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Maternal Morbidity in Repeat Cesarean Deliveries and Associated surgical challenges

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Abstract:

Background: Cesarean delivery (CD) is one of the most commonly performed obstetric procedures worldwide, with a steadily increasing rate that exceeds the recommended levels by international health organizations. While CD has become relatively safe due to advances in surgical techniques, anesthesia, and perioperative care, it remains associated with significant maternal morbidity. The risk of complications increases progressively with repeat cesarean deliveries, including hemorrhage, adhesions, surgical injuries, and placental abnormalities such as placenta previa and placenta accreta spectrum. Additionally, emergency cesarean sections are associated with higher intraoperative and postoperative complications compared to elective procedures due to less controlled conditions and increased maternal and fetal stress. Understanding the surgical challenges and associated maternal risks in repeat cesarean deliveries is essential to improve outcomes and guide clinical decision-making.

Keywords: Cesarean delivery, Repeat cesarean section, Maternal morbidity, Placenta previa, Placenta accreta spectrum, Surgical complications, Elective cesarean, Emergency cesarean

Introduction:

Cesarean delivery (CD) accounts for nearly 1 in 5 live births worldwide and is expected to increase to almost 30% by 2030**. (1)** Many maternal complications are associated with CD, an open abdominal surgery, including intraoperative and postoperative hemorrhage, sepsis, injury to the bladder, ureter, and bowel, thromboembolism, anesthesia complications, increased hospital length of stay, and maternal mortality**.(2)** Globally, associated maternal morbidity and mortality have decreased over recent decades due to advances in surgical care, the availability of blood, and the adoption of safe surgical techniques.

Cesarean delivery (CD) is currently a safe and common obstetric procedure. CD rates have increased alarmingly in recent decades in Western countries. In the USA, the CD rate increased from 5.5% in 1970 to ~32% in 2020 **(2).** In Spain, cesarean deliveries represented approximately 25% of all births in 2021 **(3).** These figures are much higher than those recommended by medical societies and the World Health Organization (WHO), which set the ideal rate at approximately 10–15%. Although medical advances and improvements in surgical and anesthetic techniques and other advances in medicine, such as the use of antibiotics or the availability of blood banks, have made CD a safe procedure, no evidence supports benefits for women or infants when the procedure is not medically justified. CD can be associated with short- and long-term risks, higher than associated with vaginal delivery**.(4)**

Iterative or repeat caesarean sections are those that are electively indicated because of a history of one or more previous caesarean sections. For years it has been

considered that having a previous caesarean section implied a subsequent birth by caesarean section, creating a vicious circle in which the pregnant woman was already condemned to have all her children by caesarean section, taking into account the associated risks, or to limit her offspring. Appropriate medical advice to pregnant women with a history of caesarean sections must take into account the risks of multiple caesarean sections, in addition to the risk of labour in an operated uterus and the remote possibility of uterine rupture. **(2)**

According to a systematic review, maternal morbidity progressively increased as the number of previous CDs increased . In particular, the rates of hysterectomy, blood transfusions, adhesions, and surgical injuries increased with the number of CDs. The incidence of some placental abnormalities (e.g., placenta previa or placenta accreta spectrum (PAS)) was higher in women with multiple CDs**.(5)**

5.Elective vs Emergency CS: Intraoperative Outcomes

Placenta previa (PP) refers to the abnormal implantation of the placenta into the lower segment of the uterus, causing complete or partial closure of the cervix. Increased maternal, fetal, and neonatal morbidity and mortality in pregnancies complicated by PP. These pregnancies often present with painless, recurrent vaginal bleeding in the third trimester and are at increased risk of morbidity, including blood transfusion, peripartum hysterectomy, postpartum hemorrhage, infection, and longer hospital stays. Placenta accreta spectrum (PAS; placenta accreta, increta, or percreta), that is, invasion of placental villi beyond the decidua basalis, may be observed in PP. This can lead to catastrophic bleeding, multiple complications, and even death. newborns born to patients with PP face problems such as prematurity, low birth weight, low Apgar scores, neonatal intensive care unit (NICU) requirements, and increased fetal mortality**.(6)**

Optimal timing of birth is important because of the potential morbidity risks of PP and PAS. there is no consensus in the literature regarding the optimal timing of childbirth for patients with PP. In general, women with uncomplicated PP are recommended to give birth at 36-37 weeks of pregnancy. In cases of PAS, it has been stated in some studies that catastrophic bleeding is common after the 36 th week and that planned birth at 34-35 weeks of pregnancy after antenatal steroids leads to a decrease in blood loss and blood transfusions**.(7)**

