORTING / SYSTEMS LEARNING (every unit)
   - Culture of huddles & debrief
   - Multidisciplinary review of serious haemorrhages
   - Monitor outcomes & processes metrics

MANAGEMENT

Measures for minor haemorrhage (blood loss 500–1000 ml) without clinical shock:

- Immediate Intravenous access (one 14-gauge cannula)
- Immediate venepuncture (20 ml) for:
  - (a) For blood grouping and cross-matching
  - (b) For full blood count
  - (c) For coagulation screen, including fibrinogen
- Pulse, respiratory rate, and blood pressure recording to be done every 15 minutes
- Start warmed crystalloid infusion.
- To Decide on need for transfusion and need for component therapy

The separation of blood into blood components is advantageous. And allows :

- optimal survival of its every constituent.
- transfusion of the only specific blood component that is required by the patient.

Before transfusion, the clinician needs to ensure

- The transfusion is clinically appropriate
- The expected benefits outweigh the potential hazards
- Informed patient consent has been obtained and documented
- Patient risk factors are identified, and special requirements are documented

BLOOD COMPONENTS [6,7]

Procedure of Blood Transfusion: Technical Aspects [6]

- Priming: Recommended use of either 0.9% normal saline or blood component. It is not advisable to mix medications and fluids (other than normal saline) in the same line.
- Re-use: The same BT set may be used for any number of blood bags for the same type of component up to 12 hrs. Not to use the same BT set for different types of blood components.
- External pressure devices: These are useful for rapid/ quick infusions of large volumes of blood components. A large bore cannula must be used with these devices to avoid haemolysis. These exert a uniform pressure on the blood bag and have a gauge to measure the pressure. The maximum pressure should not exceed 300 mm.
- Blood warmers and indications. Devices with alarm and temperature indicator, for blood warming should be used. A blood warmer may be used for:
  - (a) Intrauterine transfusion & Exchange transfusion
  - (b) Patients with significant cold antibodies
  - (c) Rapid transfusion of large blood volumes (>50ml/kg/hour in adults and > 15ml/ kg/ hour in paediatric patients)
  - (d) Plasma exchange in therapeutic apheresis
  - (e) Blood transfusions in the hypothermic patient
- Fluids and medications compatible with blood components: IV fluid solutions should not be co-administered with blood and components; however, 0.9% NS may be given when required. Calcium-containing electrolyte or colloid solution (like lactated Ringer's solution, Haemaccel®) and Dextrose solution SHOULD NEVER be co-administered with blood or in the same IV line.

Two different types of blood components should not be transfused together (e.g. plasma and packed red cells) simultaneously, even via separate IV access lines. This avoids any uncertainty arising in case of a blood transfusion reaction; however, this rule may not apply in emergency and lifesaving situations.

1. Identify the patient and the blood unit correctly and match the same before transfusion. Make sure that documentation is done for the same.
2. Observation and monitoring during blood transfusion: Except for patients with serious co-morbidities where more frequent vital recording may be required, for all patients receiving a transfusion, vitals (temperature, blood pressure, pulse rate, respiration rate, and oxygen saturation), must be recorded with the following frequency:
   - Before the start of each unit
   - 15 minutes after starting of each unit
   - If uneventful, 30-60 minutes thereafter till completion of the unit.
   - After the unit is completely transfused.
   - Whenever there is any adverse reaction to the transfusion

MASSIVE TRANSFUSION[2,5,7]

The definition of Massive transfusion is:

- Transfusion of >10 units within 24 hours.
- Transfusion of >4 units in 1 hour.
- Replacement of 50% of blood volume in 3-4 hours.
- A rate of loss >150 ml/hour.

Causes of massive blood loss

Obstetric haemorrhage due to:

- Early pregnancy complications like ectopic pregnancy, cervical pregnancy, etc
- Antenatal and intrapartum conditions like placental abruption, placenta praevia, coagulopathy secondary to amniotic fluid embolism, etc

- Postpartum emergency conditions like uterine atony, retained products of conception, genital tract laceration, coagulopathy, etc
- Coincidental causes like ruptured splenic artery aneurysm, hepatic rupture, or trauma

Management protocol for major haemorrhage with ongoing bleeding or clinical shock:[2,7]

ABC:

- Assess airway and breathing. If the airway is compromised owing to the impaired consciousness level, anaesthetic assistance should be sought urgently.
- Administer 10–15 l/min O2 via facemask, regardless of maternal oxygen concentration.
- Evaluate circulation-Pallor, delayed capillary refill, and decreased urine output indicate compromised blood volume even without a change in blood pressure or heart rate.
- Establish two 14-gauge peripheral cannula. Withdraw 20 ml of blood sample for diagnostic tests, including full blood count, coagulation screen, urea and electrolytes, and to cross-match packed red cells (4 units).

Note: Usually, the level of consciousness and airway control improve rapidly once the circulating volume is restored.

1. Position the patient flat and warm using appropriate available measures Hypothermia can exacerbate acidosis
2. Transfuse blood as soon as possible, if clinically required
3. While awaiting compatible packed red cells, infuse a total volume of 3.5 l of clear fluids (up to 2 l of warmed isotonic crystalloid as rapidly as possible, followed by up to a further 1.5 l of warmed colloid if blood is still not available). Hydroxyethyl starch should not be used Table 1.

Table 1: Different Blood Components

Component	Volume	Specifications of Usage	Need for ABO and Rh compatibility	Effect
Packed RBC	Minimum 250 ml + 10% from 450 ml bag(exclusive of additive solution)	Use within 30 minutes; Complete within 4 hours;	Required	1 unit increases Hb by 1 gm/dl
Platelet concentrate	50-70ml	Use immediately; Complete within 30 minutes; Rate 50-150 ml/ hour	Preferred; Any group may be used in case of nonavailability if no visual red cell contamination of platelet concentrate; Anti D not required in the absence of red cell contamination	1 unit increases platelets by 40-50*10^9
Cryoprecip-itate	10-20ml	Within 6 hours of thawing; Preferred immediately; Complete within 30 minutes; Rate 150-300ml/hr	Preferred not essential; Anti D not needed	1 unit /10 kg body weight increases by 50 mg
Fresh Frozen Plasma (FFP)	250 ml	Within 6 hours of thawing; Preferred immediately; Complete within 30 minutes; Rate 150-300ml/hr	ABO compatibility needed; Crossmatching is not required; Anti D not needed	1ml of FFP has 1 unit of coagulation factor activity; Dose 12-15ml/kg

4. Fluid replacement is a crucial component of the treatment of haemorrhage, although a dilutional coagulopathy may occur when large volumes of crystalloid, colloid, or red cells are used with insufficient transfusion of fresh frozen plasma (FFP) and platelets.
5. The nature of the fluid infused is of less importance than rapid administration and warming of the infusion.
6. Though no RCTs are comparing the use of colloids with other replacement fluids for the resuscitation of women with obstetric haemorrhage, guidelines from the World Health Organization (WHO)recommend that intravenous fluid replacement for PPH should be with isotonic crystalloids in preference to colloids.

Goals of massive transfusion protocol:[2,7,8]

- Early resuscitation with recognition of blood loss and activation of a massive transfusion protocol
- Maintenance of tissue perfusion and oxygenation by restoration of blood volume and haemoglobin
- Cessation of bleeding by several means including early surgical or radiological intervention
- Judicious use of blood component therapy to correct coagulopathy
- Prevention of oliguric shock which carries a high mortality rate due to organ failure and disseminated intravascular coagulation
- Avoidance of hypothermia which increases the risk of disseminated intravascular coagulation. Ongoing monitoring, reassessment, and resuscitation and use of these measurements to guide transfusion management.
  - (a) Pulse, Blood pressure, and respiratory rate monitoring
  - (b) Foley catheterization to monitor urine output
  - (c) Viscoelastic testing (ROTEM/TEG) if available
  - (d) Extended coagulation studies if ROTEM unavailable (e.g. APTT, INR, PT, fibrinogen)
  - (e) Ionised calcium
  - (f) Arterial/venous blood gases

According to the British Committee for Standards in Haematology, the therapeutic aim for the management of massive blood loss is to maintain:[2,7,9,10]

- Hb greater than 8.0 g/l
- Platelet count greater than 50 × 10^9/1
- Prothrombin time (PT) less than 1.5 times normal
- Activated partial thromboplastin time (APTT) less than 1.5 times normal
- Fibrinogen greater than 2 g/l

Blood Component Transfusion in Massive Haemorrhage: Indications[2,7,8]

There are no firm criteria for initiating red cell transfusion. The decision to provide blood transfusion should be based on both clinical and haematological assessment. The clinical picture should be the main determinant of the need for blood transfusion and time should not be unnecessarily spent awaiting laboratory results. Patients with acute haemorrhage can have normal Hb and clinical evaluation in this situation is, therefore, extremely important. The best equipment available should be used to achieve rapid warmed infusion of fluids. Special blood filters should not be used, as they slow infusions.

1. Red blood cells
    - Decision based on clinical and haematological assessment.
    - Emergency blood with immediate issue of group O, rhesus D (RhD)-negative and K-negative units, with a switch to group-specific blood as soon as feasible.
2. Fresh frozen plasma (FFP)
    - If the PPH has stopped, no FFP is required.
    - If no haemostatic results are available and bleeding continues, then, after 4 units of red blood cells, FFP should be infused at a dose of 12–15 ml/kg until haemostatic test results are known. (RCOG 2016) ACOG 2020 advises for 6:4 RBC: FFP transfusion until tests of haemostasis are available. Local hospital protocols may be formed for uniformity and consistency. Calcium Gluconate should be admin
    - If no haemostatic tests are available, early FFP should be considered for conditions with suspected coagulopathy, such as placental abruption or amniotic fluid embolism, or where detection of PPH has been delayed.
    - If prothrombin time/activated partial thromboplastin time is more than 1.5 times normal(indicates severe and established haemostatic impairment) and haemorrhage is ongoing, volumes of FFP in excess of 15 ml/kg are likely to be needed to correct coagulopathy.
    - If the PT/APTT is normal, then no FFP is required, although repeated testing should be performed if bleeding persists.
    - Early order of blood components is preferred to avoid delay
    - In rare cases of massive bleeding where women have been given 8 or more units of RBCs and they continue to bleed, and still no coagulation results or platelet counts are available, then 2 pools of cryoprecipitate and 1 pool of platelets should be infused.

    The disadvantage of unmonitored FFP is that the majority of woman will have completely normal coagulation and platelets at the time of administration and will be receiving blood products with less fibrinogen and other coagulation factors than they have circulating. Early empirical FFP may be justified if significant consumption is likely (e.g., placental abruption or amniotic fluid embolus), or a very large volume of blood loss is expected (e.g., uterine rupture or placenta accreta). By contrast, uterine atony or surgical/ genital tract trauma are unlikely to have an early haemostatic impairment and early unmonitored FFP administration is more difficult to justify.
3. Fibrinogen
    - A plasma fibrinogen level of greater than 2 g/l should be maintained during ongoing PPH.
    - Cryoprecipitate should be used for fibrinogen replacement.
4. Platelets

    During PPH, platelets should be transfused when the platelet count is less than 75000/ µl based on laboratory monitoring. Transfusion triggers for Therapeutic platelet transfusion (BJH guidelines 2017)[9]
    - Severe bleeding (Massive transfusion): 50,000/ µl
    - Non-severe bleeding: 30,000/ µl
    - DIC in the presence of bleeding: 30,000/ µl

Obstetric Haemorrhage: Other treatment modalities

- Antifibrinolytic drugs[4]: Consideration should be given to the use of tranexamic acid in the management of PPH. (FIGO 2022)
- Recombinant factor VIIa (rFVIIa) therapy: The routine use of rFVIIa is not recommended in the management of major PPH unless as part of a clinical trial
- Intraoperative cell salvage[11]: Is the process whereby blood shed during an operation is collected, filtered, and washed to produce autologous red blood cells [RBCs] for transfusion to the patient. Cell salvage should be considered for emergency use in obstetric haemorrhage associated with both caesarean section and vaginal delivery.

Table 2: Fluid Therapy and Blood Product Transfusion (RCOG 2016)[2]

Crystalloid	Up to 2 l isotonic crystalloid.
Colloid	Up to 1.5 l colloid until blood arrives.
Blood	If immediate transfusion is indicated, give emergency group O, rhesus D (RhD)-negative, K-negative red cell units. Switch to group-specific
Fresh frozen plasma (FFP)	Administration of FFP should be guided by haemostatic testing and whether haemorrhage is continuing: If prolonged haemorrhage is ongoing, administer 12–15 ml/kg of FFP. If haemorrhage continues after 4 units of red blood cells (RBCs) and haemostatic tests are unavailable, administer 4 units of FFP.
Platelet concentrates	Administer 1 pool of platelets if haemorrhage is ongoing and platelet count less than 75x 10^9/l Administer 2 pools of cryoprecipitate if haemorrhage is ongoing

- Special circumstances: When a patient is on Warfarin: Consider the use of Vitamin K 5-10 mg IV and Prothrombinex 50 international units/kg
- When a patient is on Anti-platelet agents: Consider additional platelets

Monitoring during the management of obstetric haemorrhage:

- Temperature every 15 minutes
- Continuous pulse, blood pressure, and respiratory rate (using oximeter, electrocardiogram, and automated blood pressure recording)
- Foley catheterization to monitor urine output
- Consider central venous and direct arterial pressure monitoring when the cardiovascular system is compromised by haemorrhage or disease.
- Repeated measurements of serum lactate and base deficit, together with haematocrit/Hb
- Consider transfer to ICU once the bleeding is controlled or monitor at high dependency unit on delivery suite, if appropriate
- Assess haemostatic impairment by clinical observation, laboratory-based tests (PT, APTT, Clauss fibrinogen, and platelet count), and point of care testing. Coagulopathies evolve rapidly and repeated testing and observation of trends is more useful than a single measurement.
- Point of care testing

Point of care testing[12]: Viscoelastic whole-blood assays like Thromboelastography (TEG®, Haemonetics, Braintree, Massachusetts, USA) or rotation thromboelastometry (ROTEM®, Tem, Munich, Germany) provide information on the coagulation process through the graphic display of clot initiation, propagation and lysis.

