



Sepsis in pregnancy

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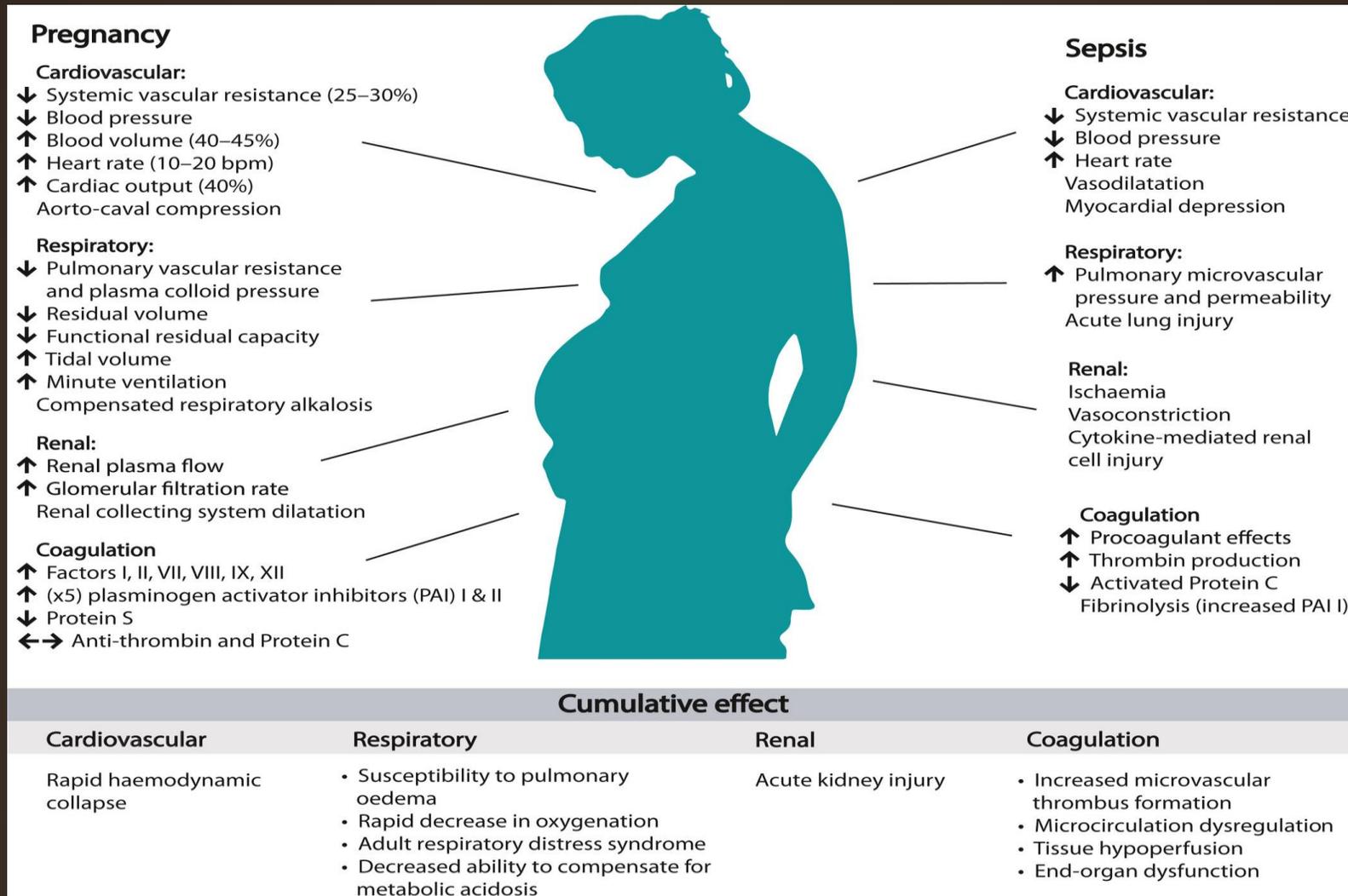
PROFESSOR OF IUMS.