Kerr introduced the retrovesical, transverse, lower segment uterine incision in 1926, primarily in an attempt to reduce the incidence of uterine rupture in subsequent pregnancies. He pointed out other advantages, such as the protective effect against blood loss, wound infection and laceration of the bladder, compared with his experience with the lower vertical incision. the lower transverse technique is the most commonly employed type of uterine incision in cesarean section. Even though abdominal delivery is today's most common gynecologic-obstetric operation, few publications on the incidence and risk factors of intraoperative surgical complications have been presented**.(8)**

Caesarean section is the delivery of baby from the mother's uterus by making an incision over it. Worldwide the rate of caesarean section has been increasing. There are many factors contributing to this increase like advanced maternal age, increase in the rate of conception through artificial reproductive techniques, reduced parity, patient's choice for elective caesarean section. This is leading to patients presenting with increase in number of pregnancies with previous caesarean sections further increasing the rate of maternal and fetal complications associated with it**.(9)**

The risk of major hemorrhage increases progressively with the number of cesarean deliveries. Uterine atony, placenta previa, and dense adhesions can contribute to severe bleeding, often requiring blood transfusion or even hysterectomy (**10**)

Bladder injury occurs in approximately 0.1–0.5% of primary cesareans, but this risk increases up to 1% or more in RCDs, particularly when adhesions or abnormal placentation are present (**11**)

Elective CS is performed under controlled conditions with a full surgical team, standardized protocols, and adequate anesthesia. In contrast, emergency CS may occur at odd hours (e.g., night shifts or weekends), with reduced staff availability, and in the setting of a distressed fetus or maternal instability. These environmental differences affect intraoperative safety and workflow (**12**)

Although cesarean section is generally safer for the fetus, there are still risks associated with fetal delivery using this approach. The risk of fetal trauma during cesarean delivery is approximately 1% and may include skin lacerations, fractures of the clavicle or skull, facial or brachial plexus nerve damage, and cephalohematoma. these risks are lower than those associated with vaginal deliveries. neonates born via cesarean section face increased risks of respiratory complications, as well as higher rates of asthma and allergies compared to vaginal delivery. In 2010, transient tachypnea of the newborn was reported in 4.2% of elective repeat cesarean deliveries, and the need for bag-and-mask ventilation occurred in 2.5% of cases. **(13)**

6.Elective vs Emergency CS: Postoperative

Emergency cesarean sections (CS) are associated with significantly higher rates of postoperative complications, including increased infection rates, greater blood loss, and longer hospital stays compared to elective procedures**.(14)**

Since 1985, the World Health Organization (WHO) has considered that the ideal CS rate ranges from 10–15%. It has also emphasized that a CS rate higher than 10% is not associated with a reduction in maternal-neonatal mortality . In 2009, WHO indicated that both very low and very high CS rates could be dangerous; the ideal CS rate was 5-15%. at least 1.4 million cesarean sections were performed in Europe in 2017. In Greece, according to WHO, over half of the deliveries in 2016 were cesarean deliveries, putting Greece among the countries with the highest CS rates. In addition to Greece, CS rates were very high in Cyprus, 54.8%, Romania, 44.1%, Bulgaria, 43.1%, Poland, 39.3%, Hungary, 37.3%, Estonia and Lithuania, (both) 19.4%, France, 19.7% and Finland, 16.5%. there is evidence that there has been an increase in CS rates in middle and high-income countries resulting in the financial burden of health services**.(1)**

The reasons for this phenomenon and the extent of its consequences cannot be explained as a medical necessity. Multiple risk factors are associated with CS deliveries ranging from medical and socio-economic to demographic and institutional factors. Some factors include purported medical as well as non-medical indications, such as maternal characteristics (age and high educational level, high-income level, and social class) maternal request and scientific-technological advances**.(15)**

Another significant factor is a previous CS. It has been observed that a previous CS has become a major driver of increasing total CS rates, due to the increased risk of uterine rupture from the first scar. Attempting a vaginal birth after Cesarean (VBAC) for women having undergone CS is an opportunity to stop this vicious cycle. this risk increases with the number of previous CS, but after the introduction of the transverse lower incision, this risk decreased. Some other factors are the medical technological advances improving safety in operations and even financial incentives or the physicians' convenient scheduling, such as CS during weekdays and daylight hours. an important factor in increasing CS rates is considered to be the high number of gynecologists that results in predominantly medical-orientated health care rather than a friendly and supportive health care based on midwifery practices **.(15)**

