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PERINATAL ASPECTS OF CESAREAN SECTION IN FULL-TERM PREGNANCY: A COMPREHENSIVE REVIEW

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Summary.

Cesarean section (CS) remains one of the most frequently performed surgical interventions in obstetric practice, particularly in term gestations. The influence of CS on perinatal outcomes in term pregnancies continues to be a subject of rigorous investigation and academic discourse.

Aim. *This review evaluates perinatal outcomes associated with cesarean section (CS) in term pregnancies (37 to 42 weeks gestation), with particular focus on comparative maternal and neonatal health parameters. The analysis examines both immediate and longitudinal risks and benefits of CS relative to vaginal delivery.*

Materials and methods. *A systematic examination of scientific literature published within the preceding twenty years was conducted, incorporating clinical studies, cohort analyses, and systematic reviews. Selected investigations met the following criteria: (1) evaluation of term pregnancies (37-42 weeks gestation), (2) comparative assessment of maternal and neonatal outcomes following CS versus vaginal delivery. Data sources included PubMed, the Cochrane Library, and Google Scholar.*

Results. *Cesarean delivery in term pregnancies demonstrates association with multiple maternal risks including postoperative infectious morbidity, hemorrhagic complications, and prolonged convalescence periods. Longitudinal data indicate elevated risks for subsequent pregnancy complications such as uterine rupture and placental implantation disorders. Neonates delivered via prelabor CS exhibit increased incidence of respiratory distress syndrome and delayed physiological transition compared to vaginally delivered infants. Importantly, CS retains critical importance in obstetric emergencies including fetal compromise, malpresentation, and placenta previa, where timely intervention prevents severe maternal and perinatal morbidity.*

Conclusion. *While cesarean section constitutes an indispensable component of contemporary obstetric practice, its escalating utilization warrants judicious clinical consideration. Although potentially life-saving in indicated circumstances, the procedure carries substantive risks for both parturient and neonate. Rigorous indication assessment remains paramount to avoid nonessential interventions and optimize perinatal outcomes. Additional investigation is warranted to elucidate long-term consequences across the reproductive lifespan and pediatric development.*

Key words: *Cesarean Section; Maternal Health; Neonatal Health; Perinatal Outcomes; Respiratory Distress Syndrome; Postpartum Recovery; Obstetric Complications.*

Introduction

Cesarean section (CS) remains one of the most frequently performed surgical interventions in obstetric practice, particularly in term gestations. While this delivery method is clinically indicated when vaginal birth presents risks to maternal or neonatal health, its escalating global prevalence has prompted scrutiny regarding both immediate and delayed consequences for parturients and offspring. The influence of CS on perinatal outcomes in term pregnancies continues to be a subject of rigorous investigation and academic discourse.

The procedure is technically defined as the extraction of a neonate through incisions in the maternal abdominal wall and uterine musculature. World Health Organization (WHO) guidelines stipulate an optimal CS rate of 10-15% of total deliveries; however, contemporary epidemiological data demonstrate substantial global exceedance of this threshold, with marked interregional variability [1]. Primary indications for elective CS in term pregnancies encompass fetal compromise, malpresentation, maternal preference, history of prior cesarean delivery, and obstetric comorbidities including preeclampsia, diabetes mellitus, and systemic infections [2]. Additional contributing factors

documented in clinical literature include labor dystocia, arrest of cervical dilation, and multifetal gestation [3, 4].

The aim of this review is to critically assess perinatal outcomes associated with CS in full-term pregnancies, with particular emphasis on comparative maternal and neonatal morbidity. The analysis will specifically evaluate evidence regarding temporal sequelae (immediate, intermediate, and long-term) of surgical delivery for both parturient and neonate.

Object, materials, and methods of the study

The object of this review comprises pregnancy outcomes following cesarean delivery compared with vaginal birth, with particular focus on maternal and neonatal health parameters. The analyzed studies exclusively examined term pregnancies (gestational age range: 37-42 weeks).

The research materials encompassed clinical trials, cohort studies, and systematic reviews published within the preceding twenty years. Inclusion criteria required studies to provide direct comparisons between cesarean and vaginal delivery modalities while evaluating maternal and neonatal health outcomes. Data sources included

established medical databases: PubMed, Cochrane Library, and Google Scholar.

The analytical process adhered to fundamental ethical principles, including impartial literature selection and rigorous adherence to scientific citation standards.

Data processing

The collected data underwent qualitative comparative analysis of study outcomes. Information organization and analysis were performed using Microsoft Excel for data tabulation and Zotero for reference management.