- There are no randomised controlled trials on the use of TEG® or ROTEM® in major obstetric haemorrhage.
- At the current time, unless a centre has special expertise in the use of TEG®/ROTEM®, conventional testing should be performed regularly during major obstetric haemorrhage to guide the transfusion of blood components.
- Centres that are using thromboelastography or rotation thromboelastometry for guiding blood transfusion during major obstetric haemorrhage must ensure that their transfusion algorithm protocol has been validated and that quality assurance measures are followed.

Advantages of point-of-care testing:

- Associated with decreased blood loss and blood product use.
- results are known earlier than for laboratory tests.
- Point of care testing using TEG® and ROTEM® has been recommended by the Obstetric Anaesthetists' Association/Association of Anaesthetists of Great Britain and Ireland.
- However, NICE has concluded that there is insufficient evidence to recommend the routine adoption of viscoelastometric point-of-care testing in the management of PPH. If used, a quality control protocol should be agreed with the haematology laboratory.

After the management of the acute episode :

- Continuous physiological monitoring and the recording of parameters essential to recognize continued bleeding
- Vigilant monitoring for development of complications(fever, hyperkalaemia, hypocalcaemia, citrate toxicity etc)
- Chemical thromboprophylaxis. Alternatively, anti-embolism stockings, foot impulse devices, or intermittent

pneumatic compression devices can be used if chemical thromboprophylaxis is contraindicated, for example, in cases of thrombocytopenia.

- Accurate documentation of the management

CONCLUSION

- The aim of resuscitation during haemorrhage are restoration of both oxygen-carrying capacity as well as blood volume.
- During volume replacement, it should be kept in mind that blood loss is often underestimated.
- The clinical picture must be the main determinant of the need for blood transfusion and decisions should not be based only on laboratory results.
- While blood transfusion is almost always required when the Hb is less than 6.0 g/l and rarely required when the Hb is more than 10.0 g/l, patients with acute haemorrhage can have normal Hb, and clinical evaluation in this situation is, therefore, extremely important.
- As compared to single Hb/ haematocrit estimations, serial measurements may be more helpful in monitoring ongoing progress.
- Measurements of serum lactate and base deficit, together with haematocrit/Hb, are repeatedly made during haemorrhage and resuscitation to assess tissue perfusion and oxygenation.

KEY POINTS

1. Blood transfusion in obstetrics requires careful consideration and monitoring to ensure the best possible outcome for both mother and baby
2. Pretransfusion cross-matching, typing, and screening for antibodies are very important
3. Obstetrics haemorrhage bundle needs to be followed diligently for positive results
4. Blood and blood components should be readily available to combat any obstetric haemorrhage
5. Other modalities like antifibrinolytic drugs may be considered in case of massive haemorrhage

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Utility of Point of Care USG (PoCUS) In Critically Ill Obstetric Patients

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INTRODUCTION

The definition of PoCUS has not been well established. However, it can be broadly described as a goal-directed, bedside ultrasound examination of a patient performed by a clinician for immediate, real-time assessment. It enables swift, informed decision-making and is often used in guided interventional procedures in various clinical settings, especially in emergency and critical care. [1,2]. In contrast, conventional ultrasound is a comprehensive imaging modality typically conducted by a radiologist or sonographer in a dedicated imaging suite. Unlike POCUS, it operates as a separate service, requiring prior scheduling, coordination with imaging departments, and formal reporting, making it less suited for urgent, on-the-spot diagnostic needs.

The evolution of Point-of-Care Ultrasound (PoCUS) has been transformative. From its modest origins in the 1940s with Karl Theodore Dussik's pioneering use of ultrasound to visualize cerebral ventricles, ultrasound technology has significantly advanced. [3] Today, Point-of-Care Ultrasound (PoCUS) has evolved as an indispensable tool in critical care. The essence of PoCUS lies in its efficient use, bringing ultrasound imaging directly to the bedside, enabling real-time, immediate diagnostic capabilities. This shift has revolutionized conventional practices, empowering healthcare providers to make rapid, informed decisions, in emergency and critical care settings where time is crucial.

Initially, PoCUS systems were used mainly for basic bedside imaging and guided procedures. However, the portability, image resolution, and integration of utility features like Doppler imaging, 3D/4D imaging, and AI-driven image interpretation, have made ultrasound technology more versatile and accessible than ever before. PoCUS can now be used in the Labour Room, Emergency Room, Intensive Care Unit (ICU), and Operation Room (OR). These advancements have profoundly impacted the management of critically ill patients, particularly in obstetric care, where rapid, accurate assessments can be life-saving [1].

Following are some specific protocols illustrating the versatility and practical applications of PoCUS in emergency settings:

- eFAST: Extended Focused Assessment with Sonography for Trauma.
- RADiUS: Rapid Assessment of Dyspnea Using Ultrasound.
- BLUE Protocol: Bedside Lung Ultrasound in Emergency situations.
- ACES: Abdominal and Cardiac Evaluation with Sonography in Shock.
- RUSH Protocol: Rapid Ultrasound for Shock and Hypotension
- FEEL: Focused Echocardiography in Emergency Life Support, particularly for cardiac arrest scenarios.

The aim of this article is to offer a comprehensive overview of the potential applications of Point-of-Care Ultrasound (PoCUS) in critically ill obstetric patients. It also aims to touch upon the integration of PoCUS with telemedicine, highlighting its role in remote consultations and expert guidance. Lastly, it emphasizes the necessity to extend the utility of PoCUS in rural areas, which can ensure early interventions or referral to higher centres for improved healthcare outcomes.

Applications of PoCUS in Obstetric Care

Pregnancy is often regarded as a joyous and hopeful journey, but this dynamic physiological state can sometimes turn into a critical medical challenge, where the lives of both mother and baby are at stake. This discussion delves into major obstetric crises and emphasizes the pivotal role of point-of-care ultrasound (PoCUS) in facilitating timely, life-saving interventions.

Obstetric Assessment:

In the Emergency Department, Point-of-Care Ultrasound (PoCUS) is highly effective in evaluating early pregnancy. Bethsabee S. Stone and colleagues concluded that PoCUS confirms ectopic pregnancies, identifies peritoneal hemorrhage, reduces patient time in the emergency department, and also allows for early intervention [4].

In the labor room, PoCUS rapidly assesses:

- Abnormal fetal presentations.
- Cord presentations.
- Amniotic fluid volume.
- Potential complications such as placental abruption and placenta previa, which can lead to antepartum hemorrhage (Figure 1).[5]

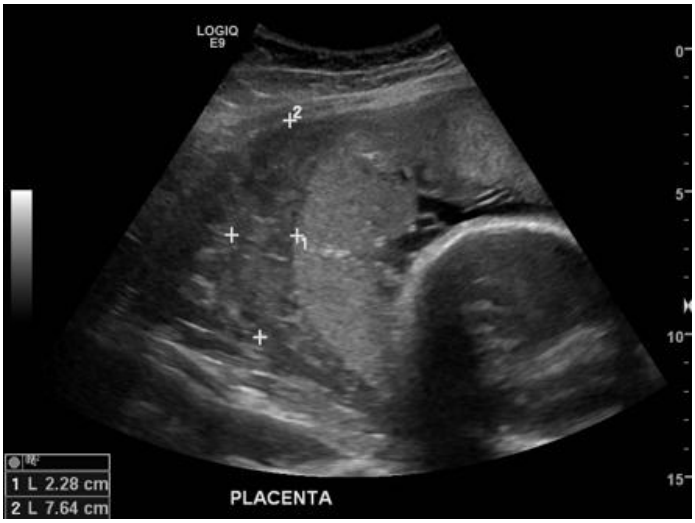

Figure 1: Placental abruption and retroplacental collection

PoCUS assesses fetal well-being

- By monitoring fetal heart rate.
- Doppler parameters.
- Fetal growth restrictions.
- In emergencies such as uterine rupture, PoCUS helps visualize uterine wall defects or free fluid in the abdomen, guiding urgent delivery decisions.

For postpartum hemorrhage (PPH), it aids in diagnosing:

- Retained products of conception.
- Uterine atony.
- Pelvic hematomas.
- Peritoneal collection.

In rural and remote healthcare settings, training of midwives to perform PoCUS and integrated telemedicine can detect critical red flags like ectopic pregnancies, hemoperitoneum, fetal complications, and stillbirths, enabling early referrals and improving outcomes [6].

Maternal Hemodynamics:

Pregnancy induces significant physiological adaptations to meet the increasing metabolic demands of the mother and developing fetus. Cardiovascular alterations are marked by a significant increase in cardiac output, heart rate, and circulating blood volume, accompanied by a reduction in systemic vascular resistance and mean arterial pressure.

Concurrently, respiratory adaptations include an elevated tidal volume and minute ventilation, resulting in a compensated respiratory alkalosis. The overlap of these physiological changes with clinical manifestations of pathological conditions poses a diagnostic challenge and hence treating maternal collapse can be tricky.

Maternal collapse, defined as sudden cardiovascular, respiratory, or neurological failure, is a rare but critical condition. PoCUS) has become a critical tool in such emergencies, enabling rapid identification of underlying causes, guiding fluid management, and facilitating timely life-saving interventions. Common etiologies of maternal collapse include:

- Obstetric or non-obstetric hemorrhages.
- Ruptured ectopic pregnancy.
- Pulmonary or amniotic fluid embolism.
- Stroke or cerebral venous thrombosis.
- Metabolic or anesthetic complications [7].

Inferior Vena Cava (IVC) assessment with PoCUS can guide fluid management (Figure 2).

The diameter and respiratory variation of the IVC provides indirect information about central venous pressure (CVP) and intravascular volume status[8,9].

- A small, collapsible IVC suggests hypovolemia or low CVP, indicates the need for fluid resuscitation.
- A distended, non-collapsible IVC indicates elevated CVP, which may suggest fluid overload or impaired cardiac function.
- **Dynamic Monitoring** can be done by repeated IVC assessments to monitor responses to fluid therapy and optimise fluid management in real-time.

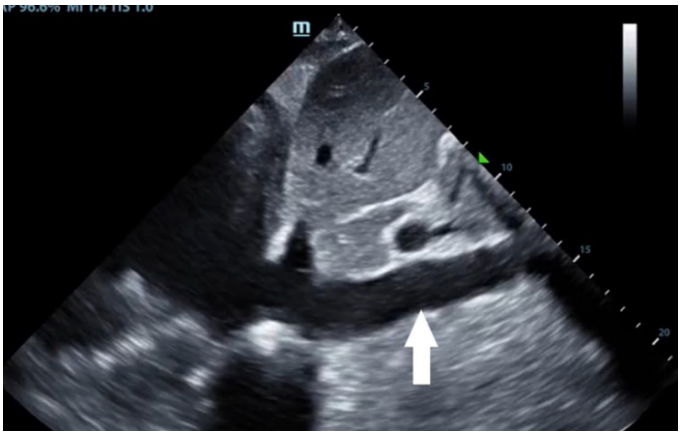

Figure 2: Inferior vena cava: Subxiphoid view

Hypertensive disorders of pregnancy, including pre-eclampsia and eclampsia, can result in life-threatening complications and contribute to 16% of maternal deaths globally. Pulmonary oedema, the most dreaded complication associated with severe pre-eclampsia, occurs in approximately 9.5% of affected women[10]. Poor fluid management can lead to maternal deaths which can be averted with use of PoCUS for better understanding of maternal hemodynamic status and its management.

Cardiovascular Assessment:

Numerous studies indicate that using cardiovascular PoCUS for direct visual assessment is superior to cardiovascular auscultation in identifying cardiovascular diseases. This advantage is consistent regardless of the clinician's expertise. It assesses cardiac function and structure in patients with pre-existing cardiac conditions like valvular heart disease, aortic aneurysm, aortic dissection or pregnancy-related cardiovascular complications such as peripartum cardiomyopathy, pulmonary embolism, and preeclampsia. PoCUS cardiothoracic evaluation includes:

- Assessment of left and right ventricular function including ejection fraction and wall motion abnormalities.
- Evaluation of function of heart valves.
- Detection of pericardial effusion.
- Assessing pulmonary arterial blood flow to detect pulmonary arterial hypertension.
- Measuring blood flow velocities and patterns in various heart chambers and vessels to detect abnormalities [9,11].

Respiratory Assessment:

PoCUS with Lung Ultrasound (LUS) is increasingly utilized in pregnant women for respiratory assessment. Its non-invasive, radiation-free nature makes it ideal for evaluating lung and pleural conditions during pregnancy, where imaging modalities like X-rays or CT scans are often avoided. LUS is particularly helpful in identifying conditions such as pulmonary oedema (common in pre-eclampsia and eclampsia), pneumonia, pleural effusion, pulmonary embolism (PE), and amniotic fluid embolism (AFE) etc[9,11,12]. Significant findings on LUS are:

- B-lines suggestive of fluid accumulation in PE or alveolar interstitial syndrome (Figure 3).
- Pleural effusion detected by anechoic fluid between the pleural layers.
- Consolidations with dynamic air bronchograms may indicate pneumonia.

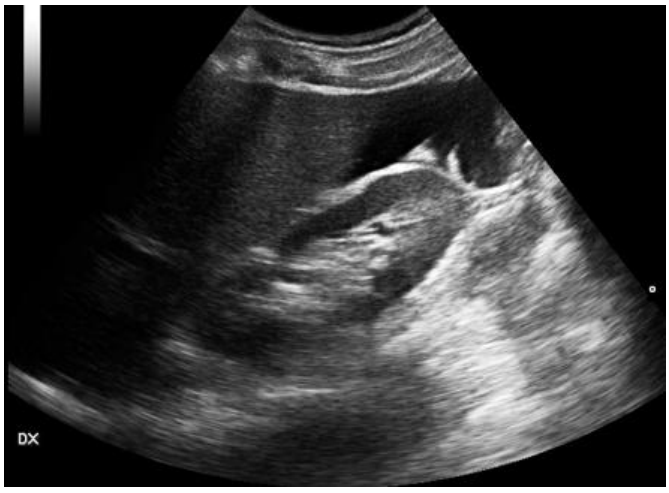

Figure 3: Multiple B-lines in the intercostal space on PoCUS, suggestive of Pulmonary Oedema

- wedge-shaped subpleural consolidations could point to a PE.