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- ▶ Maternal sepsis is the main cause of maternal death and a major contributor to severe maternal morbidity worldwide, accounting for 11% of maternal deaths worldwide and is the third most common direct cause of maternal death
 - ▶ Failure to recognize sepsis early is a significant cause of preventable morbidity, resulting in delayed treatment and escalated care, which are critical if lives are to be saved

Pathophysiology

- ▶ The pathophysiology core issue is a multifaceted host response to an infecting pathogen that may be significantly amplified by endogenous factors.
- ▶ sepsis focused solely on inflammatory excess. Sepsis is now recognized to involve early activation of both pro- and anti-inflammatory responses, along with major modifications in nonimmunologic pathways such as cardiovascular, neuronal, autonomic, hormonal, bioenergetic, metabolic, and coagulation, all of which have prognostic significance.
- ▶ Patients with sepsis can have clinical presentations in various systems, including respiratory, cardiovascular, hepatic and gastrointestinal, renal, hematological, endocrinological, and central nervous systems

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- ▶ In pregnancy and the puerperium, maternal physiological and immunological adaptations – designed to facilitate development of the fetus – may impair maternal capacity to respond to infection.
 - ▶ physiological hyperventilation of pregnancy, understood to be secondary to progesterone, creates a respiratory alkalosis that is countered by an increase in renal bicarbonate excretion
 - ▶ . Accordingly, pregnant women may be slightly less able to buffer the metabolic acidosis caused by sepsis.
 - ▶ _ Moreover, key physiological changes, which occur to promote the maintenance of a healthy pregnancy, mimic those of early sepsis, making the diagnosis challenging





Maternal sepsis may cause intra-amniotic infection,
which results in

- (1) premature rupture of membranes or preterm labor or birth
- (2) cerebral white matter damage or cerebral palsy or neurodevelopmental delay
- (3) stillbirth
- (4) early- or late-onset sepsis;
- (5) perinatal death.

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- ▶ Sepsis may be defined as infection plus systemic manifestations of infection.
 - ▶ Severe sepsis may be defined as sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion
 - ▶ Septic shock is defined as the persistence of hypoperfusion despite adequate fluid replacement therapy

Which women are at risk of sepsis in pregnancy?

- ▶ Impaired glucose tolerance / diabetes
- ▶ Impaired immunity/ immunosuppressant medication
- ▶ Anaemia
- ▶ Septic abortion
- ▶ Pyelonephritis
- ▶ Pneumonia and influenza
- ▶ Vaginal discharge
- ▶ History of pelvic infection
- ▶ History of group B streptococcal infection
- ▶ Amniocentesis and other invasive procedures
- ▶ Cervical cerclage
- ▶ Prolonged spontaneous rupture of membranes
- ▶ Of black or other minority ethnic group origin
- ▶ Smoker and older 35 years

What should prompt recognition of sepsis in the pregnant woman?

Clinical signs suggestive of sepsis include one or more of the following:

- ▶ pyrexia, hypothermia, tachycardia, tachypnoea, hypoxia, hypotension, oliguria, impaired consciousness and failure to respond to treatment.
- ▶ **. It is important to note that fever is not necessary or sufficient to the diagnosis of sepsis.**
- ▶ These signs, including pyrexia, may not always be present and are not necessarily related to the severity of sepsis.

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- ▶ The signs and symptoms of sepsis in pregnant women may be less distinctive than in the nonpregnant population and are not necessarily present in all cases
 - ▶ therefore, a high index of suspicion is necessary. Healthcare professionals should be aware of the symptoms and signs of maternal sepsis and critical illness.
 - ▶ Disease progression may be much more rapid than in the non-pregnant state.
 - ▶ Genital tract sepsis may present with constant severe abdominal pain and tenderness unrelieved by usual analgesia, and this should prompt urgent medical review
 - ▶ Severe infection may be associated with preterm labour.
 - ▶ Toxic shock syndrome caused by staphylococcal or streptococcal exotoxins can produce confusing symptoms including nausea, vomiting and diarrhoea; exquisite severe pain out of proportion to clinical signs due to necrotising fasciitis; a watery vaginal discharge; generalised rash; and conjunctival suffusion.

Clinical features suggestive of sepsis

- ▶ Fever or rigors
- ▶ Diarrhoea or vomiting - may indicate exotoxin production (early toxic shock)
- ▶ Rash (generalised streptococcal maculopapular rash or purpura fulminans)
- ▶ Abdominal /pelvic pain and tenderness
- ▶ Offensive vaginal discharge (smelly suggests anaerobes; serosanguinous suggests streptococcal infection)
- ▶ Productive cough
- ▶ Urinary symptoms



Septic shock is a severe and systemic infection. This means that it affects the entire body. It is caused when bacteria get into your bloodstream and it most often occurs after trauma or surgery.