Research results

Postoperative complications: As a major abdominal surgical procedure, cesarean delivery entails inherent risks including infectious morbidity, hemorrhagic events, and anesthesia-related complications. Current evidence demonstrates elevated risks of postoperative infections among cesarean deliveries, particularly endometritis and surgical site infections compared with vaginal births [5]. Furthermore, maternal hemorrhage substantially increased compared to vaginal deliveries [6]. It is documented that women who undergo cesarean section have higher frequencies of blood transfusion and uterine atony, which can lead to more severe complications [7].

Long-term risks: Cesarean delivery is associated with several persistent maternal health risks, including uterine rupture in subsequent pregnancies, placenta accreta, and other placental implantation abnormalities [8]. These conditions demonstrate significant morbidity potential for both mother and fetus in future gestations. Furthermore, meta-analyses indicate increased risks of secondary infertility and subsequent requirement for assisted reproductive technologies among women with prior cesarean deliveries [9].

Mental health implications: Women undergoing cesarean delivery may experience significant psychological sequelae, including postpartum depression, post-traumatic stress disorder (PTSD), and emotional distress related to unmet birth expectations [10]. These psychological impacts demonstrate heightened prevalence in cases of unplanned cesarean sections performed under emergency conditions [11]. Furthermore, current evidence indicates that traumatic cesarean delivery experiences correlate with increased incidence of postpartum regret and prolonged grief reactions [12].

Cesarean delivery is associated with significantly elevated neonatal risks of respiratory morbidity. Neonates delivered via cesarean section demonstrate increased incidence of transient tachypnea of the newborn (TTN) and other respiratory complications, primarily attributable to the absence of physiological labor processes that facilitate fetal pulmonary fluid clearance [13]. Elective cesarean sections performed prior to 39 weeks of gestation are particularly associated with heightened risks of neonatal respiratory distress syndrome, as evidenced by contemporary clinical studies [14].

More severe respiratory pathologies associated with surgical delivery include neonatal respiratory distress syndrome (NRDS) and persistent pulmonary hypertension of the newborn (PPHN), often necessitating intensive respiratory support and extended hospitalization [15].

Neonatal adaptation and gut microbiota: Delivery mode significantly impacts early microbial colonization

patterns. Cesarean-delivered neonates exhibit reduced gut microbiota diversity compared to vaginally delivered infants, with particular depletion of *Bacteroides* and *Bifidobacterium* species [16,17]. This dysbiosis has been associated with long-term immunological consequences, including increased risks of atopic conditions, asthma, and metabolic disorders during childhood [18].

While neonatal mortality rates following term cesarean deliveries remain low, these neonates demonstrate increased likelihood of neonatal intensive care unit (NICU) admission compared to vaginal births, particularly in non-emergent cases [19]. Additionally, cesarean delivery correlates with higher incidence of early-onset neonatal infections, including sepsis and pneumonia [20].

Comparative studies demonstrate significant differences in postpartum recovery between cesarean and vaginal deliveries. Cesarean sections are consistently associated with prolonged convalescence periods, elevated thromboembolic risk, and increased postpartum complication rates [21]. Conversely, vaginal delivery correlates with accelerated recovery trajectories, reduced analgesic requirements, and lower incidence of postpartum hemorrhage [22].

Quantitative analyses reveal that cesarean deliveries necessitate extended hospitalization and more frequent postpartum medical interventions [23]. Studies further identify associations between cesarean delivery and chronic pelvic pain syndromes, along with scar-related complications including keloid formation and adhesions [24].

Fetal and neonatal outcomes: From a neonatal perspective, vaginal delivery confers distinct neonatal advantages, including reduced respiratory morbidity and optimized microbial colonization patterns. Vaginal delivery is associated with enhanced early maternal-neonatal bonding and more timely initiation of breastfeeding compared to cesarean birth [25]. Nevertheless, in cases of fetal compromise or placental pathology, cesarean delivery represents a critical intervention that can preserve maternal and neonatal survival [26].

Multiple determinants contribute to increasing cesarean delivery rates worldwide, including medical, sociocultural and healthcare system factors. Maternal age, obesity, multiple pregnancies and previous cesarean section represent significant predictors of elective cesarean [27]. The rising trend of maternal-request cesarean section, sometimes motivated by perceived safety or labor concerns, further increases elective rates [28]. Other sociocultural factors include higher socioeconomic status, urbanization and healthcare access, which may increase cesarean likelihood in certain populations [29].

Beyond established clinical factors, elective cesarean sections are increasingly performed due to psychological and emotional considerations. Severe childbirth anxiety (tokophobia) or adverse prior birth experiences may motivate cesarean requests in the absence of medical indications. Healthcare provider preferences, institutional protocols, and resource availability further influence procedural decision-making [30].