However, LUS is operator-dependent, and its diagnostic accuracy can be affected by obesity. Though highly sensitive for many conditions, many a times additional investigations are necessary for definitive diagnoses, such as AFE and PE. Despite these limitations, LUS is a vital component of respiratory care during pregnancy, ensuring safety and precision in managing maternal health.

CNS Assessment

PoCUS is a crucial adjunct tool in the preliminary evaluation of CNS changes in pregnant women, especially in the setting of obstetric emergencies like preeclampsia, eclampsia, stroke, posterior reversible encephalopathy syndrome (PRES), or cerebral venous thrombosis (CVT). While it cannot replace advanced imaging modalities like Computed Tomography (CT) or Magnetic Resonance Imaging (MRI), PoCUS helps provide rapid, real-time information on conditions that may contribute to neurological symptoms.

- **Transcranial Doppler (TCD):** TCD assesses cerebral blood flow velocity, providing information on intracranial pressure (ICP) and cerebral perfusion. It detects intracranial haemorrhages (e.g. in eclampsia or stroke) and stroke-related changes in blood flow patterns[9].
- **Optic Nerve Sheath Diameter (ONSD):** Measuring ONSD helps estimate ICP. Increased ONSD may indicate raised ICP in conditions such as severe pre-eclampsia or eclampsia[13].
- Additionally, PoCUS can assist in evaluating venous thrombosis in cases of cerebral venous thrombosis (CVT) by examining the **jugular veins** for signs of thrombosis.

Emergency and Trauma Situations:

Focused Assessment with Sonography for Trauma (FAST) and its extended version, eFAST are crucial for assessing obstetric patients in emergency situations like surgical emergencies, trauma or hemorrhage. The examination involves assessment of four primary regions, the perihepatic space, perisplenic space, pelvis, and thorax. eFAST is extremely valuable in obstetric emergencies like ruptured ectopic pregnancy, placental abruption, and uterine rupture, where internal bleeding can seriously compromise maternal and fetal well-being (Figure 4).

eFAST is particularly effective in detecting conditions that cause acute abdomen, including bowel obstruction, bowel oedema, appendicitis etc which can sometimes present with overlapping symptoms in obstetric patients[14,15]. However, in cases with unclear findings, further advanced imaging modalities are often required. Despite these limitations, eFAST is an essential tool for assessing critically ill obstetric patients.

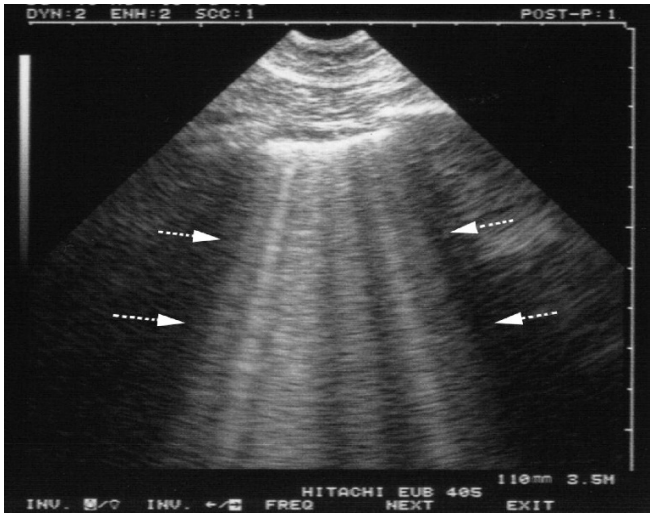

Figure 4: Evidence of free fluid in Morrison's pouch

Procedural Guidance

PoCUS can assist clinician by guiding in various procedures for obstetric patients in emergency or critical care settings thereby enhancing the accuracy, safety, and efficiency of various interventions. It helps in in reducing complications and improving patient outcomes.

In obstetric emergencies, PoCUS can be used for central venous catheter (CVC) insertion, in cases of shock or trauma, where rapid venous access is needed. Ultrasound guidance ensures precise needle placement. It can aid in arterial puncture, difficult peripheral venous access by aiding. It is particularly valuable for guiding procedures such as thoracentesis, paracentesis, and pericardiocentesis, abscess drainage, evacuation of retained products of conception[16].

Use in Obstetric Anaesthesia

PoCUS is a versatile tool in obstetric anaesthesia, providing real-time guidance for various challenging scenarios, thereby enhancing safety and optimizing outcomes. Its applications include:

- Difficult neuraxial block and airway management.
- Difficult intravascular access.
- Gastric antrum assessment.
- Transverse abdominal plane block for pain management [17].

Benefits of PoCUS:

- **Immediate Results:** PoCUS provides real-time imaging, enabling prompt diagnosis and treatment decisions without the delay of transporting patients to radiology departments.
- **Improved diagnostic accuracy:** PoCUS allows for direct visualization of visceral organs thereby improves diagnostic accuracy.
- **Dynamic assessment:** PoCUS enables dynamic assessments, meaning that clinicians can observe changes in real time as they occur.
- **No ionizing radiation**: PoCUS does not involve ionizing radiation, making it a safe and effective diagnostic tool for both the mother and the fetus during pregnancy hence particularly important in obstetric care, where minimizing exposure to radiation is crucial.
- **Non-Invasive:** As a non-invasive tool, PoCUS minimizes patient discomfort and risk, which is particularly important in the vulnerable obstetric population.
- **Portability:** The portability of PoCUS devices allows for use in various settings, including intensive care units, emergency departments, and even in resource-limited environments.
- **Cost-Effective:** By reducing the need for more expensive diagnostic modalities and facilitating early intervention, PoCUS can be cost-effective in managing critically ill patients.
- **Telemedicine Integration**: PoCUS can be integrated with telemedicine platforms, allowing remote consultation and guidance from specialists. This ensures that patients in remote areas have access to expert opinions and advanced care when needed.

Challenges and Ethical Considerations:

Ethical considerations in the use of Point-of-Care Ultrasound (PoCUS) in obstetric patients in India are multifaceted and crucial for ensuring patient safety, autonomy, and regulatory compliance. Here are some key ethical considerations:

- **Informed Consent:** Healthcare provider has to ensure that patients understand the purpose, benefits of PoCUS. Informed consent should be obtained before performing any ultrasound examination.
- **Privacy and Confidentiality:** Protecting patient privacy and maintaining confidentiality of ultrasound findings is paramount. This includes secure storage and handling of ultrasound images and reports.
- **Training and Competency:** Clinicians performing PoCUS should be adequately trained and certified to ensure accurate and safe use of the technology. Additionally, there is a requirement of ongoing education and skill assessment.
- **Regulatory Compliance:** Adhering to national and local regulations and guidelines for the use of PoCUS in obstetric care is necessary to ensure legal and ethical practice. In Indi, the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act regulates the use of ultrasound for pregnant women to prohibit pre-natal sex determination and prevent female feticide. Compliance with this act is crucial to ensure that PoCUS is used ethically and legally in obstetric care.

- **Medical Device Rule:** PoCUS devices fall under the category of medical devices, and manufacturers must comply with the Medical Devices Rules, 2017, which include registration, licensing, and quality control requirements.

Future directions-

Despite the increasing adoption of point-of-care ultrasound (PoCUS) in modern medical practice and the presence of clinical guidelines for its various applications, there is still a lack of standardization and consensus on optimal practices for several PoCUS uses.

In 2022, the Society of Point-of-Care Ultrasound (SPOCUS) established a working group to create a set of recommended best practices for PoCUS that are applicable to clinicians regardless of their training, specialty, resource setting, or scope of practice[18].

CONCLUSION

Medical diagnostics is at the brink of an "ultrasound renaissance." The field is experiencing a dramatic and unprecedented transformation, and PoCUS has evolved as an extension to clinical examination and conventional diagnostics in the management of critically ill obstetric patients. It offers immediate, actionable insights that enhances clinical decision-making and patient care.

PoCUS has broad applications across obstetric, cardiovascular, respiratory, and emergency care settings, making it a versatile and vital tool in modern obstetric practice. As its use continues to expand, there is a growing need for proper training, development of standardized protocols and best practices.

Despite the challenges posed by the **Pre-Conception and Pre-Natal Diagnostic Techniques (PNDT) Act**, PoCUS remains an essential tool in the obstetrician's toolkit.

KEY POINTS:

Harnessing the Power of PoCUS in Obstetrics

1. **Swift Emergency Diagnosis:** PoCUS enables quick identification of life-threatening obstetric conditions like ectopic pregnancy, uterine rupture, maternal collapse, pulmonary embolism, and severe hemorrhage. This ensures prompt and effective intervention when every moment matters.
2. **Precision in Procedures and Trauma Management**: Whether guiding catheter placements, performing fluid drainage, or detecting internal injuries, PoCUS enhances accuracy and safety, making it indispensable in critical and emergency care scenarios.
3. **Bridging the Gap in Rural and Remote Healthcare**: The portability of PoCUS empowers clinicians in resource-limited settings to detect complications, make early referral to improve patient outcomes, and meet healthcare standards even in rural or distant areas. Telemedicine integration can allow remote expert consultation.
4. **Ensuring Regulatory and Ethical Compliance:** As PoCUS becomes more accessible and widely used, strict adherence to regulatory standards and ethical guidelines is essential. Compliance with frameworks like the PCPNDT Act safeguards patient care and prevents misuse, ensuring that technology's potential is not diluted by lapses in legal or ethical practices.

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Ventilator Support in Critically Ill Obstetric Patients

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INTRODUCTION

Ventilatory management of an obstetric patient requires careful consideration of the physiological changes during pregnancy, prioritizing uterine blood flow and foetal well-being while ensuring adequate oxygenation for the mother. Indications or ventilatory management can be many[1] -

1. Pregnancy-specific conditions – Haemorrhage, sepsis, hypertensive disorders of pregnancy, amniotic fluid embolism, complex cardiac diseases, acute fatty liver, aspiration syndromes, infections, ovarian hyperstimulation syndrome, tocolytic-induced pulmonary oedema,

   Severe hypoxemia – in acute respiratory distress (ARDS,) pneumonia, PIH-related pulmonary oedema.
2. Surgical/medical condition not related to pregnancy – Trauma, asthma, diabetes, autoimmune diseases.
3. Medical diseases that may worsen during pregnancy – Anaemia, congenital heart diseases, rheumatic and non-rheumatic valvular diseases, pulmonary hypertension, renal failure, autoimmune diseases (e.g. SLE, myasthenia gravis), etc.
4. Elective postoperative for high-risk obstetric procedures or critical illnesses.

These illnesses can cause hypoxia, hypercapnia, and altered mental status necessitating mechanical ventilation. Estimated blood loss, AKI(acute kidney injury, myocardial injury, and PaO2/FiO2 are independent risk factors for PMV in critically ill obstetric patients.[2]

Pregnancy causes certain physiological and anatomic changes in the lung and respiratory system which increases the chances of respiratory failure[3]-

- Oedema and hyperaemia of the upper airways
- Decreased tone of the lower oesophagus sphincter
- Due to raised levels of progesterone there is increased respiratory drive with greater tidal volume leading to increased minute ventilation.
- Decreased functional residual capacity (FRC)
- Elevated diaphragm due to the enlarging uterus (up to 5 cm)
- Decreased compliance of the ventilatory system (reduction of chest wall compliance; lung compliance is unaltered)
- Increased O2 consumption and CO2 production due to increased demands of the foetus
- Respiratory alkalosis with a decrease of bicarbonate

Pregnant women have hypocapnia due to hypoventilation at baseline. The arterial carbon dioxide tension (PaCO2) tends to be lower in pregnant woman. A normal PaCO2 is a sign of impending respiratory failure. Due to the above cited reasons failure during intubation is 8 times more common in pregnant women than nonpregnant patients. Principles of mechanical ventilation in obstetric patients are similar to those in non-obstetric patients.[4]

Pregnancy Induced Hypertension (PIH) - Pulmonary oedema+ ARDS

Preeclampsia and eclampsia are severe forms that may cause hypoxemia secondary to pulmonary oedema by increasing capillary permeability, decrease in colloid osmotic pressure, and left ventricular dysfunction. Other complications like hypertensive encephalopathy & HELLP syndrome may also warrant mechanical ventilation.[5] Pulmonary oedema is a dire complication with morbidity & mortality of neonates, obstetricians are tasked with the critical decision of whether to do an extremely preterm delivery(<28 weeks gestation). ARDS is a clinical syndrome characterized by severe hypoxemia, bilateral infiltrates on chest radiographs, and reduced pulmonary compliance.[6] Pregnant women are at increased risk of developing ARDS (Acute respiratory distress syndrome) & needing mechanical ventilation compared with nonpregnant women[6]. Magnesium sulfate which is used as an anti-seizure medication and tocolytic agent in preeclampsia can cause respiratory depression at levels >12 mg /dL and respiratory arrest at levels of 16 – 18 mg/dL. Treatment of ARDS in pregnancy is the same as in a nonpregnant patient which includes lung protective ventilation, adequate antimicrobial therapy, and supportive therapy for sepsis. Berlin's definition of ARDS is

- Onset within 1st week of known clinical insult or new or worsening respiratory symptoms.
- Bilateral opacities on chest imaging not fully explained by effusions, lobar/lung collapse, or nodules.
- Respiratory failure not explained by cardiac failure or fluid overload.
- Need objective assessment such as echocardiography to exclude hydrostatic oedema if no risk factor is present.
- Impaired oxygenation.