- ▶ When pregnant women develop septic shock, it's usually a complication of one of the following conditions:
- ▶ septic abortion (a miscarriage associated with a uterine infection)
- ▶ severe kidney infection
- ▶ abdominal infection
- ▶ infection of the amniotic sac
- ▶ uterine infection



Septic shock causes a variety of systemic signs and symptoms, including:

- ▶ restlessness and disorientation
- ▶ rapid heart rate and low blood pressure (hypotension)
- ▶ fever of 103°F or higher
- ▶ low body temperature (hypothermia)
- ▶ skin that's warm and flushed due to dilation of your blood vessels (vasodilation)
- ▶ cool and clammy skin
- ▶ irregular heart beat
- ▶ jaundice
- ▶ decreased urination
- ▶ spontaneous bleeding from genital or urinary tract

How Is Septic Shock Usually Diagnosed?

- ▶ use blood tests to look for: evidence of infection
- ▶ problems with blood clotting
- ▶ liver or kidney problems
- ▶ electrolyte imbalances
- ▶ chest x-ray to find out if have ARDS or pneumonia. CT scans, MRIs, and ultrasounds may help identify the primary infection site.
- ▶ electrocardiographic monitoring to detect irregular heart rhythms and signs of injury to your heart.

What are the appropriate investigations when sepsis is suspected?

- ▶ Blood cultures are the key investigation and should be obtained prior to antibiotic administration; however, antibiotic treatment should be started without waiting for microbiology results.
- ▶ Serum lactate should be measured within six hours of the suspicion of severe sepsis in order to guide management. Serum lactate ≥ 4 mmol/l is indicative of tissue hypoperfusion.
- ▶ Any relevant imaging studies should be performed promptly in an attempt to confirm the source of infection.

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- ▶ Blood cultures and other samples as guided by clinical suspicion of the focus of infection (e.g. throat swabs, mid-stream urine, high vaginal swab, or cerebrospinal fluid) should be obtained prior to starting antibiotic therapy as they may become uninformative within a few hours of commencing antibiotics but must not delay antibiotic therapy.
 - ▶ If the methicillin-resistant *Staphylococcus aureus* (MRSA) status is unknown, a pre-moistened nose swab may be sent for rapid MRSA screening where such testing is available.
 - ▶ prompt imaging may identify the source of the infection, allowing early definitive treatment, and should not be deferred on the grounds of pregnancy

management

- ▶ deliver an initial minimum 30ml/kg of crystalloid or an equivalent
- ▶ Apply vasopressors for hypotension that is not responding to initial fluid resuscitation to maintain mean arterial pressure (MAP) >65mmHg In the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate >4mmol/l a.
- ▶ central venous pressure (CVP)
- ▶ central venous oxygen saturation (ScvO₂) ≥ 70% or mixed venous oxygen saturation (SvO₂) ≥ 65%
- ▶ the initiation of empiric antimicrobial treatment with broad-spectrum agent therapy within the first hour of diagnosis, source control within the first 12 hours if possible, and the prevention of complications and sequelae

What are the commonly identified organisms, including hospital acquired infection?

- ▶ The most common organisms identified in pregnant women dying from sepsis are Lancefield group A beta-haemolytic Streptococcus and E.Coli.
- ▶ Mixed infections with both Gram-positive and Gram-negative organisms are common, especially in chorioamnionitis.
- ▶ Coliform infection is particularly associated with urinary sepsis, preterm premature rupture of membranes, and cerclage
- ▶ Anaerobes such as Clostridium perfringens (the cause of gas gangrene) are less commonly seen nowadays, with Peptostreptococcus and Bacteroides spp. predominating

What empirical and specific antimicrobial therapy should be used to treat the woman?