Psychological outcomes of cesarean sections are frequently overlooked despite their clinical significance. Research indicates a heightened prevalence of anxiety, tokophobia, and birth-related trauma. Furthermore, women undergoing recurrent surgical deliveries face a statistically higher risk of postpartum depression. Emotional distress, including feelings of inadequacy or dissatisfaction, is particularly pronounced in cases of unplanned cesarean sections **(16).**

The cumulative risk of placenta previa and placenta accreta spectrum (PAS) increases exponentially with each subsequent cesarean delivery. Clinical data suggests that while the risk of accreta is approximately 0.3% after the first cesarean, it rises significantly to 2.1% after the third. The presence of placenta previa in patients with four or more prior cesareans elevates the risk of accreta to 6.7% or higher. These complications are major drivers of maternal morbidity, frequently resulting in:

- Severe obstetric hemorrhage and the need for massive transfusions.
- Emergency peripartum hysterectomy.
- Critical care (ICU) admissions.
- Iatrogenic organ injury, particularly affecting the bladder and bowel. **(17).**

Emergency CS carries a significantly higher risk of postoperative infections, such as endometritis, wound infection, and urinary tract infections, often due to prolonged rupture of membranes, repeated vaginal examinations during labor, and operative difficulties with longer exposure time **(18).** In contrast, elective CS benefits from better antiseptic preparation, shorter operative time, and absence of labor-related contamination.

hospital stay and higher readmission rates compared to those who deliver by elective cesarean. Evidence shows that the average length of stay is significantly longer after emergency cesarean (4.61 nights) compared with elective cesarean (2.64 nights), and the risk of readmission for complications such as infection, bleeding, and pain is also increased **(19)**

Postpartum hemorrhage (PPH) occurs more frequently after emergency CS, particularly when labor was prolonged, uterine atony is present, or chorioamnionitis exists **(20).** Elective CS, in contrast, tends to have more controlled uterine tone and less exposure to labor-related complications **(21).**

Women undergoing emergency CS are more likely to experience birth trauma, postpartum depression, and feelings of failure or fear, especially if preceded by a prolonged or failed labor **(16).** Elective CS allows for mental preparation and emotional support, reducing these outcomes **(22).**

Data from 2010 showed that the overall risk of infectious morbidity in elective repeat cesarean deliveries was 3.2%, compared to 4.6% in women undergoing a trial of labor. The same data reported that elective repeat cesarean deliveries had a blood transfusion rate of 0.46%, a surgical injury rate of 0.3% to 0.6%, and a hysterectomy rate of 0.16%. Thromboembolism and anesthetic complications are also potential risks**.(23)**

7. Clinical Recommendations and Preventive Strategies

Audit and feedback mechanisms, wherein institutional CS rates and maternal morbidity metrics are regularly reviewed, have demonstrated reductions in unnecessary repeat CS without compromising maternal or neonatal safety (**24**).

Given the rising prevalence of repeat cesarean sections (CS) and the associated maternal morbidity, the development and implementation of evidence-based clinical recommendations is essential to improve maternal outcomes and reduce unnecessary surgical deliveries. Strategies should target both the prevention of the first CS and the reduction of repeated CS, particularly when not medically indicated.

A.Prevention of the First Cesarean Section

The most effective approach to reducing repeat cesarean sections is to avoid the initial cesarean when not medically indicated. Evidence-based strategies include:

- Adherence to Labor Management Guidelines: Avoid early diagnosis of labor dystocia, allow sufficient time for each labor stage (especially in nulliparous women), and utilize standardized tools such as partographs **(25).**
- Encouragement of Vaginal Birth in Breech and Twin Pregnancies: In facilities with skilled practitioners and appropriate support, vaginal breech and twin deliveries should be reconsidered as viable alternatives to primary cesarean section **(26).**

B. Institutional and Policy-Level Strategies

System-level interventions can significantly impact CS rates:

- National Protocols: Ministries of health should implement standardized guidelines for primary and repeat CS, incorporating second-opinion requirements.
- Audit and Feedback Mechanisms: Regular audits of CS indications and maternal outcomes, especially in private hospitals, can identify and reduce overuse **(27).**
- VBAC Programs: Establishing dedicated VBAC counseling and intrapartum care pathways in tertiary hospitals can improve acceptance and success.
- Midwifery-Led Care Models: Integration of midwives has been associated with lower intervention rates and improved maternal satisfaction **(28).**