Mild: 200< PaO_2/FiO_2 <300 with PEEP or CPAP ≥5 cm H_2O

Moderate: 100< PaO_2/FiO_2 <200 with PEEP ≥5 cm H_2O

Severe: PaO_2/FiO_2 <100 with PEEP ≥5 cm H_2O

Where, PaO2 = Partial pressure of oxygen in arterial blood, FiO2= Fraction of inspired oxygen, PEEP =Positive end-expiratory pressure, CPAP = Continuous positive airway pressure

The goals of ventilation is to maintain maternal oxygen saturation > 95% and also ensure foetal oxygenation, PaO2 > 60 mmHg , PaO2/FiO2 ratio >150 , PaCo2 at 28 to 35 mmHg, lung protective strategies with low tidal volume (6 to 8 ml /kg), plateau pressure <30 cm H2O, PEEP optimum with minimum FiO2 to achieve oxygenation goal.[7]Non invasive positive pressure ventilation may be considered in milder cases initially but invasive ventilation may be necessary if pulmonary oedema becomes severe & requires immediate intervention. If the foetus is near-term, prompt delivery may be necessary to alleviate the maternal respiratory distress. If the patient is hemodynamically unstable, immediate interventions to stabilize blood pressure may be required before focusing on ventilatory management. Point of care Ultrasonography (POCUS) can be used to predict fluid responsiveness by measuring the diameter or collapsibility of the inferior vena cava, to assess left ventricular systolic and diastolic function to correctly guide the treatment of hypotension.

Obstetric causes of ARDS can be aspiration, amniotic fluid embolism, and Pre-Eclampsia.

Septic abortion, haemorrhage tocolytic induced pulmonary oedema. Non-obstetric causes include pneumonia, Transfusion, Trauma, Fat embolism, Cardiac pulmonary oedema.

For initial ventilator settings –

Calculate predicted body weight which is 45 + 0.91(Height – 152)

Set up and adjustment

- Select any controlled ventilatory mode. CMV, ACV or BIPAP, ASV
- Set TV of 6ml/kg
- Set (not > 35) to maintain optimal minute ventilation (MV)
- aim for SpO2 88-95 % or PaO2 55-80 mmHg
- increase PEEP with increasing FiO2 (5- 24 cm H2O) according to sliding scale
- aim for plateau pressure (Pplat<30 cm H2O)
  - (a) if necessary decrease TV stepwise by 1 mL/kg PBW to a minimum of 4 mL/kg PBW
  - (b) If Pplat< 25 cmH20, increase TV stepwise by 1 mL/kg PBW until Pplat>25 cmH20 or TV of 6 mL/kg PBW
  - (c) Pplat>30 cmH20 allowed if TV 4 mL/kg IBW and pH <7.15
  - (d) TV could be increased up to 8 mL/kg PBW for patients with severe dyspnoea if Pplat maintained <30 cmH20
- pH goal = 7.30 – 7.45
- if pH < 7.15 increase TV or give NaHCO3.
- Additional considerations in pulmonary oedema include diuretics to alleviate pulmonary congestion, neuroprotective ventilation to prevent hypercapnia or excessive PEEP, steroids (hydrocortisone or dexamethasone)
- Permissive hypercapnia with Paco2 of 60 mm Hg has no adverse effects on the foetus but higher levels of CO2 should be avoided.
- Delivery of the foetus can improve the maternal health in ARDS.

Non-invasive ventilation (NIV)

NPPV (Non-invasive positive pressure ventilation) is a kind of non-invasive ventilation (NIV) where there is delivery of assisted mechanical ventilation without an invasive endotracheal airway. In pregnancy, NIV is usually avoided because of increased aspiration risk due to increased abdominal pressure and lower oesophagus sphincter tone. The prerequisites of NIV are a good respiratory drive, stable hemodynamics, and minimum secretions. It has been shown to be useful in patients with obstructive airway disease in pregnancy.[8] A low threshold for ETT intubation should be kept in view of high aspiration risk. The main modalities in NIV are continuous positive airway pressure (CPAP), non-invasive pressure support ventilation (NIPSV) or BIPAP, and high-flow nasal cannula (HFNC). NIPSV is programmed at two levels: EPAP or PEEP & IPAP which is obtained with pressure support. The respiratory rate is not pre-set and depends on the condition of the patient. For the success of NIV, patients should be alert in the head-up position and cooperative.

Mechanical ventilation in Cardiac failure

Cardiac failure is a common cardiovascular complication that occurs in pregnancy & postpartum period. Cardiomyopathies and other cardiac conditions are responsible for 27 % of pregnancy-related deaths accounting for the greatest percentage of any cause.[9] Other common reasons are valvular heart diseases like mitral stenosis, severe anaemia, and chronic hypertension with superimposed pre-eclampsia. The most common valvular lesions involved in

pregnancy are mitral stenosis & aortic stenosis which can be mild, moderate, or severe depending on the valve area. It results in elevated left atrial pressure, increased cardiac output and ventricular volume, increased pulmonary vascular resistance, pulmonary venous oedema& congestion resulting in right heart failure. An early trial of non-invasive ventilation can be instituted on patients with pulmonary oedema. A negative fluid balance with diuretics, and specific pulmonary hypertension treatment with inhaled nitric oxide help improve lung function. Optimize preload and afterload by avoiding fluid overload using diuretics judiciously. Vasodilators may help reduce afterload and improve cardiac output but monitor for hypotension. Inotropes may be considered if myocardial contractility is severely impaired. Use left lateral tilt to reduce uterine compression of the inferior vena cava.

Rescue strategies for severe hypoxemia[10]

1. Inverse ratio ventilation (IRV) -The inspiratory-to-expiratory time ratio is usually set in the physiological range of 1: 2. IRV is an advanced mechanical ventilation strategy that involves setting the inspiratory-to-expiratory (I:E) ratio greater than the conventional 1:2 (e.g., 2:1 or higher) extending the inspiratory phase which increases the mean airway pressure, improves alveolar recruitment and hence enhancing oxygen diffusion.
2. Prone ventilation – In the third trimester, proning the patient needs careful attention to prevent inadvertent decannulation or extubation, there needs to be adequate room for the abdomen to expand passively. This can be achieved by using adequate-size bolsters at the chest and hip level. Close monitoring of the mother and foetus including continuous foetal CTG should be done (Table 1).
3. ECMO (Extracorporeal membrane oxygenation)- If used at the appropriate time it can improve maternal &foetal survival by up to 80%. Its major disadvantage is that it exposes the indwelling foetus to extracorporeal circulation and systemic heparinisation.
4. Inhaled pulmonary vasodilators – Inhaled nitric oxide and prostacyclins are commonly used for this purpose. It causes selective pulmonary vasodilatation in well-ventilated lung units hence a better ventilation-perfusion match resulting in improved oxygenation in ARDS patients

Table 1: Changes in ABG Values in Pregnancy

Blood gas values	Non-pregnant	1st trimester	2nd trimester	3rd trimester
PH	7.4	7.44	7.44	7.44
PaO_2 (mm Hg)	100	107	105	103
$PaCO_2$(mm Hg	40	30	30	30
Serum bicarbonate (mmol/L)	24	21	20	20

Monitoring during mechanical ventilation-

1. Routine monitoring – ECG, NIBP, SpO2 & urine output
2. Specific monitoring- Invasive blood pressure – IBP, Central venous pressure. Acid Base Gas (ABG) – To monitor oxygenation and ventilation, End-tidal carbon dioxide (EtCO2) &Foetal heart rate monitoring.

A few physiological criteria can guide for escalating the level of monitoring like Modified early obstetric warning system (MEOWS), Simplified Acute Physiology Score (SAPS) II] or organ failure based [Sequential Organ Failure Assessment (SOFA), and Multiple Organ Dysfunction Score (MODS)]

Essential adjunctive measures consist of daily checking of FAST HUG [11]

- F = Feeding via preferably naso-jejunal tubes or TPN
- A = Analgesia with short-acting opioids along in combination with drugs like acetaminophen.
- S = Sedation
- T = Thrombosis prophylaxis, unfractionated, and LMWH are safe to use as they do not cross the placenta.
- H = Head end of the bed to be elevated to prevent aspiration.
- U = Ulcer prophylaxis with proton pump inhibitors.
- G = Glycaemic control with OHAs with or without insulin

Propofol remains the first choice of sedation in these patients and if paralysis is needed, cis atracurium is the preferred agent. Benzodiazepines are able to cross the placenta and may accumulate in the foetus. Short-acting drugs like midazolam may be used temporarily. Short-acting opioids like fentanyl may be used. A daily awakening trial, spontaneous breathing trial, and head-up position complete the ventilation management of pregnant patients.

Weaning from Mechanical Ventilation

Weaning is the gradual withdrawal of mechanical support from the patient and encouragement to breathe spontaneously once the primary pathology is settled and the patient is hemodynamically stable. It involves daily spontaneous breathing trials with gradual stepping down of ventilatory support to minimum CPAP support or T piece until extubation. Post-extubation support should be continued with supplemental oxygen or non-invasive ventilation as needed.

CONCLUSION

Optimal management of a critically ill obstetric patient on mechanical ventilation involves early detection and multidisciplinary treatment by obstetricians, paediatricians and anaesthesiologists based on knowledge of physiological & pathophysiological changes.

KEY POINTS

1. Anticipate a difficult airway in a pregnant patient and prepare for potential complications.
2. Use the lowest FiO□ possible needed to achieve target oxygenation, avoiding hyperoxia to reduce oxidative stress on the foetus.
3. Monitor hemodynamics and avoid excessive PEEP or hyperventilation to maintain venous and cardiac output.
4. Optimize Carbon dioxide levels of the mother between 28- 32 mm Hg to avoid foetal acidosis and reduced uteroplacental blood flow.
5. Use lung protective low tidal volume ventilation of 6-8 ml/kg to prevent barotrauma and volume trauma to the lungs. Target SpO2 > 95 % to ensure adequate oxygen delivery.

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Monthly Clinical Meetings AOGD Calendar 2024-25

Date	Hospital
31st January, 2025	VMMC & Safdarjung Hospital
28th February, 2025	UCMS & GTB Hospital
28th March, 2025	RML Hospital
25th April, 2025	LHMC & Smt Sucheta Kriplani Hospital

Quality Improvement Initiatives in Obstetrics Critical Care

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INTRODUCTION

Every pregnant woman and her family desires to have a pleasant and memorable birthing experience with a healthy mother and new born. Though the Maternal mortality ratio (MMR) has reduced from 167 (2013) to 97 (2020) and Infant Mortality Rate from 34 (2016) to 30 (2019), these indicators are still unacceptably high as compared to developed countries. Hence there is a huge scope to bring about improvement in the indicators. Death in most of these cases are preventable with provision of good quality antenatal, natal, post-natal-care, safe institutional delivery services, timely referral, and provision of emergency obstetrics care. This article outlines quality improvement (QI) initiatives in obstetric critical care, leveraging tools like the Donabedian model, standardization of care protocols, and enhanced infrastructure.

DISCUSSION

The Donabedian model evaluates the quality of care through three components[1]:

- Structure: Physical and organizational resources, including infrastructure, drugs, equipment, and skilled personnel.
- Process: Steps required to deliver care, such as patient registration, treatment, and discharge.
- Outcome: Impact of healthcare interventions on patient and population health.

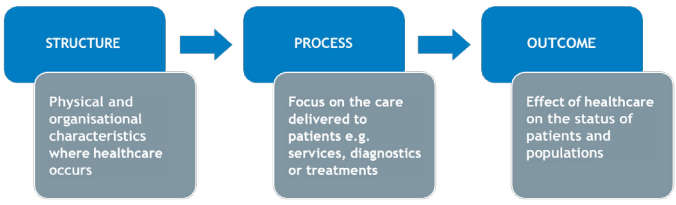

Figure 1: The Donabedian model for quality of care

This model emphasizes the interconnectedness of these components.

From an improvement perspective, processes make the important connection between behavioural changes and outcomes. According to Donabedian, outcome measures remain the 'ultimate validators' of the effectiveness and quality of healthcare.

Key QI initiatives commonly implemented in Obstetrics critical care:

1. User Friendly Signage System: Clear signage mitigates delays in seeking and receiving care. It ensures that facilities provide emergency obstetric services, improving communication with referral points and reducing conflicts in emergency departments. Signage with Service provision is mandatory part of all Quality Assurance Programs.
2. Early recognition of critical illness: The use of tools like obstetrically modified quick-SOFA score (omqSOFA), miniPIERS (Pre-eclampsia Integrated Estimate of Risk) risk prediction model helps in the timely identification and management of critical conditions. Maternal Early Warning Scoring Systems improve outcomes through early intervention. Shock Index (SI), defined as the ratio between heart rate and systolic blood pressure, has been proposed as a useful and reliable tool to predict hypovolemic states and early haemodynamic compromise.[2]
3. Infrastructure for delivery of assured services: Facilities should align with operational norms, including designated triage areas, functional communication systems, and secure emergency setups. Proximity of emergency departments to operation theatres, ICUs, and laboratories enhances service delivery.[3] Hospital should have sound security system to manage overcrowding in emergency. Emergency drug trays to be maintained at every point of care.
4. Standardizing Care Protocols: Evidence-based protocols for managing emergencies like preeclampsia, postpartum haemorrhage (PPH), and sepsis should be implemented. Care bundle use has better clinical outcomes as the interventions, often existing as part of standard care, are used collectively rather than in isolation.[4] WHO initiated development of global recommendations related to the use of care bundles for PPH treatment.[5] For referral/transfers to

higher centre, continuum of care has to be assured by advance communication after arranging referral vehicle along with a designated person.

