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Review Article

Sepsis in pregnancy: a review of diagnosis and management

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Abstract

Maternal sepsis accounts for 11% of all maternal deaths worldwide. In addition to being a significant factor in other frequent causes of maternal mortality, such as hemorrhage and thromboembolism, it is the third most frequent direct cause of maternal death. The epidemiology, risk factors, prevention, diagnosis, care plans, and management of maternal sepsis-including the use of antibiotics and critical care measures like extracorporeal membrane oxygenation-are just a few of the significant issues covered in this study. The epidemiology, risk factors, prevention, diagnosis, care plans, and management of maternal sepsis-including the use of antibiotics and critical care measures like extracorporeal membrane oxygenation-are just a few of the significant issues covered in this study. Maternal death from sepsis has generally been thought to be a concern in low-income nations, although severe obstetric morbidity and maternal death from sepsis are rising in high-income nations. The prevalence of maternal sepsis worldwide, risk variables connected to obstetrics and patients, and possible sources are described. Early detection and treatment are essential after maternal sepsis to save lives and stop long-term negative effects. Future research is necessary to maximize the therapeutic options for a maternal septic shock as the dogma surrounding critical care interventions during pregnancy is being challenged.

Keywords: infection, pregnancy, sepsis

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Introduction

The third most frequent direct cause of maternal death is maternal sepsis, which causes 11% of maternal deaths globally (1). In addition, sepsis aids in the development of thrombosis and hemorrhage, two other common causes of maternal mortality. Maternal sepsis has not drawn the same attention and study as other top causes of maternal death, despite the rise in mortality and morbidity during pregnancy and the unpredictable nature of developing causative organisms (such as novel influenza serotypes) (2). Early sepsis recognition is essential for saving lives because delayed treatment and escalating care are major causes of avoidable morbidity (3). The diagnosis of sepsis during the prenatal, intrapartum, and postpartum periods will be affected by our increased understanding of the pathophysiology of sepsis and our increased awareness of the interaction between maternal physiology and sepsis (4).

Maternal septic shock and sepsis risk factors

Numerous risk factors, which can be categorized as patient- or obstetric-related risk factors, are connected to sepsis and its progression to septic shock.

Obstetric-related risk factors

Operative intervention is the most independent obstetric risk factor for postpartum maternal sepsis, and cesarean sections (CS) are linked to a 5–20% increase in infectious morbidity when compared to vaginal birth (5). Elective CS is the least risky, followed by surgical vaginal birth and CS following the start of labor, but bacterial prophylaxis and sterility are common practices in the UK (6). A history of pelvic infection, group B or group A streptococcal infection in close contacts or family members, vaginal discharge, multiple pregnancies, retained fetuses, preterm prelabour rupture of membranes (PPROM), amniocentesis, or other invasive procedures are additional obstetric-related risk factors (7).

Patient-related risk factors

Primariness, pre-existing medical disorders, ethnic minority status, febrile sickness, or use of antibiotics in the two weeks before admission are patient-related risk factors for maternal sepsis (8). Congestive heart failure, chronic liver or renal failure, HIV infection, systemic lupus erythematosus, and diabetes are co-morbidities that have an independent relationship with maternal sepsis (9). Another excellent illustration of health inequity is the prevalence of maternal sepsis. Maternal sepsis has a considerable and progressive association with lower socioeconomic positions, and there is a strong social gradient linked with it.

Infection sources and responsible microorganisms

In the UK, pneumonia is the most frequent cause of maternal illness, followed by genital tract sepsis. In conjunction with vaginal birth and obstetric treatments, genital tract sepsis is more prevalent in the postpartum period and pneumonia is more prevalent in the intrapartum period (6).

Group A streptococcal genital tract infections

In the UK, the rise in group A streptococcal (Streptococcus pyogenes) genital tract infections, which were accountable for 50% of direct maternal deaths during the 2006–2008 triennium, was blamed for the rise in maternal mortality from sepsis (9).

Influenza

Infections with the influenza virus considerably increase the risk of maternal sepsis, especially during the pandemic years. Pregnancy-related influenza symptoms are more severe and increase the risk of serious illness and hospitalization by four to five times (10). The second and third trimesters of pregnancy, as well as the early postpartum period, are when influenza infections are most prevalent. These periods are also when preterm birth rates and fetal growth are at their highest (11). According to the Centers for Disease Control and Prevention, the unique H1N1 strain of influenza A caused the swine flu pandemic, which peaked in 2009 and claimed the lives of 30 women, or 5% of all H1N1 deaths in the US that year (12).

Escherichia coli

E. coli was the most prevalent pathogen in the prenatal period and was responsible for the majority of cases of maternal sepsis, accounting for 37% of cases of 150,043 pregnancies between 2005 and 2012, according to a prospective review (13).

Diagnosing maternal sepsis

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) Committee revised the definition of sepsis in 2016. Sepsis is currently described as a "life-threatening organ dysfunction brought on by an abnormal host response to infection" (14). Additional patient subgroups that qualify as having "septic shock" include those who need vasopressors to keep their mean arterial pressure at least 65 mm Hg and whose serum lactate levels are at least 2 mmol/L. This represented a significant change from the previous Sepsis-2 definition, which required patients to meet at least two SIRS criteria in addition to a confirmed or suspected infection in order to be classified with "sepsis." The term "severe sepsis" was used to describe patients who fulfilled these criteria and had organ dysfunction, while the term "septic shock" was used to describe patients who had hypotension that did not improve with fluid resuscitation. The term "severe sepsis" has lost its meaning due to the new Sepsis-3 definition, and the SIRS criteria that were previously used to screen for sepsis have also been eliminated.