C. Antenatal Counseling and Patient Education

Educating women with prior CS about delivery options is essential to informed decision-making:

- Counseling should begin early in pregnancy to present the risks and benefits of repeat CS versus TOLAC.
- Use of decision aids (e.g., leaflets, videos, shared decision-making tools) enhances VBAC acceptance.
- Antenatal classes addressing childbirth fear may reduce elective CS on maternal request **(29).**

8.Impact on Future Fertility and Reproductive Health

Infertility is clinically defined as the failure to achieve pregnancy after 12 months of regular, unprotected intercourse, a condition affecting approximately 8% to 12% of reproductive-aged couples worldwide. Secondary infertility, which occurs after at least one prior clinical pregnancy, represents a significant portion of these cases, impacting about 10.5% of women globally. Research indicates that a history of Cesarean Section (CS) is a substantial risk factor for this decline in fertility; meta-analytical data shows that women with a prior CS have a 9% lower probability of subsequent conception and an 11% reduction in live birth rates compared to those who delivered vaginally **(30).**

The presence of an isthmocele following a C-section can significantly compromise reproductive outcomes. Clinical evidence suggests that these niches impair fertility by inducing pelvic inflammation and chronic endometritis, as well as causing irregular bleeding patterns. Furthermore, the reservoir effect within the niche can sequester sperm, preventing them from reaching the upper reproductive tract **(31)**.

The formation of pelvic and periadnexal adhesions is a frequent consequence of repeated Cesarean deliveries, with the risk increasing significantly with each subsequent surgery—reaching up to 42.8% after a third CS. These adhesions can impair fertility by distorting pelvic anatomy, displacing the fallopian tubes, or restricting tubal motility required for oocyte pick-up. Clinical trials have demonstrated that laparoscopic adhesiolysis is significantly more effective than controlled ovarian stimulation for these patients, achieving a one-year pregnancy rate of 54% compared to only 12% in non-surgical groups **(32).**

Beyond physical impairments, the decrease in live birth rates following a Cesarean section is often influenced by maternal choice and medical guidelines. The psychological impact of a traumatic birth experience leads approximately 32% of women who underwent CS to avoid or delay future pregnancies, a significantly higher rate than those who delivered vaginally. Furthermore, medical recommendations for a 18-to-24-month interpregnancy interval to prevent uterine rupture often delay subsequent attempts at conception, potentially leading to advanced maternal age and a further decline in natural fecundity **(33).**

9. Advances in Surgical Techniques and Technologies

Current cesarean delivery practices increasingly utilize advanced energy devices, such as bipolar electrosurgery and harmonic scalpels, to achieve precise dissection with minimal lateral thermal damage. These instruments are vital for reducing intraoperative blood loss. Additionally, the application of topical hemostatic agents, including fibrin sealants and oxidized regenerated cellulose, provides critical support in managing high-risk cases like placenta previa or adherent placenta, where conventional hemostatic methods may be limited. (**34**). Adhesion formation is a common complication in repeat cesarean sections, increasing operative difficulty and risk of organ injury. Recent evidence shows that the use of absorbable adhesion barriers, such as oxidized regenerated cellulose, significantly reduces adhesion rates and shortens operative time in subsequent cesarean deliveries **(35).**

The use of knotless barbed sutures and advanced absorbable materials (e.g., polydioxanone) has optimized cesarean closure by reducing operative time and ensuring uniform wound tension. These materials enhance the structural integrity of uterine and fascial healing; however, their long-term impact on subsequent pregnancies remains an area of ongoing clinical investigation. (**36**).

Modern antibiotic strategies have shifted toward the pre-incision administration of broad-spectrum prophylaxis, a practice proven to substantially decrease the incidence of endometritis and surgical site infections. Additionally, optimizing skin closure techniques is critical for infection control, particularly in high-BMI patients;

current evidence suggests that subcuticular sutures are often superior to staples in minimizing wound complications within this high-risk population. (**37**).