5. Competency-Based Training & Emergency Drills: Regular multidisciplinary drills and training in areas like obstetric emergencies (e.g., shoulder dystocia, eclampsia), early warning systems, foetal monitoring and maternal resuscitation build skills for handling acute obstetric events. Simulation-based education improves teamwork, leadership, and decision-making.[6]
6. Multidisciplinary Collaboration: Dedicated critical care teams, comprising obstetricians, anaesthesiologists, intensivists, and neonatologists, ensure comprehensive care. A multidisciplinary approach involving process optimization, competency-based training, and patient-centred care is essential for impactful outcomes.
7. Postpartum Haemorrhage management: PPH is the most common cause of maternal death during childbirth in India and accounts for 38% of all maternal deaths. Active management of the third stage of labour (AMTSL), uterine balloon tamponade, surgical interventions, and blood product usage are critical for PPH management. Quantification of blood loss is preferred over visual estimation and is highly recommended.[7] In 2022, the International Federation of Gynaecology and Obstetrics (FIGO) published a statement in support of care bundles for PPH-related care.
8. Maternal Sepsis Prevention and Management: Sepsis screening tools, antibiotic stewardship programs, and infection prevention measures are essential. When bacterial sepsis in pregnancy or postpartum is suspected, treatment with antibiotics as early as possible (preferably within the first hour) is important for maternal survival. Mortality can increase by 8% for each hour delay in antibiotic administration.[8]
9. Blood Bank Services: Ensure adequate blood and blood product availability. Cell Salvage Techniques can be used to explore autologous blood salvage during caesarean sections for optimizing blood usage. Robust transfusion protocols are mandatory.
10. Resource Management: Ensuring ICU/HDU availability, functional equipment, and adequate drug supplies prevents disruptions in emergency care. Strategic resource allocation and maintenance reduce critical downtime. Point of care diagnostic devices should be present.
11. Lifesaving Anaesthetic skill for Emergency Obstetric Care: Training course for such skills help in resuscitation of mother and new-born. All facilities need to develop anaesthetic Guidelines for safe practices during obstetric emergencies. Management of shock and resuscitation protocols need to be emphasized as a central component in comprehensive strategy
12. Patient centred care initiatives: Shared decision-making improves patient satisfaction and reduces conflict. Transparent communication, informed consent, and family involvement are critical components of patient entered care. Facility should have defined and established procedures for informing and involving patient and their families about treatment and obtaining informed consent wherever it is required.
13. High risk pregnancy: Identify high risk pregnant women and treat them on priority basis. ANM/ASHA workers to be actively involved for providing effective ANC care. Anaemia to be handled on war footing level. Early identification of anaemic women and adequate treatment and follow up of severely anaemic pregnant women is a critical intervention which helps to prevent/reduce a significant proportion of maternal mortality. Contraception plays a strategic role in obstetrics and maternal health by helping to prevent unintended pregnancies.
14. Access to Care: Expand access to obstetric critical care in underserved areas as most tertiary centres are in living in urban areas, while 65-70% of the population resides in rural areas. Expand access to innovative technologies and approaches, including Birth preparedness and complication readiness (BPCR). Inadequate medical facilities, drugs, equipment and shortage of skilled manpower particularly in rural areas further compound the problem in managing critically ill obstetric patients.

Quality management

Quality Improvement should be data driven. Use data analytics and predictive analytics (Table 1).

Table 1: Quality Improvement Tools

Working with ideas/concept	Working with numbers
Brainstorming	Pareto charts
Cause & effect	Control Charts
Process Mapping	Run Charts
Flow charts	Check sheets
Gantt charts	Histogram
PICK Chart	Scatter Diagram

- Pareto Charts: Identify major causes of inefficiencies.
- Process Mapping: Streamline critical processes by identifying non-value-adding activities.
- Plan-Do-Study-Act (PDSA) Cycles: Test and implement changes.
- Structured Communication Tools: Use SBAR (Situation, Background, Assessment, Recommendation) for clarity.

Outcome Monitoring to be done by tracking maternal mortality, near miss cases and neonatal outcomes. Identify gaps and Benchmark outcomes with national and international standards for improvement.

A quality team with a quality improvement plan should be in place which periodically reviews the quality improvement initiatives. Use checklist in different departments and services.

Employees satisfaction rate should also be monitored for a healthy and supportive work environment.

SMART Objectives

Specific, measurable, achievable, relevant, and time-bound objectives include:

- Implementing safe birth and surgery checklists.
- Reducing mortality due to conditions like PPH, sepsis, and eclampsia.
- Conducting regular audits of maternal and neonatal outcomes.
- Enhancing compliance with oxytocin administration immediately post-birth.
- Every facility needs to identify gaps and make Smart Objectives accordingly.[9]

CONCLUSION

Improving maternal and neonatal outcomes remains a global priority. Despite progress in reducing maternal mortality rates, preventable deaths due to postpartum haemorrhage, sepsis, and other critical conditions persist that require emergency obstetric care and the need for coordinated QI initiatives. Respectful, high-quality maternal care is a fundamental right and requires multidisciplinary collaboration, robust infrastructure, and active community participation. Expanding access to critical care in underserved areas, combined with innovative approaches, will ensure equitable, high-quality services. Contraception should be offered to women of reproductive age group at all point of time. Let us all join hands to ensure that all pregnant women receive most appropriate care without any delays with dignity and respect.

KEY POINTS

1. Quality improvement (QI) initiatives in obstetric critical care aim to enhance maternal and neonatal outcomes by addressing clinical challenges, improving processes, and reducing preventable complications.
2. Targeted interventions through initiatives like LaQshya workshops, Safe Motherhood and Anaemia Mukt Bharat campaigns is crucial.
3. Process improvements in triaging, risk management, and referral systems enhance care.
4. Quality assurance relies on meeting patient needs through team-based approaches and structured processes.

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1. An Interesting Case of Secondary Amenorrhea with Neurofibromatosis

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ABSTRACT

Neurofibromatosis (NF) is a genetic disorder characterized by tumors in the nervous system and skin. Neurofibromas are associated with precocious puberty but its association with secondary amenorrhea is rare as described in this case. A 19-year-old girl known case of neurofibromatosis presented with secondary amenorrhea not responding to the progesterone challenge test. On evaluation, a pituitary adenoma was diagnosed on MRI. A multidisciplinary approach is required in such cases and needs thorough evaluation and management.

INTRODUCTION

Neurofibromatosis (NF) is a genetic disorder characterized by tumors in the nervous system and skin.[1] Various types of NF are present out of which type 1 contributes to 96% of the cases and NF2 contributes to 3% of cases and 1% of cases are of Schwannomatosis. It is a rare condition with a prevalence of Type 1 NF is 1 in 3000 births, however, type 2 NF is 1 in 33,000.[1] Neurofibromas are associated with precocious puberty but its association with secondary amenorrhea is rare as described in this case.

CASE REPORT

A 19-year-old unmarried girl with, a known case of NF1, presented with a complaint of amenorrhea since February 2024, not responding to a progesterone challenge test. She also complained of scanty flow since 2020. She consulted in a medical college in February 2021 and was evaluated there. USG in 2021 was s/o B/L atrophic ovaries. The patient was having amenorrhea for 3 months for which she was advised Tab. Norethisterone for 5 days for withdrawal, followed by OCP for 21 days for 3 cycles. After 3 months of OCP, she again had amenorrhea for which she was given OCP cyclically till 2021 mid. She had cycles every 2-3 months following this.

She also complained of the presence of pigmented flat lesions all over the face and body since birth. Initially, 3 pigmented flat marks were noticed at the face,4-5 over the trunk and back at birth following this she developed a large black patch over the thigh. The pigmentation had gradually increased over time in number and size and the black patch now extends from the right groin to the knee.

No history of rapid weight loss/gain, anorexia excessive exercise regimen, or anosmia. No history of headaches, seizures, trauma, surgery, or vision disturbances. No history of heat/cold intolerance, lethargy, altered bowel/bladder habits, acne, galactorrhea, lethargy, stress, or depression. No h/o hot flashes, vaginal dryness, irradiation, surgery, or long-term intake of drugs. No h/o sudden enlargement of fingers/toes, increase in shoe size.

Menstrual History

Menarche at 15 years of age, Previous cycles- 5/30 days, regular, 2 pads per day. Now - 2 days /2-3 months, irregular, delayed cycles, scanty menses, only spotting, 1 superficially soaked pad per day. LMP: February 2024.

Past History

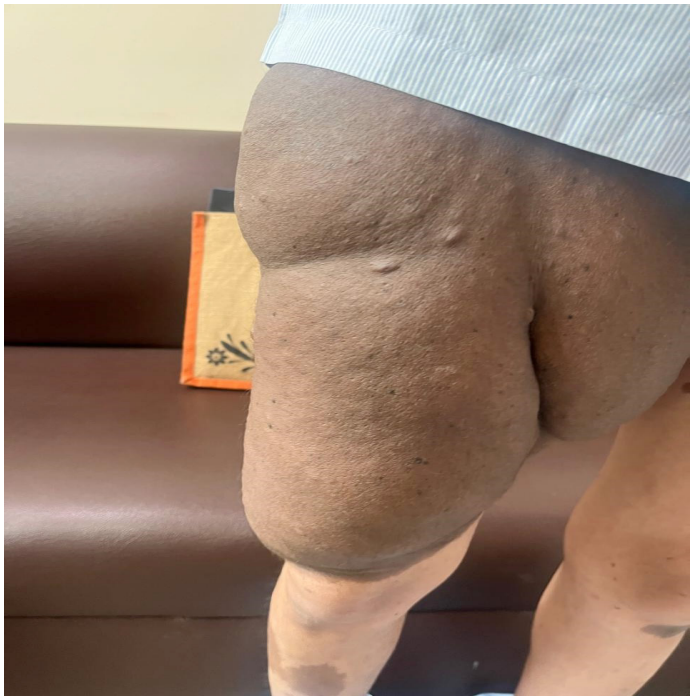
K/C/O Neurofibromatosis since 2021 – under treatment in AIIMS 2021 - Skin Biopsy reported diffuse neurofibroma involving deep dermis

Family History

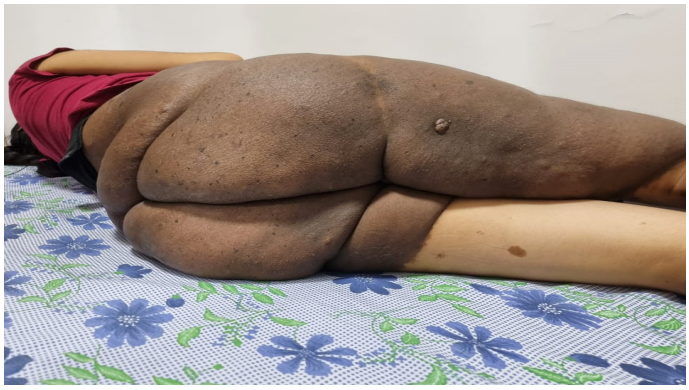
Mother had menarche at 13 years and menopause at 43 years. She has 1 brother-normal development as per age, the rest of the family history is not significant.

On examination, her Face had no dysmorphic features but hyperpigmented skin lesions >10-15 in number and of size <2 cm (picture 1). Breast, spine, body ratio-upper segment/lower segment 79/80.4= 0.94, thyroid was normal. Neurofibroma was present at the back and thigh to knees on the right side and left side till the upper 1/3 of the thigh, bilateral labia majora was swollen (pictures 2,3,4).

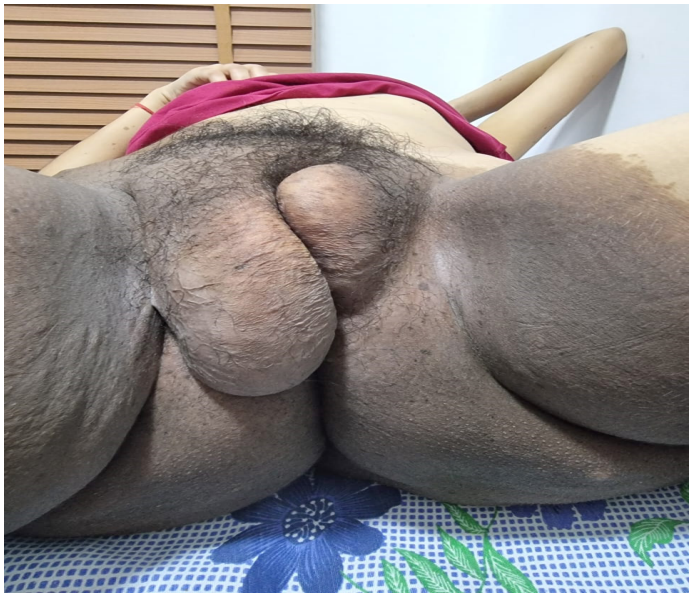
PICTURE 1: Café au lait spots over face



PICTURE 2: Neurofibromatosis involving the right thigh



PICTURE 3: Neurofibromatosis of the back and thigh



PICTURE 4: Neurofibromatosis involving the vulva

Management

An investigation of her hormone profile was done and reported as FSH:

9.12mIU/mL, LH: 6.79mIU/mL, estradiol: 25.90pg/mL, prolactin:3.75ng/mL, serum calcium:10.01mg/dL, phosphorus: 4.03mg/dL, PTH: 109pg/mL, Thyroid profile reported normal, serum cortisol: 13.50ug/dL, IGF-1: 147.300ng/ml. USG reported normal size uterus with, ET-3.1mm and Multiple small follicles seen in both ovaries (<7mm), and ovarian volume was 6.2 ml and 5.0 ml. Tab Clonidine 100mcg two and a half tablets was given and GH levels were monitored and reported normal. MRI brain evidence of a small bulge noted along the superior margin measuring 3.7 x 29mm in size similar enhancement like pituitary suggestive of pituitary adenoma. MRI thigh reported a large near circumferential lesion noted along the lower back, perineum, tibia, and right thigh involving the skin and subcutaneous planes with multiple associated

tortuous nerves and vessels suggestive of Plexiform neurofibroma. Ophthalmologic examination and Leisch nodule were ruled out. The patient was given 21 days estrogen+progesterone challenge followed by withdrawal bleeding. Currently, the patient is being managed on cyclical OCP and is planned for plastic surgery for neurofibromas and trans-sphenoid resection of pituitary adenoma by the neurosurgery team.