- ▶ Administration of intravenous broad spectrum antibiotics is recommended within one hour of suspicion of severe sepsis, with or without septic shock.
- ▶ If genital tract sepsis is suspected, prompt early treatment with a combination of high-dose broadspectrum intravenous antibiotics may be lifesaving.
- ▶ Empirically, broad spectrum antimicrobials active against Gram-negative bacteria, and capable of preventing exotoxin production from Gram-positive bacteria, should be used according to local microbiology policy, and therapy narrowed once the causative organism(s) has been identified

. Antimicrobial choices and limitations of antimicrobial

- ▶ Co-amoxiclav Does not cover MRSA or Pseudomonas, and there is concern about an increase in the risk of necrotising enterocolitis in neonates exposed to co-amoxiclav in utero.
- ▶ Metronidazole Only covers anaerobes.
- ▶ Clindamycin Covers most streptococci and staphylococci, including many MRSA, and switches off exotoxin production with significantly decreased mortality. Not renally excreted or nephrotoxic.
- ▶ Piperacillin–tazobactam Covers all except MRSA and are renal sparing (in contrast to aminoglycosides).
- ▶ (Tazocin) and carbapenem ,Gentamicin (as a single dose Poses no problem in normal renal function but if doses are to be given regularly serum levels must be of 3–5mg/kg) monitored

Antibiotics

- ▶ The spectrum might need to be broad, covering both gram-positive and gram-negative pathogens. Antibiotic coverage for maternal sepsis should be aimed at covering the most common bacteria: *E. coli*, *Staphylococcus*, *Streptococcus*, and other gram-negative bacteria. Viral and fungal cover should be considered, if suspected.
- ▶ Combination therapy is preferred over monotherapy. Most often, a broad-spectrum carbapenem (eg, meropenem, imipenem/cilastatin, or doripenem) or extended-range penicillin/ β -lactamase inhibitor combination (eg, piperacillin/tazobactam or ticarcillin/clavulanate) is used.
- ▶ Several third- or higher-generation cephalosporins can also be used, especially as part of a multidrug regimen.

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- ▶ Source control
 - ▶ Once a source of sepsis is identified, source control is a priority and may involve abscess drainage or the delivery of the fetus if the uterus is found to be the source of the infection.
 - ▶ There is a direct increase in mortality with each 6-hour delay in achieving source control.
 - ▶ If surgical intervention for source control, including cesarean section, D&C is required, the decision about regional or general anesthesia should be made on a case-by-case basis.
 - ▶ Hysterectomy were performed on 5.4% of severe sepsis cases

Indications for transfer to ICU

System Indication

- ▶ Cardiovascular Hypotension or raised serum lactate persisting despite fluid resuscitation, suggesting the need for
- ▶ inotrope support
- ▶ Respiratory Pulmonary oedema
- ▶ Mechanical ventilation
- ▶ Airway protection
- ▶ Renal dialysis
- ▶ Neurological Significantly decreased conscious level
- ▶ Miscellaneous Multi-organ failure
- ▶ Uncorrected acidosis
- ▶ Hypothermia

10 Simple Steps to Prevent Infections During Pregnancy

- ▶ Maintain good hygiene.
- ▶ Cook your meat until it's well done.
- ▶ Avoid unpasteurized (raw) milk and foods made from it
- ▶ vaccinations.
- ▶ Get tested for sexually transmitted infections (STIs)
- ▶ During the COVID-19 pandemic, be sure to follow recommended safety measures—wear a mask, avoid crowds, and practice social distancing.
- ▶ Protect against insects known to carry diseases. Avoid traveling to areas where infections
- ▶ Do not touch or change dirty cat litter and avoid contact with potentially contaminated soil
- ▶ Stay away from wild or pet rodents, lizards, and turtles, and their droppings

Fetal considerations

- ▶ It is imperative to stabilize the mother first, and the fetal status will also improve. The decision of whether to deliver the fetus or to continue the pregnancy is influenced by a number of factors, including the patient's condition, the gestational age of the foetus, the fetal condition, the presence of chorioamnionitis and the stage of labor.
- ▶ In the setting of antenatal sepsis, there should be frequent assessment of fetal status after viability. Efforts should be aimed at treating maternal sepsis and prolonging pregnancies that are far from term if the source of infection is outside the uterus.
- ▶ If the source of sepsis is from the uterus, delivery of the fetus is required. If delivery is imminent, then betamethasone should be administered if gestational age is less than 34 weeks.
- ▶ A previable fetus (<23 to 24 weeks, depending on institutional practice) may not need fetal monitoring.



Thank
you