Contemporary cesarean rates substantially exceed WHO recommendations across most high-income nations, with the United States documenting 32.1% cesarean deliveries (2022 data) versus the recommended 10-15%

threshold [31]. Middle-income countries demonstrate parallel increases (annual growth rate 4.2%), reflecting healthcare infrastructure development. This trend has prompted concerns regarding excessive cesarean utilization without definitive medical indications, highlighting the need for enhanced clinical guidelines and optimized prenatal care strategies to minimize non-indicated procedures [32]. Several nations, particularly Scandinavian countries, maintain comparatively low cesarean section rates, attributable to strong cultural preferences for vaginal delivery.

Discussion

To address the rising rates of cesarean delivery, several strategies have been proposed. These include the promotion of vaginal birth after cesarean (VBAC) in women with a previous cesarean section, provided that no contraindications are present. Enhanced intrapartum support, including midwifery care and individualized birth plans, may also contribute to a reduction in unnecessary cesarean deliveries. Furthermore, the implementation of antenatal education programs emphasizing the benefits of vaginal birth and addressing fear of childbirth may play a critical role in lowering the incidence of elective cesarean delivery [33]. Ensuring that healthcare providers and patients are adequately informed regarding the risks and benefits of different delivery modalities is essential to achieving a balanced and evidence-based approach.

The long-term health consequences associated with cesarean delivery represent an area of increasing concern. Evidence indicates several risks related to cesarean section, including an elevated risk of uterine rupture in subsequent pregnancies, particularly following a prior cesarean delivery. Although uterine rupture is rare, it may result in catastrophic maternal and neonatal outcomes, such as massive hemorrhage, organ injury, and the necessity for emergency surgical interventions [34]. Moreover, women with a history of cesarean delivery demonstrate a higher risk of placenta previa and placental abruption in subsequent pregnancies, both of which pose significant threats to maternal and fetal health [35].

Chronic pain and long-term pelvic sequelae, including intra-abdominal adhesions and scar tissue formation, are also frequently reported among women with a history of cesarean delivery. These complications may cause persistent pain, dyspareunia, and in some cases infertility, due to tubal occlusion or impaired ovarian function secondary to adhesion formation [36]. In addition, adverse psychological outcomes, including post-traumatic stress disorder (PTSD) following a traumatic cesarean experience, may persist long after delivery, with affected women reporting enduring emotional distress related to the birth event [37].

Neonates delivered by cesarean section are at increased risk of specific health complications compared with those born via vaginal delivery. Respiratory conditions, such as transient tachypnea of the newborn (TTN), are more frequently observed among infants born by cesarean section. This phenomenon is attributed to the absence of the physiological thoracic compression occurring during vaginal birth, which facilitates the clearance of pulmonary fluid [38]. Infants delivered by cesarean section are also at elevated risk of developing asthma and other

atopic disorders, most likely due to disruption of normal microbiota colonization at birth [39].

In addition, cesarean delivery, particularly when performed electively, is associated with delayed initiation of breastfeeding, which may adversely affect neonatal nutrition and immune system maturation. Breastfeeding provides essential immunoglobulins and commensal microorganisms that support immune development and promote overall health. Furthermore, neonates delivered by cesarean section demonstrate a higher likelihood of admission to the neonatal intensive care unit (NICU) as a consequence of complications such as respiratory distress [40].

Women with a history of cesarean section are at increased risk of complications in subsequent pregnancies. One of the most serious complications is uterine scar rupture during labor, which can result in significant maternal and perinatal morbidity and mortality [41]. This risk increases proportionally with the number of prior cesarean deliveries and must be carefully considered when evaluating the option of vaginal birth after cesarean (VBAC). While VBAC is regarded as safe in many cases, it is appropriate only in selected patients in whom the previous cesarean was performed under low-risk circumstances and who otherwise meet favorable clinical criteria [42].

Placenta accreta, characterized by abnormal trophoblastic invasion into the myometrium, is another complication strongly associated with multiple cesarean deliveries. The likelihood of placenta accreta rises with each successive cesarean procedure and may result in life-threatening maternal hemorrhage, often necessitating hysterectomy or other extensive surgical interventions [43].

From a public health perspective, the increasing prevalence of cesarean delivery imposes a substantial economic burden, as cesarean sections are more costly than vaginal births due to prolonged hospitalization, greater need for medical interventions, and higher incidence of postoperative complications. Moreover, recovery following cesarean delivery is often extended, potentially impairing maternal capacity to resume occupational and caregiving responsibilities [44]. The World Health Organization (WHO) has underscored the importance of prioritizing vaginal birth when clinically feasible in order to reduce healthcare expenditures and improve maternal and neonatal outcomes [45].