DISCUSSION:

Neurofibromatosis (NF) is a genetic disorder (AD) in which the nerve tissue grows abnormally to form tumors that may be asymptomatic or may cause serious damage by compressing nerves and other tissues. It affects all neural crest cells (Schwann cells, melanocytes, and endoneural fibroblasts). Melanocytes also function abnormally resulting in cafe au lait spots. Approximately half of the cases are d/t de novo mutations and no other family member is affected. Types of neurofibromatosis are mentioned below:

1. **Neurofibromatosis Type 1 (NF1) aka von Recklinghausen disease**. Most common form (90-96%). The mutation is seen in the 17q11.2 gene which codes for neurofibromin which leads to hyperactivation of proto-oncogene RAS and its downstream effectors. It is characterized by skin changes and the growth of tumors along nerves.[1]

   Diagnosing criteria of NF1 (2 out of 7):

   - 2 or more neurofibromas on or under the skin or one plexiform neurofibroma (a cluster of tumors involving multiple nerves)
   - Freckling of groin or axilla >3 mm in diameter
   - Café au lait spots- 6 or more >15 mm in greatest diameter
   - Leisch nodules- freckling in iris 2 or more
   - Optic glioma
   - Distinctive osseous lesion or cortical thinning of long bones with or without pseudoarthrosis
   - First-degree relative with NF1
2. Neurofibromatosis Type 2 (NF2) aka central neurofibromatosis. Mutation in chromosome 22q12 i.e. NF 2 gene leads to loss of expression of the protein Merlin or schwannoma which is a tumor suppressor protein. It Causes benign tumors on the nerves responsible for hearing and balance. Clinical features are as follows:
   - B/L acoustic neuromas – a hallmark of NF2
   - Headache
   - Balance problems and peripheral vertigo d/t schwannoma and involvement of inner ear
   - Facial weakness/paralysis (involvement of facial nerve)
   - Brain tumors, spinal tumors
   - Deafness and tinnitus
   - Menigiomas and ependymomas
3. **Schwannomatosis:** Mutation in both chromosomes 17 and 22. It is a rare form that causes tumors to develop both in cranial and spinal/peripheral nerves. It causes chronic pain and sometimes numbness, tingling, and weakness. About 1/3 of patients have segmental schwannomatosis i.e. schwannomas limited to a single part of the body such as arm, leg, or spine. No hearing loss, no learning disabilities.

CORRELATION BETWEEN NEUROFIBROMATOSIS AND SECONDARY AMENORRHEA: Correlation between neurofibromatosis and secondary amenorrhea is extremely rare. It is attributed to pituitary lesions and growth hormone excess.[2] Microduplications in the GPR101 gene are seen in NF1 which results in overexpression in genes responsible for pituitary tumors leading to X-Linked acrogigantism.[3] GPR101 gene encodes for an orphan G-protein coupled receptor which is important for brain and pituitary function.[4] Another mechanism is the loss of somatostatinergic inhibition from infiltrating optic glioma leading to dysregulated GH secretion. In our case, it was the pituitary lesion that was causing amenorrhea.

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2. Acute Pancreatitis in Pregnancy-varied aetiologies and feto-maternal outcome: A Case Series

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ABSTRACT

Acute pancreatitis (AP) in pregnancy (APIP) is a rare condition associated with significant maternal and perinatal morbidity and mortality. This study reports a series of four cases of pregnant women treated for acute pancreatitis over the past year. The patients had an average age of 25 years (range: 23–39 years). The diagnosis was primarily based on clinical and biochemical criteria, including characteristic epigastric pain radiating to the back and elevated lipase levels. Among the four cases, two were attributed to biliary causes, one to hypercalcemia secondary to a parathyroid adenoma, and one to hypertriglyceridemia. All cases had favorable maternal outcomes, although two required recurrent hospital admissions. Regarding fetal outcomes, there was one case of in-utero fetal demise, one preterm delivery, and two-term deliveries. Acute pancreatitis during pregnancy poses a significant risk to both maternal and fetal health, and its differential diagnosis should be considered to ensure timely and effective management.

Keywords: Acute pancreatitis in pregnancy, pregnancy

INTRODUCTION

The incidence of acute pancreatitis in pregnancy (APIP) varies, ranging from approximately 1 in 1,000 to 1 in 10,000 births1. Historically, case series reported poor outcomes with high maternal and fetal mortality rates2. Over the past decades, there has been an observed increase in the incidence of APIP. Acute progression of APIP can lead to complications such as pancreatic necrosis, abscess formation, multi-organ dysfunction, and other adverse maternal and fetal outcomes. APIP typically has an acute onset and is challenging to diagnose and manage. Studies suggest that APIP may pose a greater risk to fetal health than to maternal health3. However, advancements in diagnostic techniques and management strategies have contributed to improved outcomes in recent years. This retrospective analysis aims to assess the etiology, risk factors, management approaches, and maternal and fetal outcomes in cases of pancreatitis during pregnancy.

Clinical cases:

Case 1

A 23-year-old female, gravida 2, abortion 1 (G2A1), at 23+1 weeks of gestation, presented with complaints of excessive vomiting and upper abdominal pain for two days. On examination, she was afebrile, with a pulse rate of 120 bpm, blood pressure of 90/60 mmHg, abdominal distension, tenderness in the upper abdomen, and a 24-week gravid uterus. Laboratory investigations revealed elevated amylase (770 IU/L) and lipase (1,454 IU/L) levels. Ultrasonography (USG) of the abdomen showed a thickened gallbladder wall with echogenic sludge, a bulky pancreas, and free fluid in the peripancreatic region, suggestive of acute pancreatitis. Further workup revealed hypercalcemia (12.3 mg/dL), elevated parathyroid hormone (PTH) levels (514 pg/mL), and a parathyroid adenoma on neck ultrasound. After adequate hydration, she underwent total parathyroidectomy within 48 hours of admission with informed consent. The postoperative period was uneventful, with normalized serum calcium (8.52 mg/dL) and PTH levels (98 pg/mL). She improved gradually and was discharged after three weeks of hospitalization. At 36+6 weeks of gestation, she had a spontaneous vaginal delivery of a healthy female baby weighing 2,690 grams and was discharged 72 hours postpartum. (Figure 1 & 2)

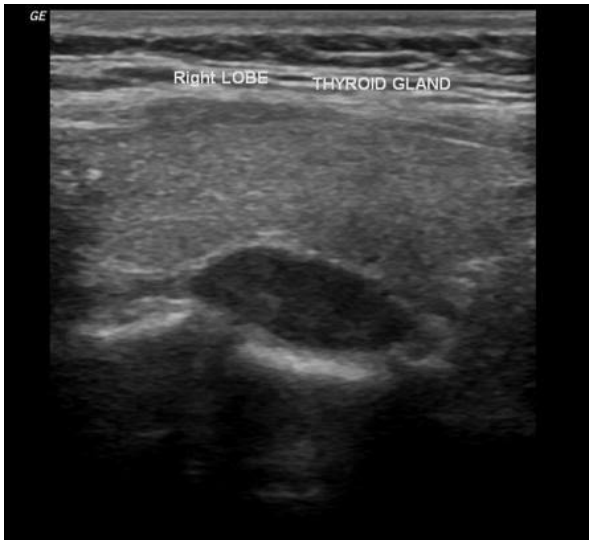

Figure 1: USG s/o Parathyroid Adenoma of a single lobe

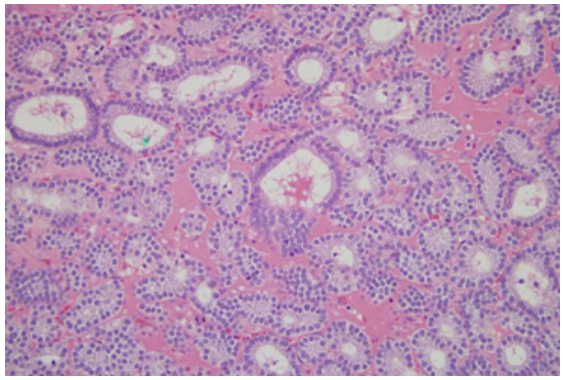

Figure 2: Histopathology of parathyroid adenoma

Case 2

A 39-year-old female, gravida 3, para 2, live 1, abortion 1 (G3P2L1A1), at 30 weeks of gestation with a history of one lower segment cesarean section (LSCS) and intrauterine fetal demise (IUFD), presented with abdominal pain, nausea, vomiting, yellowish sclera, and shortness of breath for 10 days. USG of the abdomen revealed gallstones and a bulky pancreas, while obstetric USG confirmed a 30-week IUFD. Magnetic resonance cholangiopancreatography (MRCP) diagnosed acute severe pancreatitis with cholelithiasis. The patient's condition was complicated by acute fatty liver of pregnancy (AFLP), acute kidney injury (AKI), acute respiratory distress syndrome (ARDS), and coagulopathy. She had spontaneous labor, resulting in vaginal delivery of the intrauterine fetal demise. Post-delivery, she developed massive atonic postpartum hemorrhage (PPH), which was managed with uterotonics, blood products, and uterine packing. A multidisciplinary approach helped manage ARDS, AKI, and coagulopathy conservatively. Her condition gradually improved, and she was discharged after 14 days of hospitalization. She is scheduled for cholecystectomy in a follow-up visit. (Figure 3)

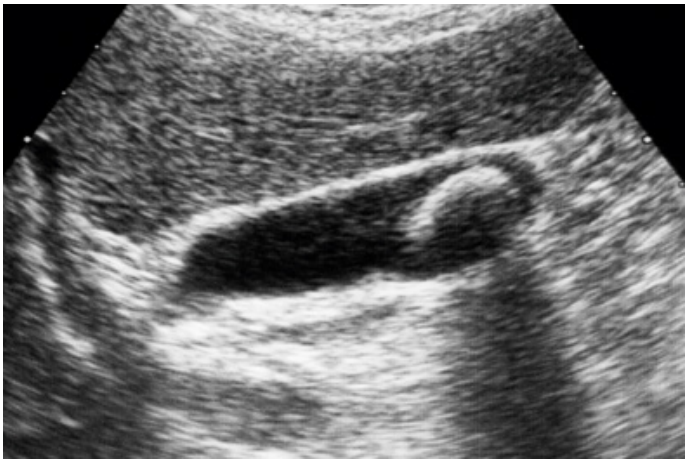

Figure 3: USG s/o 13 mm gallstone

Case 3

A 32-year-old primigravida with an in vitro fertilization (IVF) pregnancy at 30 weeks of gestation presented with abdominal pain, vomiting, and constipation for three days. Laboratory investigations showed elevated amylase (1,259 IU/L) and lipase (2,749 IU/L) levels, and USG of the abdomen revealed hepatomegaly, a bulky pancreas, and small amounts of peripancreatic, perisplenic, and perihepatic fluid. Serum triglycerides were markedly elevated (998 mg/dL), confirming a diagnosis of acute pancreatitis secondary to hypertriglyceridemia. The patient was treated with intravenous patient-controlled analgesia (PCA) and fenofibrate. Her symptoms gradually resolved, and enzyme levels improved. She was discharged after 10 days in stable condition. Due to recurrent symptoms, she was readmitted, and an elective cesarean section was performed at 34+6 weeks after steroid cover. A healthy male baby weighing 2,545 grams was delivered, and both mother and baby were discharged in stable condition on postoperative day five.

Case 4

A 27-year-old female, gravida 2, abortion 1 (G2A1), at 37 weeks of gestation, presented with complaints of upper abdominal pain and vomiting for two days. Laboratory results showed elevated amylase (821 IU/L) and lipase (1,470 IU/L) levels, with USG findings consistent with acute calculus cholecystitis and acute pancreatitis. Obstetric USG revealed a single live intrauterine fetus (SLIUF), cephalic presentation, fetal heart rate of 134 bpm, amniotic fluid index of 7.8 cm, and a biophysical profile of 4/8. The patient was planned for an emergency LSCS with laparoscopic cholecystectomy. A healthy female baby weighing 3,000 grams was delivered, and the mother's postoperative period was uneventful. Both were discharged in stable condition on postoperative day five.

Case Summary

Case	Age	POG	Symptoms	Cause of pancreatitis	Maternal outcome	Recurrent admission	Fetal outcome	Delivery
1	23	23	Typical pain, vomiting	Hypercalcemia related to PTH adenoma	Well	Present	Well	term
2	39	30	Typical pain, jaundice	Biliary +? AFLP	Well	-	Death	IUD
3	32	30	Typical pain, vomiting	Hypertriglyceridemia	Well	Present	well	Preterm
4	27	37	Typical pain, vomiting	Biliary	Well	-	well	Term

DISCUSSION

Acute pancreatitis in pregnancy (APIP) is a rare condition, with an estimated incidence of 1 in 1,000 to 1 in 10,000 pregnancies. APIP is uncommon in the first two trimesters of pregnancy (12%) and occurs more frequently in the third trimester (50%) or the immediate postpartum period (38%) [1].

The most common symptoms include severe epigastric pain radiating to the back, nausea, vomiting, anorexia, and fever2. In our study, all cases presented with vomiting and severe epigastric pain. A lipase level elevated to more than three times the upper limit of normal is a key diagnostic criterion3, and all the reported cases demonstrated this finding.

As far as etiology is concerned, biliary pancreatitis is the most common cause of APIP, accounting for 65–100% of cases3. In our case series, two patients had gallstones. Ultrasonography (USG) of the abdomen is the first line and most effective investigation for assessing gallstones and the biliary system. USG has higher sensitivity for gallstones compared to computed tomography (CT). While CT use has increased for diagnosing pancreatitis, it raises concerns about teratogenic and carcinogenic risks to the fetus due to ionizing radiation4. Magnetic resonance imaging (MRI) is a safer alternative, offering excellent spatial and contrast resolution without radiation exposure5. MRI can reliably assess the severity of pancreatitis (e.g., using the Balthazar score) with comparable accuracy to CT scans6.