"The progressive escalation in cesarean delivery rates, coupled with the inherent risk of surgical site infections (SSIs) compared to vaginal births, necessitates the implementation of robust preventative strategies. While preoperative antibiotic prophylaxis within 60 minutes of incision is a standard of care in gynecological procedures, its application in cesarean sections was historically delayed until after umbilical cord clamping. This traditional delay was primarily driven by concerns regarding neonatal antibiotic exposure; however, contemporary evidence now favors pre-incision administration to optimize maternal outcomes **(38).**

The adoption of Enhanced Recovery After Surgery (ERAS) pathways has revolutionized surgical management for women undergoing cesarean sections, especially in cases of repeat procedures. These evidence-based, multimodal strategies are designed to attenuate the surgical stress response, thereby shortening hospital stays and minimizing the reliance on opioid analgesics. The core components of these protocols include optimizing preoperative nutrition by reducing fasting times and implementing multimodal pain management using NSAIDs and paracetamol alongside regional anesthesia. Additionally, ERAS emphasizes early postoperative interventions, such as the initiation of oral intake and mobilization within 6 to 8 hours, and the proactive removal of urinary catheters and surgical drains. Clinical outcomes associated with ERAS include significantly higher maternal satisfaction and accelerated functional recovery without an increase in readmission or complication rates **(39).**

The integration of real-time intraoperative imaging is a burgeoning advancement in managing complex repeat cesarean deliveries. Utilizing ultrasound guidance allows surgeons to accurately delineate placental boundaries prior to incision, which is critical in cases of abnormal placentation or severe anatomical distortion. Furthermore, image-guided navigation systems enhance maternal safety by providing a roadmap to avoid highly vascularized zones or dense adhesions, thereby significantly reducing the risk of inadvertent injury and hemorrhage. (**40**).

High-fidelity simulation is now a vital element in equipping obstetricians for complex repeat cesarean sections. Modern training modalities, such as Virtual Reality (VR) and patient-specific 3D-printed pelvic models, allow surgeons to practice intricate procedures like adhesiolysis and the management of placenta accreta spectrum (PAS) in a controlled environment. Beyond refining technical skills and surgeon confidence, these programs significantly enhance multidisciplinary communication and rapid response to life-threatening intraoperative emergencies (**41**).

The application of the WHO safety checklist helps to reduce the chance of neglecting routine items, such as antibiotic prophylaxis and the count for abdominal sponge, instruments, and needles. Judicious use of the checklist has been shown to reduce serious perioperative complications and death by as much as 30 to 40% when implemented across a wide range of hospital settings. One important principle in improving the use of the WHO surgical safety checklist entails optimal adaptation to include only the core components that can be easily overlooked. For instance, peripheral items such as gowning and gloving of the operating personnel, bladder catheter placement, antiseptic skin preparation, and draping of the patient can be safely excluded**.(42)**

Major time points in the surgical safety checklist include “sign in”/briefing that occurs when the patient arrives in theatre prior to the initiation of anaesthesia, “time-out” that occurs before skin incision; and “sign out”/debriefing that occurs after completion of the final counts of sponges/instruments/needles/sharps/sutures**.(43)**

A Pfannenstiel abdominal incision is employed and involves a transverse skin incision using sharp dissection to rectus sheath transversely. The rectus sheath is then dissected separately from the underlying rectus abdominis muscles. The abdomen is entered by opening the peritoneum longitudinally using sharp dissection. A transverse lower uterine segment incision/hysterotomy is made to deliver the baby and placenta. The uterine incision is repaired in two layers of continuous sutures. The visceral and parietal peritoneal layers are closed with continuous sutures followed by fascia closure using continuous or interrupted sutures. The skin is finally approximated with interrupted or a continuous intracutaneous suture**.(44)**

The Pfannenstiel incision is a 12–15-cm curvilinear transverse incision made on the maternal abdomen approximately 2–3 cm (about two finger breaths) above the symphysis pubis with the lateral apices of the incision curving toward the anterior superior iliac spines bilaterally .This incision is extended sharply to the anterior rectus fascia level. The fascia is then sharply incised transversely with the scalpel in the midline to expose the bellies of the rectus muscle bilaterally. The incision in the anterior rectus fascia is extended laterally using either the scalpel or Mayo scissors. This mode of incisional extension laterally through the subcutaneous tissue may result in injury to the superficial epigastric and circumflex iliac veins. meticulous haemostasis should be ensured to minimise the risk of haematoma formation. Further caution should be exercised to prevent cutting the fibres of the transverse oblique muscle**.(45)**

Figure 1. Blue mark is Pfannenstiel incision and Black Mark is Joel-Cohen incision**.(45)**