The committee chose to apply the sequential organ failure assessment (SOFA) scoring method to align the diagnosis of sepsis with the revised criteria. Based on a number of indicators, SOFA rates the performance of several organ systems, including the respiratory, coagulation, liver, cardiovascular, central nervous system, and renal, on a scale from 0 to 4. Higher scores are linked to worse outcomes and are frequently used in the ICU to predict mortality. The Sepsis-3 committee has recommended using a fast SOFA (qSOFA) score for patients who are not in the intensive care unit. Through the use of multivariate logistic regression analysis, it has been shown that three variables can accurately predict inpatient mortality (14). Patients with at least two of these characteristics are categorized as being at high risk of having poor outcomes after sepsis. These characteristics are tachypnoea (respiratory rate of at least 22 breaths per minute), hypotension (systolic blood pressure of not more than 100 mm Hg), and altered level of consciousness (Glasgow Coma Score scale of not more than 14). In comparison to SIRS and SOFA, qSOFA is a better predictor of mortality outside of the ICU. The death rate for septic patients with a qSOFA score of at least 2 was 24% (15).

The difficulties in identifying maternal sepsis

Pregnant women may experience more subtle sepsis clinical indications due to the physiological changes of pregnancy. By 28 weeks of gestation, the circulating volume has increased by 30 to 50%, and pregnancy is associated with hyperdynamic circulation. When vasodilation causes pregnant women to suffer a reduction in systolic and diastolic blood pressure, especially in the first trimester, and compensatory sinus tachycardia (16), this hyperdynamic circulation can hide cardiovascular indications of sepsis. Sepsis-related tachypnoea and natural

tachypnoea in pregnancy, which are mostly brought on by high progesterone levels, can be confused. Current SIRS criteria overlap with maternal physiological indicators, hence changes to SIRS criteria are needed to recognize maternal sepsis (17). All other SIRS criteria elements, excluding temperature, are consistent with the physiological parameters of healthy pregnant women during the second and third trimesters as well as intrapartum. The qSOFA score also has elements that might be related to maternal physiology. Delays in the detection of maternal sepsis have been attributed to the absence of a quick screening method that takes into account physiological changes during pregnancy.

Treating maternal sepsis

A diagnosis of maternal sepsis

The International Surviving Sepsis Campaign (SSC) has made protocols for the first treatment of sepsis patients available since 2004. Five care components are included in the most recent "Hour-1 bundle" for 2018 and should be started within the first hour of sepsis being diagnosed (18). The components are lactate testing, blood cultures before antibiotics are given, the administration of broad-spectrum antibiotics, the administration of a 30-mL/kg crystalloid fluid bolus in the event of hypotension or high serum lactate levels (hyperlactatemia) of at least 4 mmol/L, and the administration of vasopressors to maintain a mean arterial pressure of at least 65 mm Hg. Although other factors such as mitochondrial dysfunction, microcirculatory failure, reduced oxygen extraction, increased glycolytic flux due to an endogenous catecholamine surge during sepsis, and hepato-renal dysfunction (70% of lactate is eliminated by the liver), resulting in decreased lactate elimination, have been implicated, serum lactate measurement is still recommended in sepsis. This is because hyperlactatemia is a marker for anaerobic metabolism following tissue hypoperfusion. In obstetric patients, elevated lactate has been positively correlated with the requirement for ICU admission, and every 1-mmol/L increase in lactate is linked to a 2.34-fold greater probability of needing ICU admission (19). Lactate may therefore make it possible to identify pregnant women with sepsis early and get them the urgent care they need.

Antibiotics for maternal sepsis

After drawing blood for culture, the first round of antibiotics for sepsis should be broad-spectrum and given within an hour of the diagnosis being suspected. Group A streptococcus and E. coli are frequently linked to serious infections in genital tract infections, which makes it necessary to use empirical broad-spectrum antibiotics that cover Gram-positive, Gram-negative, and anaerobic organisms before culture results are available. Group A streptococcus exotoxins can result in streptococcal toxic shock syndrome and rapid deterioration. Since group A streptococcus has been shown to produce less exotoxin, clindamycin should be used in conjunction with broad-spectrum antibiotics to enhance clinical results (20).

Ventilation strategies

It could be necessary to modify sepsis ventilation techniques for septic pregnant patients. To support fetal oxygenation and placental perfusion, the maternal arterial PaO2 should be maintained at greater than 70 mm Hg and the partial pressure of carbon dioxide (PaCO2) at less than 60 to 70 mm Hg. The mortality rate for acute respiratory distress syndrome (ARDS) is 23% during pregnancy and 50% after delivery (21). Pregnant women with severe ARDS who use prone ventilation throughout pregnancy experience considerable increases in oxygenation (22,23).

Extracorporeal membrane oxygenation

Extracorporeal membrane oxygenation (ECMO) has been utilized more frequently during pregnancy as a remedy

for respiratory failure in ICU patients, particularly throughout the 2009 H1N1 pandemic. With ECMO, there were concerns about possible fetal harm and bleeding, but the results were on par with the general population. There was no appreciable increase in hemorrhage, and the rates of mother and fetal survival were respectively 80% and 70% (24).

Conclusions

A substantial source of morbidity and mortality in pregnancy continues to be maternal sepsis. Sepsis terminology has recently evolved, and it is critical to grasp this transition from both a clinical and scientific perspective to stay current. To decrease the occurrence of maternal sepsis and to promote early detection and treatments that were previously thought to be impractical for pregnant women, more study into the risk factors for the condition is needed. Larger studies are needed to evaluate the role that interventions like prone ventilation and ECMO will play in the treatment of maternal sepsis.

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