APIP requires a multidisciplinary team approach involving obstetricians, gastroenterologists, anesthesiologists, and surgeons. Care should prioritize the health of both the mother and fetus during pregnancy, delivery, and the puerperium. Management depends on the severity of acute pancreatitis and the stage of pregnancy2. Conservative treatment is recommended, particularly in the first trimester, and includes adequate hydration, electrolyte correction, and the use of antispasmodics (e.g., drotaverine, hyoscine butylbromide) and analgesics (e.g., paracetamol). Painkillers contraindicated during pregnancy include nonsteroidal anti-inflammatory drugs (NSAIDs) in the first and third trimesters, acetylsalicylic acid throughout pregnancy, metamizole, and opioids2,7.

Early initiation of oral nutrition with a low-fat diet is advised, ideally within 1–2 days of fasting, or within three days from symptom onset. Enteral nutrition is recommended for patients with severe acute pancreatitis. Antibiotics are reserved for cases of infected pancreatic necrosis, cholangitis, or other infections (e.g., urinary tract infections, pneumonia)8. Surgical interventions are limited to specific indications, such as obstructive jaundice, acute cholecystitis refractory to medical management, peritonitis, or pseudo-pancreatic cysts. In our series, one patient underwent a combined laparoscopic cholecystectomy and cesarean section, and another had a parathyroidectomy for definitive management of a parathyroid adenoma.

Maternal outcomes in APIP have significantly improved in recent decades. Historically, APIP was associated with high maternal and perinatal mortality rates (0–37% and 11–37%, respectively). Advances in diagnostic tools and management have resulted in better prognoses9. Fetal outcomes in APIP are often complicated by intrauterine demise (IUD), prematurity, and intrauterine growth restriction (IUGR). Studies indicate that pancreatitis in the first trimester carries higher risks of fetal loss (20%) and preterm delivery (16%). In our study, one case resulted in an IUD due to multiple organ failure in the third trimester, while the other three cases had favorable maternal and fetal outcomes10.

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3. Extra-Uterine Leiomyomas (EULs) of Vulva and Urethra: A Rare Clinical Entity

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ABSTRACT

Extra-uterine leiomyomas (EULs) are rare benign tumours arising in unusual locations, most reported being – the vulva, ovary, bladder, and urethra. In this report, we present a case of co-existing multiple vulvar and a single large urethral leiomyoma. Sixteen masses in total (space of Retzius and bilateral vulvar region) were excised, and histopathologically confirmed to be leiomyomas. This case discusses diagnostic dilemmas, the use of imaging to map the lesions, differentiating benign vs malignant pathology, and the management of EULs. With this report, we add to the valuable literature of this rare clinical entity.

Keywords: Space of Retzius, Vulvar fibroid, Urethral fibroid, Extra-uterine leiomyomas

INTRODUCTION

Leiomyomas are well-circumscribed benign soft tissue tumors of mesenchymal origin, and can develop where smooth muscles are present, the most common location being the uterus. Unusual sites of origin include the vulva, ovaries, urinary bladder, and urethra. Extrauterine leiomyomas (EULs) are extremely rare. In this case, we present a co-existing occurrence of two of the rare EULs; which to our knowledge has not been reported to date in the literature.

Case history

A 43-years-old female, P1L1 presented with an enlarging mass in the vulvovaginal area. She had noticed a gradual increase in size over 14 months. Medical comorbidities included hypothyroidism and there was a history of undergoing abdominal hysterectomy for uterine fibroids 10 years back. The presentation was not associated with any other complaints apart from feelings of discomfort while walking and sitting. On local examination – there was a dumbbell-shaped mass felt (**Figure 1**), protruding through the left paravaginal space involving the left labia minora and majora, pushing away the urethral meatus to the right. Rectal mucosa was smooth with effacing of sphincter complex by mass on left. MRI-Pelvis done suggested post-hysterectomy status, evidence of large well defined altered signal intensity mass lesion seen in space of Retzius, compressing and displacing urinary bladder ~ 82 x 100 mm appears arising from the urethral wall, multiple varying size cystic lesion in bilateral ischioanal and ischiorectal fossa and along labia majora, largest abutting anorectal region ~117 x 98 mm and it shows few T2 hypointense foci (**Figure 2**).

Figure 1: Local clinical examination of vulvar area

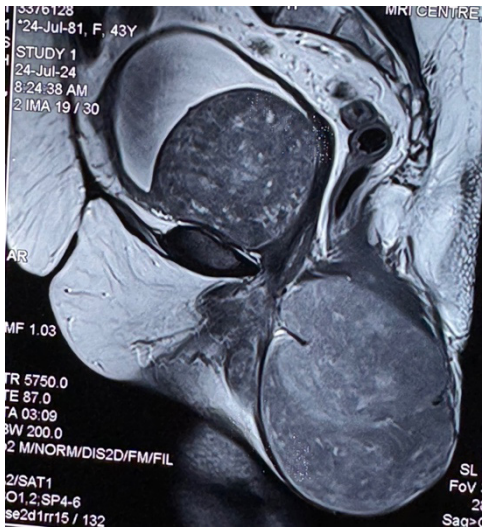

Figure 2: MRI Pelvis showing space of Retzius mass (urethral leiomyoma) – red arrow and large vulvar leiomyoma – yellow arrow

Surgery was planned by abdominoperineal approach after reviewing MRI and examination under anesthesia findings. Intraoperative transvaginal and transperineal sonography was done to map the lesions. Per-operative findings showed both normal tubes and ovaries. Mass measuring 10 x 8 cm was present in the Space of Retzius overlying urethra. Anterior bladder wall rent (iatrogenic) was repaired in two layers. About 10 x 10 cm sized cystic-solid globular lesions were present in the left vulvar region extending up to the left labia majora with an irregular uneven surface. Multiple small nodular masses were mapped bilaterally in

the right and left vulva and extending up to the ischiorectal fossa. She underwent excision of the retropubic mass with bladder repair by abdominal approach + bilateral salpingo-oophorectomy f/b excision of left large vulvovaginal mass + excision of multiple ischiorectal/ischioanal fossa masses + reconstruction of the vulva. A total number of 16 masses were excised from the bilateral vulvar region including mass from the Space of Retzius. The intraoperative and postoperative period was uneventful and the patient was discharged on the 6th day post-op. Histopathological Examination revealed all masses on the cut surface appeared grey-white and whorled. Sections examined from all the masses showed tumors composed of fascicles of spindle-shaped tumor cells displaying indistinct cell borders, moderate eosinophilic cytoplasm, cigar-shaped nuclei with blunt ends, dispersed chromatin, and absent nucleoli. There was no evidence of atypia, tumor necrosis, or increased mitosis. On immune-histochemistry (IHC), tumor cells were positive for SMA, desmin, and caldesmon while negative for SOX10. Ki67 proliferative index: 1-2%. Estrogen receptor: Positive in 80-90% of tumor cells with intermediate intensity. Progesterone receptors: Positive in 80-90% of tumor cells with strong intensity. Based on the HPE report diagnosis of multiple leiomyomas favoring the possibility of leiomyomatosis was made. On her second follow-up, 6 months after surgery – the patient had no complaints, and clinical examination and ultrasound of the pelvis with vulvar region revealed no abnormal findings.

DISCUSSION

Extrauterine leiomyomas (EULs) are rare and they present a greater diagnostic challenge. These histologically benign tumors, which originate from smooth muscle cells, arise in unusual locations in the genitourinary tract (most reported being - the vulva, ovaries, urethra, and urinary bladder) but may arise in nearly any anatomic site [1] The etiology of these leiomyomas is unclear but some studies suggest it might be originating from the remains of the Müllerian or Wolffian ducts or from the smooth muscle cells of the vascular walls that are sensitive to estrogen and progesterone [1,2]. In the presence of such a pattern, a synchronous uterine leiomyoma or a previous hysterectomy for removal of a primary uterine tumor may be indicative of the diagnosis[1]. In our case, the patient had undergone an abdominal hysterectomy for uterine fibroids. Differentials of vulvar masses include soft tissue sarcoma, Bartholin cyst, fibroma, lymphangioma, and neurogenic tumors [2].

As for imaging modality, MRI is the imaging of choice for the diagnosis of EULs as they appear as isointense to muscle on T1-weighted images and are hypointense to muscle on T2-weighted images, with homogenous enhancement [3]. Transperineal ultrasound also adds valuable input in cases of dilemmas. In the present case, preoperative diagnosis of the lesion was difficult because the tumor was atypically located in the space of Retzius and co-existed with a vulvar mass appearing as dumbbell-shaped. Although an MRI scan helps with the preoperative mapping and diagnosis, histopathologic study is required to diagnose leiomyoma and distinguish it from leiomyosarcoma. Leiomyosarcomas in EULs have been reported although very rare [4]. As per Neilsen et al., vulvar leiomyosarcoma may be suggested if 3 of the following criteria are met: the size of 5 cm or more, infiltrative margins, 5 or more mitotic figures per 10 high power fields, and grade 2 to 3 atypia. If 2 features are fulfilled, atypical but benign leiomyoma should be considered while pure benign ones would have one or no features [4]. Since there were no infiltrative margins, no increased mitosis, or atypia with a size > 5 cm; our case fulfilled one trait and was diagnosed as benign.

Surgical excision is the mainstay of the treatment. Long-term follow-up is suggested. Known to be strongly hormone-dependent and as shown in IHC too in our case, we had decided on bilateral salpingo-oophorectomy after consenting from the patient preoperatively. To date, 160 cases of vulvar leiomyomas [1] have been reported but none with co-existing urethral leiomyoma to our knowledge. Challenges include diagnosing EULs, differentiating benign vs malignant pathology, and surgical management. A high index of suspicion is needed to differentiate from other common vulvar lesions most often being large Bartholin cyst.

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Journal Scan

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Comparison of the Efficacy for Early Warning Systems in Predicting Obstetric Critical Illness

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European Journal of Obstetrics and Gynecology and Reproductive Biology, Volume 296, 327 – 332, May 2024

OBJECTIVE

To validate the accuracy of four early warning scores for early identification of women at risk.

Methods

This was a retrospective study of pregnant women admitted to the obstetrics Critical Care Unit (ICU). Capacity of the Modified Obstetric Early Warning Score (MOEWS), ICNARC Obstetric Early Warning Score (OEWS), Maternal Early Obstetric Warning System (MEOWS chart), and Maternal Early Warning Trigger (MEWT) were compared in predicting severe maternal morbidity. The area under the receiver operator characteristic (AUROC) curve was used to evaluate the predictive performance of the scoring system.

Results

A total of 352 pregnant women were enrolled and 290 were identified with severe maternal morbidity. MOEWS was more sensitive than the MEOWS chart, ICNARC OEWS, and MEWT (96.9 % vs. 83.4 %, 66.6 % and 44.8 %). MEWT had the highest specificity (98.4 %), followed by MOEWS (83.9 %), ICNARC OEWS (75.8 %), and MEOWS chart (48.4 %). AUROC of MOEWS, ICNARC OEWS, MEOWS chart, and MEWT for prediction of maternal mortality were 0.91 (95 % CI: 0.874–0.945), 0.765(95 % CI: 0.71–0.82), 0.657(95 % CI: 0.577–0.738), and 0.716 (95 % CI, 0.659–0.773) respectively. MOEWS had the highest AUCs in the discrimination of serious complications in hypertensive disorders, cardiovascular disease, obstetric hemorrhage, and infection. For individual vital signs, maximum diastolic blood pressure (DBP), maximum systolic blood pressure (SBP), maximum respiratory rate (RR), and peripheral oxygen saturation (SPO2) demonstrated greater predictive ability.

CONCLUSION

MOEWS is more accurate than ICNARC OEWS, MEOWS chart, and MEWT in predicting the deterioration of women. The prediction ability of DBP, SBP, RR, and SPO2 are more reliable.

Point-of-Care Ultrasound in Critical Care Obstetrics: A Scoping Review of the Current Evidence

Juliana G Martins, Jerri Waller, Rebecca Horgan, Tetsuya Kawakita, Camille Kanaan, Alfred Abuhamad, George Saade

J Ultrasound Med. 2024 May;43(5):951-965

OBJECTIVES

To synthesize the current evidence of maternal point-of-care ultrasound (POCUS) in obstetrics. A scoping review was conducted using PubMed, Clinicaltrials.gov, and the Cochrane Library from inception through October 2023.

Methods

Studies were eligible for inclusion if they described the use of POCUS among obstetric or postpartum patients. Two authors independently screened all abstracts. Quantitative, qualitative, and mixed-methods studies were eligible for inclusion. Case reports of single cases, review articles, and expert opinion articles were excluded. Studies describing detailed maternal non-obstetric sonograms or maternal first-trimester sonograms to confirm viability and rule out ectopic pregnancy were also excluded. Data were tabulated using Microsoft Excel and summarized using a narrative review and descriptive statistics.

Results

A total of 689 publications were identified through the search strategy and 12 studies met the inclusion criteria. Nine studies evaluated the use of lung POCUS in obstetrics in different clinical scenarios. Lung ultrasound (LUS) findings in preeclampsia showed an excellent ability to detect pulmonary edema (area under the receiver operating characteristic 0.961) and findings were correlated with clinical evidence of respiratory distress (21 of 57 [37%] versus 14 of 109 [13%]; P = .001). Three studies evaluated abdominal POCUS, two of the inferior vena cava (IVC) to predict post-spinal anaesthesia hypotension (PSAH) and fluid receptivity, and one to assess the rate of ascites in patients with preeclampsia. Patients with PSAH had higher IVC collapsibility (area under the curve = 0.950, P < .001) and, in patients with severe preeclampsia, there is a high rate of ascites (52%) associated with increased risk of adverse outcomes. There were no studies on the use of subjective cardiac POCUS.