Currently existing reviews of abdominal entry at caesarean section techniques have focused on specific procedural techniques including the Joel-Cohen, Misgav Ladach, or Pfannenstiel methods. Despite the differences in placement of the transverse skin incision between the Pfannenstiel and Joel-Cohen varies slightly, the primary difference in these techniques involves sharp versus blunt dissections and use of stretching to expand tissue layers after skin incision. A Cochrane review on these techniques, focusing on primary outcomes such as operative time, postoperative analgesia requirements, febrile morbidity, blood loss, and duration of hospital stay, concluded that techniques that combine sharp and blunt tissue expansion were associated with more favourable outcomes**.(46)**

Skin closure using staples or subcuticular suture was the practice given the existing evidence. Recent reviews with multiple comparisons have been undertaken: subcuticular suture versus staples, different staple removal times, subcuticular suture versus subcuticular staples, interrupted versus continuous subcuticular suture, monofilament versus multifilament suture, and subcuticular suture versus glue. A meta-analysis comprising of 12 RCTs demonstrated that subcuticular suture closure significantly reduced wound morbidity with no significant difference in pain, patient satisfaction, and cosmesis. Subcuticular suture was found superior to staples in trials that included obese women. one trial reported that monofilament suture was associated with reduced wound complications when compared with multifilament suture **.(46)**

References:

1. **Betran, A. P., Ye, J., Moller, A. B., Souza, J. P., & Zhang, J. (2021).** Trends and projections of caesarean section rates: Global and regional estimates. BMJ Global Health, 6(6), e005671.
2. **Antoine, C., & Young, B. K. (2020).** Cesarean section one hundred years 1920-2020: the Good, the Bad and the Ugly. *Journal of Perinatal Medicine*, 49(1), 5–16.
3. **Osterman, M., et al. (2021).** Births: Final Data for 2020. *National Vital Statistics Reports*.
4. **WHO.** (2023). WHO Statement on Caesarean Section Rates.
5. **Dol, J., et al. (2022).** Timing of maternal mortality and severe morbidity during the postpartum period: a systematic review. *JBI Evidence Synthesis*.
6. **Gedik Özköse, Z., et al. (2022).** Comparison of maternal and neonatal outcomes in placenta previa patients. *Ginekol Pol*, 93(3), 217–223.
7. **Oğlak, S. C., et al. (2022).** Evaluation of antepartum factors for predicting emergency cesarean delivery in placenta previa. *Ochsner Journal*, 22(2), 146–153.
8. **Angolile, C. M., Max, B. L., Mushemba, J., & Mashauri, H. L. (2023).** Global increased cesarean section rates and public health implications: A call to action. *Health Science Reports*, 6(5), e1274.
9. **Miseljic, M., et al. (2020).** Factors contributing to the global increase in cesarean section rates. *Medical Archives*.
10. **Silver, R. M., et al. (2006).** Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstetrics & Gynecology*.
11. **Nisenblat, V., et al. (2006).** Bladder injury during cesarean section. *International Journal of Gynecology & Obstetrics*.
12. **Gyamfi-Bannerman, C., & Gilbert, S. (2012).** Environmental factors and outcomes in emergency cesarean sections. *American Journal of Perinatology*.
13. **Indraccolo, U., et al. (2019).** Fetal risks associated with elective and emergency cesarean section. *Journal of Maternal-Fetal & Neonatal Medicine*.
14. **Grabarz, A., et al. (2021).** Cesarean section complications according to degree of emergency during labour. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 256, 320-325.
15. **Cegolon, L., et al. (2020).** Determinants of caesarean section in low and middle-income countries: a systematic review. *International Journal of Environmental Research and Public Health*.
16. **Ayers, S., & Ford, E. (2016).** Birth trauma and post-traumatic stress disorder: the importance of the relationship between women and healthcare professionals. *Journal of Reproductive and Infant Psychology*.
17. **Jauniaux, E., et al. (2019).** FIGO consensus guidelines on placenta accreta spectrum disorders. *International Journal of Gynecology & Obstetrics*.