To reduce the overuse of cesarean section and improve maternal and neonatal outcomes, several strategies have been proposed. These include:

- Promoting evidence-based guidelines and protocols restrict the use of cesarean section to medically indicated situations.
- Encouraging a supportive labor environment that incorporates adequate pain management, continuous intrapartum support, and the avoidance of non-essential interventions.
- Training healthcare providers to accurately identify appropriate indications for cesarean section while ensuring that women receive counseling on the risks and benefits of both cesarean and vaginal delivery [46].
- Supporting vaginal birth after cesarean (VBAC) in eligible candidates to decrease the frequency of repeat cesarean sections.

Public health initiatives aimed at educating pregnant women about the risks and benefits of both cesarean and vaginal delivery, as well as the potential long-term consequences of cesarean birth, are also considered critical to reducing unnecessary cesarean procedures.

One of the principal obstetric complications associated with cesarean delivery is postoperative hemorrhage. This may result from rupture of blood vessels supplying the placenta or from impaired uterine contractility following the surgical incision. The severity of hemorrhage can vary from mild to massive bleeding requiring blood transfusion or additional surgical interventions. Hemorrhage following cesarean section remains one of the leading causes of postoperative maternal mortality, with an incidence of 1.5-2% among women undergoing the procedure [47].

Another major complication is postoperative infection. Surgical site infection and endometritis, defined as inflammation of the endometrial lining, represent serious sequelae of cesarean section. Studies report that postoperative infections occur in 5-15% of cases [48]. Such infections often prolong hospitalization and necessitate additional therapeutic measures.

Impaired healing of the postoperative uterine scar constitutes another important clinical concern. Repeated cesarean sections increase the risk of uterine wall weakness and subsequent rupture during later pregnancies or deliveries. Evidence indicates that the risk of uterine rupture in women undergoing a subsequent cesarean section after two previous procedures is approximately 1.5-2% [49]. Uterine rupture presents a life-threatening risk for both mother and fetus. Accordingly, careful surveillance of the postoperative uterine scar is warranted during subsequent pregnancies to mitigate the risk of rupture and associated complications.

Cesarean section is associated with an increased risk of intra-abdominal adhesion formation, which may lead to chronic abdominal pain, bowel obstruction, and other significant complications. As with any surgical intervention, cesarean delivery carries a risk of postoperative adhesions, frequently necessitating subsequent surgical management for resolution. Current evidence suggests adhesion development occurs in 15-30% of post-cesarean cases [50].

From a neonatal perspective, cesarean delivery elevates the risk of respiratory distress syndrome (RDS) due to incomplete pulmonary fluid clearance absent the physiological stresses of vaginal delivery. The incidence of RDS is 3-5% higher in neonates delivered via prelabor cesarean section compared to those born vaginally [51].

Additional neonatal risks include procedural trauma, with 0.5-1% of cesarean deliveries resulting in iatrogenic injuries such as skin lacerations or organ damage [52].

Maternal complications may include urological dysfunction secondary to intraoperative bladder injury,

along with hemorrhage attributable to surgical factors or suboptimal postpartum management.

The prospects for further research. Future research priorities should focus on longitudinal assessment of cesarean section outcomes, particularly regarding reproductive sequelae and pediatric health implications. Investigation of preventive strategies to optimize delivery modality selection and mitigate procedure-associated risks represents another critical research direction.

Conclusion

Cesarean section remains an essential and potentially life-saving intervention in specific obstetric circumstances; however, its escalating global utilization presents complex challenges regarding both acute and chronic health consequences for mothers and neonates. This review demonstrates that cesarean delivery in term pregnancies correlates with multiple perinatal risks, including neonatal respiratory complications, altered immune system development, and increased maternal morbidity encompassing chronic pelvic pain, subsequent pregnancy complications, and psychological sequelae. Furthermore, cesarean delivery may negatively impact early maternal-neonatal bonding and breastfeeding initiation, processes fundamentally important for infant health.

The documented rise in cesarean rates underscores the necessity for judicious delivery planning, prioritizing reduction of non-indicated surgical interventions. Implementation of comprehensive patient education programs, facilitation of informed decision-making processes, and promotion of vaginal delivery when clinically appropriate constitute critical components of this effort. Enhanced postoperative management protocols for cesarean patients, coupled with neonatal care strategies emphasizing early breastfeeding initiation and skin-to-skin contact, may improve outcomes.