CONCLUSION

POCUS use in the management of high-risk obstetrics has increased. LUS has been the most studied modality and appears to have a potential role in the setting of preeclampsia complicated by pulmonary edema. Cardiac and abdominal POCUS have not been well studied. Trials are needed to evaluate its clinical applicability, reliability, and technique standardization before widespread use.

Prediction of Mechanical Ventilation Greater than 24 Hours in Critically Ill Obstetric Patients: Ten Years of Data from A Tertiary Teaching Hospital in Mainland China

Huiying Zhao, Guangjie Wang, Jie Lyu, Xiaohong Zhang, Youzhong An

BMC Pregnancy Childbirth 21, 40 (2021)

BACKGROUND

Maternal admission to the intensive care unit (ICU) during pregnancy or in the postpartum period is a marker of severe acute maternal morbidity. Mechanical ventilation is an important and basic method of maintaining life support in the ICU, but prolonged mechanical ventilation (PMV) is associated with a prolonged length of hospital stay and other adverse outcomes. Therefore, we conducted this retrospective study to describe morbidity and further try to identify the risk factors for PMV in critically ill obstetric women.

Methods

The clinical data were obtained from a single-centre retrospective comparative study of 143 critically ill obstetric patients at a tertiary teaching hospital in mainland China between January 1, 2009, and December 31, 2019. PMV was defined as a mechanical ventilation length of more than 24 hours. Clinical and obstetric parameters were collected to analyse the risk factors for PMV. Patients were separated into groups with and without PMV. Potential risk factors were identified by univariate testing. Multivariate logistic regression was used to evaluate independent predictors of PMV.

Results

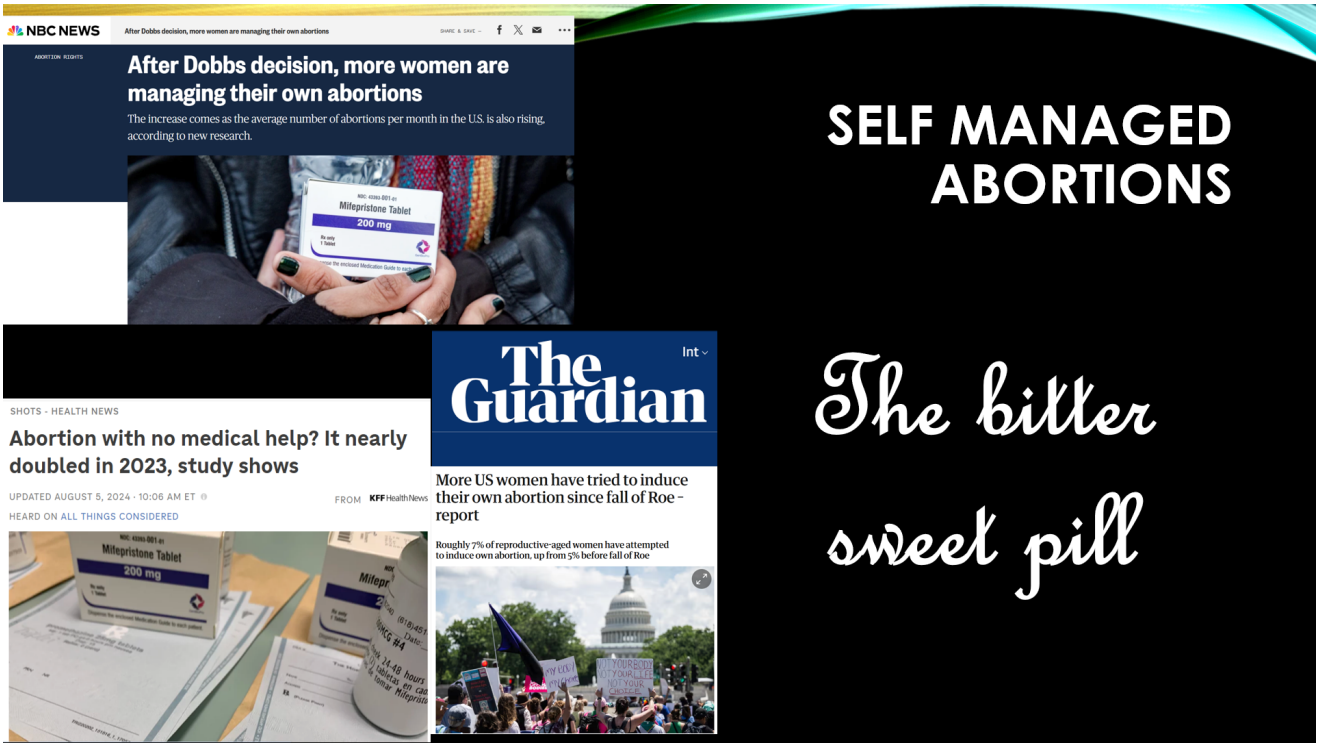
Out of 29,236 hospital deliveries, 265 critically ill obstetric patients entered the ICU. One hundred forty-five (54.7%) of them were treated with mechanical ventilation. Two were excluded because of death within 24 hours. Sixty-five critically ill obstetric patients (45.5%) underwent PMV. The independent risk factors for PMV included estimated blood loss (odds ratio (OR) =1.296, P=0.029), acute kidney injury (AKI) (OR=4.305, P=0.013), myocardial injury (OR=4.586, P=0.012), and PaO2/FiO2 (OR=0.989, P< 0.001). The area under the receiver operating characteristic (ROC) curve based on the predicted probability of the logistic regression was 0.934.

CONCLUSIONS

Estimated blood loss, AKI, myocardial injury, and PaO2/FiO2 were independent risk factors for PMV in critically ill obstetric patients.

News Flash

Dr. Jaya Chawla
Professor
Department of Obstetrics and Gynaecology, ABVIMS & Dr RMLH



An unwanted pregnancy can take a humungous toll on the physical and mental health of the woman harbouring it. The sense of dismay and insecurity, lack of societal support, absence of privacy in visiting a medical centre, and the fear of complications, all stem from a lack of information. And this is what the FIGO project on self-managed abortions is set to address. FIGO in Zambia worked on spreading this information to women who needed it and the results were encouraging to say the least. This was in line with the latest WHO opinion on abortions. (Abortion Care Guideline. World Health Organization; 2022) Next, the American Journal of Obstetrics & Gynaecology published the ACOG committee opinion on self-managed abortions recently in December 2024.

The question that arises in the mind of all of us as gynaecologists who manage the other side of the story pretty much every day is, "Are doctors truly vestigial in this entire journey of a woman's abortion?" When we see a woman with already precarious haemoglobin walk into the casualty in shock from an incomplete abortion when she lands up into an inevitable acute kidney injury from this neglected dehydration and haemorrhage when she has to be transfused insanely in the hope of salvaging her life and ends up with imaging showing signs of transfusion-associated lung injury, does the thought of staying marginalised to protect her comfort at home with self-managed abortion, her privacy, her rights cross our minds for even a nanosecond?

When we, as obstetricians have witnessed a sudden surge of ruptured ectopics in various sites, all thanks to an abortion pill popped without taking care to confirm an intrauterine pregnancy, do we still think it is time to stand up for the cause of self-managed abortions in the name of human rights, autonomy, and privacy? Or a better choice would be to support the decision of a woman to terminate her pregnancy with accessible medical care and draft a legal mantle that saves her the mental agony of persecution. At the end of the day, the fact that should stir us all within is why everything from contraception to termination of pregnancy appears to be a female bastion when all of it starts with a sperm? If the choice is between a woman in the ICU battling for life if she is well, and fortunate, and a woman battling her family and societal barriers to reach a hospital, guess the question should be why, the woman alone.

Snitch Snatchers

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1. A 28-year-old woman with severe placental abruption at 38 weeks and fibrinogen levels of 100 mg/dl. What is the most appropriate strategy for her coagulopathy
   A. FFP
   B. Cryoprecipitate
   C. Recombinant factor VIIa
   D. Expectant management
2. A 30-year-old woman at 30 weeks gestation presents with severe respiratory distress and a PaO2/FiO2 ratio of 150. What is the most likely diagnosis?
   A. ARDS
   B. pulmonary embolism
   C. Amniotic fluid embolism
   D. cardiogenic pulmonary edema
3. A term pregnancy delivered with severe PPH with a cardiac output of 2L/MIN now. What is the most appropriate strategy for her hemodynamic instability
   A. Fluid restriction
   B. Vasopressor administration
   C. Ionotropic support
   D. Mechanical cardiac support
4. The recommended weight-adjusted dose of FFP for a patient with obstetric hemorrhage is
   A. 15-20 ml/kg
   B. 30-40 ml/kg
   C. 50-6- ml/kg
   D. none of the above
5. Following is a specific marker for sepsis
   A. procalcitonin
   B. CRP
   C. pro BNP
   D. WBC
6. The estimated risk of uterine rupture for women who have had a previous inverted T incision is
   A. 1 – 2%
   B. 4 – 9%
   C. 20 – 40 %
   D. 9 – 32%
7. The criteria for primary abdominal pregnancy are
   A. Studifords criteria
   B. Wrigley's criteria
   C. Rubins criteria
   D. Spiegelbergs criteria
8. The blood flow to the uterus at term is around
   A. 500 ml/min
   B. 800ml/min
   C. 700ml/min
   D. 1000ml/min
9. The following state has the least mortality rate in India
   A. Kerala
   B. Maharashtra
   C. Telangana
   D. Karnataka
10. The randomized, double-blind, placebo-controlled study that evaluated the use of tranexamic acid in treating post-partum haemorrhage was named
    A. WOMAN TRIAL
    B. MAGPIE TRIAL
    C. CLASP TRIAL
    D. None of the above

Answer Key to December Quiz on Gynaecological Oncology

1. One third
2. Malignant mixed mullerian tumour
3. Bras & kras
4. Trials of potential screening methods for ovarian cancer are ongoing
5. Median survival following platinum taxane chemotherapy is 2-3 years
6. Bowel obstruction is common and is usually managed medically using subcutaneous medication given via a syringe driver
7. Papillary serous carcinoma
8. Ca vulva
9. Bleomycin
10. Hilus cell tumors

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Send Complete Membership Form Along With Cheque / DD and Photocopy of required documents.

AOGDtiOffice, Department of Obstetrics & Gynaecology, Maternity Nursing Home,ABVIMS & Dr RML Hospital, New Delhi- 110001

Contact: 01123404419. Mob :+91 97173 92924

Inviting Applications for AOGD Subcommittees Chairperson (2025-27)

Fresh applications are invited for vacancies of chairpersons in 7 subcommittees.

1. Adolescent Health Sub-Committee
2. Endometriosis Sub- Committee
3. Endoscopy Sub- Committee
4. Fetal Medicine & Genetics Sub- Committee
5. Oncology Sub- Committee
6. QI Obst & Gynae Practice Sub-Committee
7. Urogynaecology Sub- Committee

The applications to be submitted to the AOGD office, Department of Obstetrics and Gynaecology, MNH Building ABVIMS RML Hospital,, New Delhi - 110001,(Scan Copies) on Email id : aogdrml2024@gmail.com

At in the given format by 31st January 2025

Dr Kamna Datta

Secretary AOGD

Eligibility Criteria for AOGD Sub-committee chairperson

1. The chairperson of a sub-committee should have been a member of the sub-committee in question for at least one term, with one term being equivalent to two years, prior to his/her appointment as chairperson of that sub-committee.
2. He/she should have been a member of the AOGD for fifteen years.
3. He/she should have experience in the field related to the subcommittee.
4. He/she should have completed atleast fifteen years from the date of his/her registration as a medical practitioner. Further, he/she should have held as senior/faculty position for not less than that of associate professor, senior consultant or an equivalent thereof in his/her respective organization, for a period of at least five years.
5. No person should hold chairpersonship of the same subcommittee for two consecutive terms with each term comprising of two years. Further, a person who has been chairperson for one subcommittee cannot be nominated as chairperson of another subcommittee unless separated by a duration equivalent to two terms of the subcommittee.
6. The Executive Committee may laydown additional criteria for the eligibility and pre-requisites for appointment as chairperson of each sub-committee from time to time.
7. An eligible member must send an application for nomination as chairperson of a sub- committee stating herein his/her previous experience in the field related to the sub- committee and future vision for further in the goals of the AOGD through such sub- committee. One person shall not apply for chairpersonship of more than one sub-committee at a time. The application shall be scrutinized by the Executive Committee of AOGD for nomination as chairperson.
8. In the event of more than one application being received for appointment as chairperson of a subcommittee and in the absence of unanimous decision of the Executive committee in this regard, the Executive Committee shall decide the nomination by cast of secret ballot.
9. No institution should have more than a maximum of 2 Chairpersons of subcommittees at any time. A third Chairperson from the same institution can be permitted only if there are no applications from other institutions even after repeated applications being asked for and the particular person's credentials are outstanding
10. In case there are more than 2 applications from the same institution 'first come, first served principle' will be applicable.
11. No subcommittee will have consecutive terms in the same institution.
12. The tenure of the chairperson of subcommittee shall be for a period of two years.

The Association of Obstetricians & Gynaecologists of Delhi

Nomination Form For Subcommittee Chairperson

Name: _____ AOGD Membership no: _____

Work place & Designation: _____

_____ Official Address: _____

Residential Address: _____

Phone: _____ Email: _____

Bio Sketch (250 words)

Includes duration of permanent membership of AOGD, previous subcommittee positions with tenure year and previous experience in the field related to the sub- committee along with future vision.

Post Applied for

Chairperson

2025-2027

Name of Subcommittee

Proposed by–Name

AOGD Membership Number

Signature

Seconded by

1.

2.

The applications to be submitted to the AOGD office ABVIMS RML Hospital Obst & Gynae Dept, MNH Building, New Delhi - 110001, (Scan Copies) on Email Id : aogdrml2024@gmail.com, 1:00pm

At in the given format **By 5th January 2025**

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