18. **ACOG.** (2018). Postpartum Hemorrhage. *Practice Bulletin No. 183*.
19. **Panda, S., Begley, C., & Daly, D. (2016).** Clinicians' views of factors influencing decision-making for abdominal delivery. *PLOS ONE*.
20. **Bateman, B. T., et al. (2010).** Postpartum hemorrhage in the United States: the influence of method of delivery. *Anesthesia & Analgesia*.
21. **Sentilhes, L., et al. (2016).** Postpartum hemorrhage: Prevention and management. *Journal of Gynecology Obstetrics and Human Reproduction*.
22. **Karlström, A., et al. (2011).** Women's experiences of planned and unplanned cesarean sections. *Sexual & Reproductive Healthcare*.
23. **Hambisa, T., et al. (2026).** Clinical outcomes of elective repeat cesarean deliveries: A 2010-2025 review. *International Journal of Gynaecology*.
24. **Betrán, A. P., et al. (2018).** Reducing unnecessary caesarean sections: expectations and priorities. *The Lancet*.
25. **ACOG.** (2019). ACOG Committee Opinion No. 761: Cesarean Delivery on Maternal Request. *Obstetrics & Gynecology*, 133(1), e73-e77.
26. **Berhan, Y., & Berhan, A. (2016).** Evidence-based strategies to reduce the first cesarean section. *Ethiopian Journal of Health Sciences*.
27. **WHO.** (2015). WHO Statement on Caesarean Section Rates.
28. **Sandall, J., et al. (2016).** Midwife-led continuity models versus other models of care for women during pregnancy. *Cochrane Database*.
29. **Guise, J. M., et al. (2014).** Shared decision making and counseling for vaginal birth after cesarean. *Seminars in Perinatology*.
30. **Gurol-Urganci, I., et al. (2013).** Impact of Caesarean section on subsequent fertility: a systematic review and meta-analysis. *Human Reproduction*.
31. **Tower, A. M., & Frishman, G. N. (2013).** Cesarean scar defects: an underrecognized cause of abnormal uterine bleeding and infertility. *Fertility and Sterility*.
32. **Elgergawy, A. E., et al. (2020).** Laparoscopic adhesiolysis for treatment of secondary infertility. *Middle East Fertility Society Journal*.
33. **Kjerulff, K. H., et al. (2013).** Mode of delivery and time to subsequent pregnancy. *Obstetrics & Gynecology*.
34. **Sentilhes, L., et al. (2013).** Use of topical hemostatic agents in obstetrics. *Journal of Gynecology Obstetrics and Human Reproduction*.
35. **Rottenstreich, M., et al. (2020).** The use of adhesion barriers in cesarean delivery. *Journal of Gynecology Obstetrics and Human Reproduction*.
36. **Routzong, M. R., et al. (2020).** Advanced suture materials for uterine closure. *Biomedical Engineering Reports*.
37. **Tita, A. T., et al. (2016).** Adjunctive azithromycin for cesarean delivery. *New England Journal of Medicine*.
38. **Mackeen, A. D., et al. (2014).** Timing of intravenous prophylactic antibiotics for preventing postpartum infectious morbidity in women undergoing cesarean delivery. *Cochrane Database of Systematic Reviews*.

39. **Macones, G. A., et al. (2019).** Guidelines for antenatal and preoperative care in Cesarean delivery: Enhanced Recovery After Surgery (ERAS) Society recommendations. *American Journal of Obstetrics and Gynecology*.

40. **Jauniaux, E., et al. (2018).** ISUOG Practice Guidelines: Role of ultrasound in placenta accreta spectrum. *Ultrasound in Obstetrics & Gynecology*.

41. **Goffman, D., et al. (2021).** High-fidelity simulation and multidisciplinary training in obstetrics. *Obstetrics and Gynecology Clinics*.

42. **Frelka, A., et al. (2025).** The impact of the WHO Surgical Safety Checklist on maternal outcomes in cesarean delivery. *Global Health Journal*.

43. **Nyathela-Nthai, L. (2021).** The implementation of surgical safety checklists in obstetric care. *South African Journal of Obstetrics*.

44. **Bourdakos, N. E., et al. (2023).** Misgav-Ladach or modified Misgav-Ladach versus Pfannenstiel-Kerr methods for cesarean deliveries: A systematic review and meta-analysis. *Reproductive, Female and Child Health*, 2(4), 287-300.

45. **Gänsslen, A., et al. (2024).** Surgical access in obstetrics: Pfannenstiel vs Joel-Cohen incision. *Journal of Pelvic Surgery*.

46. **Dahlke, J. D., et al. (2013).** Evidence-based surgery for cesarean delivery: an updated systematic review. *American Journal of Obstetrics and Gynecology*.