Given the profound implications for maternal and child health, future investigations should prioritize three key areas: development of evidence-based interventions to reduce unnecessary cesarean deliveries, refinement of surgical techniques to minimize complications, and elucidation of long-term health outcomes associated with operative delivery. Concurrently, healthcare systems must maintain commitment to providing equitable access to high-quality, evidence-based obstetric care that optimally supports both vaginal and cesarean delivery when medically indicated, thereby ensuring optimal outcomes for mothers and their newborns.

Conflict of interest. Absent.

Consent for publication. All authors have reviewed the manuscript and given their consent for publication.

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ПЕРИНАТАЛЬНІ АСПЕКТИ КЕСАРЕВОГО РОЗТИНУ ПРИ ДОНОШЕНІЙ ВАГІТНОСТІ: КОМПЛЕКСНИЙ ОГЛЯД

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Резюме.

Кесарів розтин (КР) є однією з найпоширеніших хірургічних процедур в акушерстві, особливо при доношеній вагітності. Вплив кесаревого розтину на перинатальні результати, особливо при доношеній вагітності, є предметом постійних досліджень і дискусій.

Мета. Оцінити перинатальні результати, пов'язані з кесаревим розтином при доношених вагітностях, з акцентом на здоров'я матері та новонародженого. Зокрема, мета цього огляду полягає у вивченні короткострокових і довгострокових ризиків та переваг КР як для матері, так і для новонародженого, з акцентом на здоров'я та відновлення обох груп.

Матеріали та методи: Огляд був проведений шляхом аналізу відповідної наукової літератури, зокрема клінічних досліджень, когортних досліджень та систематичних оглядів, опублікованих за останнє десятиліття. Включені в огляд дослідження зосереджувались на доношених вагітностях (визначених як вагітності тривалістю від 37 до 42 тижнів) та результатах, пов'язаних з кесаревим розтином. Критерії включення: дослідження, що вивчали здоров'я матері та новонародженого після КР і порівнювали ці результати з пологамі через природні родові шляхи. Статті були отримані з медичних баз даних, таких як PubMed, Cochrane Library та Google Scholar. Всі дослідження оцінювались на якість методології, розмір вибірки та їх релевантність темі огляду.

Результати. Результати цього огляду свідчать, що кесарів розтин при доношених вагітностях пов'язаний з різноманітними ризиками для матері та новонародженого. Для матері ризики включають підвищену ймовірність післяопераційних інфекцій, кровотеч, а також тривале відновлення. Крім того, жінки, які проходять КР, мають вищу ймовірність ускладнень під час майбутніх вагітностей, таких як розрив матки, аномалії плаценти та передчасні пологи. Також існує підвищений ризик утворення спайок, що може ускладнити майбутні операції. Ризики для новонароджених включають синдром дихальних розладів, особливо у дітей, народжених через плановий КР до початку пологів. Також спостерігається вищий ризик травм під час пологів, хоча такі випадки рідкісні. Незважаючи на ці ризики, кесарів розтин залишається важливим і життєво необхідним втручанням у разі акушерських екстрених ситуацій, таких як фетальний дистрес, неправильне положення плода або плацента previa, коли вагінальні пологи можуть становити загрозу здоров'ю матері та дитини. Огляд показує, що хоча плановий КР пов'язаний з більшою неонатальною захворюваністю порівняно з вагінальними пологами, у випадках екстрених ситуацій він може врятувати життя як матері, так і дитині.

Висновок. КР залишається важливою медичною операцією в акушерстві, особливо в разі акушерських екстрених ситуацій. Однак його зростаюча поширеність викликає занепокоєння щодо можливих негативних наслідків для здоров'я матері та новонародженого. Хоча КР може запобігти загрозовим для життя ускладненням, він має ризики як для матері, так і для дитини. Існує потреба у проведенні додаткових досліджень для з'ясування довгострокових наслідків КР, зокрема в аспекті здоров'я матері та майбутньої репродуктивної функції. Лікарі повинні ретельно оцінювати показання до КР, щоб забезпечити оптимальні перинатальні результати та мінімізувати необхідність у непотрібних процедурах. Профілактичні стратегії, зокрема належне ведення пологів та моніторинг здоров'я матері, можуть допомогти знизити частоту непотрібних КР і зменшити їхні супутні ризики. Оцінка основних причин зростання числа КР допоможе оптимізувати перинатальні результати і поліпшити загальний стан здоров'я матері та новонароджених.

Ключові слова: кесарів розтин; здоров'я матері; здоров'я новонародженого; перинатальні наслідки; респіраторний дистрес-синдром; післяпологове відновлення; акушерські ускладнення.

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