

## SPECIAL ARTICLE

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# The cesarean section and possible repercussions for the mother and the child. Reflections from experience

## La cesárea y posibles repercusiones en la madre y el niño. Reflexiones desde la experiencia

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### ABSTRACT

Cesarean section has evolved over time to become a safe procedure to save the life of the mother and/or fetus in the event of an alteration in their health. On the other hand, the woman has acquired autonomy over her own health and can decide how to terminate her pregnancy. However, cesarean sections are also known to be performed for unjustifiable medical reasons. This article presents some of the immediate and mediate complications of cesarean sections on the health of the woman and the newborn, which the pregnant woman should be aware of before signing an informed consent, even in serious cases that require immediate surgical intervention. The obstetrician-gynecologist and the general practitioner must be updated for the best decision.

**Key words:** Pregnancy, Pregnant women, Fetus, Infant, Newborn, Cesarean section, Personal autonomy, Child health, Pediatric obesity

### RESUMEN

La intervención cesárea ha evolucionado en el tiempo hasta convertirse en un procedimiento seguro para salvar la vida de la madre y/o el feto ante una alteración de su salud. Por otra parte, la mujer ha adquirido autonomía sobre su propia salud, y puede decidir la forma de terminar embarazo. Pero, también se conoce la realización de cesáreas por razones médicas no justificables. En el presente artículo se presenta algunas de las complicaciones inmediatas y mediatas de la cesárea en la salud de la mujer y el neonato, las cuales la gestante debe conocer antes de firmar un consentimiento informado, incluso en casos de gravedad y que requieran la intervención quirúrgica inmediata. El médico ginecobstetra y el médico general deben estar actualizados para la mejor decisión.

**Palabras clave.** Embarazo, Mujeres embarazadas, Feto, Recién nacido, Cesárea, Autonomía personal, Salud infantil, Obesidad infantil

### INTRODUCTION

The cesarean section is a surgical intervention that has evolved over time to become a safe procedure to protect the life of the mother and/or the fetus in case of a health alteration. Over time, women have gained autonomy over their health and can decide how to terminate their pregnancy. The main reasons for performing a cesarean section are the disproportion between the size or shape of the maternal pelvis in relation to the fetus, when the cause of a previous cesarean is repeated, if there are alterations in maternal, fetal, or placental health, if the fetus is the result of assisted reproductive techniques, or if the conditions for spontaneous delivery are not favorable<sup>(1)</sup>. In its origins, the cesarean section was used to save the life of the fetus and the mother<sup>(2)</sup>, but in recent decades a frequent reason has been the mother's request<sup>(3,4)</sup>, as well as the convenience of the attending doctor<sup>(5,6)</sup>.

There are few contraindications for performing a cesarean section. However, there are situations when vaginal delivery is preferred, such as in severe preeclampsia with multiple organ damage or sudden and severe hemorrhagic disorders, especially when active labor is already underway<sup>(7,8)</sup>.



In this article, aspects related to the consequences of cesarean section as an alternative to vaginal delivery, its informed indications, and the consequences for the mother-child dyad are discussed. To this end, an updated search for information on the topic over the past decade was conducted in PubMed, in the archives of the Peruvian Journal of Gynecology and Obstetrics, and in Scielo Peru.

### POSSIBLE MATERNAL COMPLICATIONS IN A C-SECTION

With advances in technical management and safety of surgical rooms for obstetric surgery, we will refer to the mother's right to decide that the pregnancy ends by cesarean section without the need for medical indication, when she considers it safer or desires to avoid the pain of labor and minimize pelvic floor trauma<sup>(9)</sup>. The disadvantages could be the interference in mother-child interaction in the delivery room<sup>(10)</sup>, the risk of maternal morbidity and mortality due to injuries to abdominal organs (bladder, intestine, blood vessels) -especially if there was previous abdominal surgery-, infections of the surgical wound, uterus, or urinary tract, and thromboembolic complications<sup>(11)</sup>. Also, cesarean section can be associated with psychological sequelae, post-traumatic stress, scar pain<sup>(12)</sup>, subsequent risk of dehiscence or rupture or cavity of the scar<sup>(13)</sup>, ectopic pregnancy in the scar<sup>(14)</sup>, and uterine rupture. Additionally, there is a subsequent risk of ectopic pregnancy, placenta previa, placenta accreta, placental abruption, risk of fetal death, or neonatal morbidity due to prematurity<sup>(15)</sup>.

A Swedish study evaluated between 2008 and 2017 the maternal complications following an elective cesarean section and an elective vaginal delivery in 714,326 patients without a previous cesarean or medical issues. In the planned cesarean group (n = 22,855), 15% had a postpartum infection compared to 10% in the planned vaginal delivery group (n = 691,471) (adjusted risk ratios (aRR) 1.6), and 0.08% versus 0.05% suffered a postpartum pulmonary embolism. (aRR 1,7). The risks of endometritis (aRR 1.2), wound infection (aRR 2.7), urinary tract infection (aRR 1.5), and mastitis (aRR 2.0) were higher after planned cesarean section<sup>(16,17)</sup>.

Postoperative surgical site infection (SSI) ranges from 3% to 15% and is associated with a maternal mortality rate of up to 3%. The optimization of maternal comorbidities, appropriate antibiotic prophylaxis, and evidence-based surgical techniques are effective practices to reduce this SSI incidence<sup>(18)</sup>.

The retained surgical sponge is an uncommon and preventable surgical error that occurs in 1 in 1,000-15,000 intra-abdominal surgeries, including cesarean sections. Serious complications can be avoided by suspecting the retention of the intraabdominal pack in patients with complex abdominal symptoms after abdominal surgery<sup>(19)</sup>.

Adhesions frequently occur after an elective cesarean section and increase with surgical time, the time until the baby is delivered, and with each subsequent cesarean<sup>(20)</sup>.

One consequence of the increase in cesarean sections is pregnancy in the cesarean scar (PCS)<sup>(21)</sup>. There would be a preferential attachment of the blastocyst to the scar which, if associated with a defective decidua, favors abnormal implantation. The scars located in the implantation zone show increased fibrosis and alteration of the myometrium, which would be related to patterns of E-cadherin expression in response to the invasion of extravillous trophoblasts<sup>(22)</sup>. It is necessary to differentiate low implantation ECC from a normal pregnancy, cervical ectopic pregnancy, and evolving pregnancy loss<sup>(23)</sup>.

A pictorial review of images to request in case of a postoperative complication points out that ultrasound remains the first-line modality, although it depends on a skilled operator and the equipment<sup>(24)</sup>. Magnetic resonance imaging (MRI) confirms, corrects, or completes the ultrasound diagnosis due to its higher tissue resolution and field of view. The modifications in the myometrium of the lower uterine segment depend on the time elapsed since the cesarean section. The scar is observed as a hypointensity due to fibrous tissue. If a uterine scar is incompletely healed, there is a thinning and retraction of the uterine wall, sometimes with a triangular or semicircular defect known as a cesarean scar niche. This indentation of the myometrium of at least 2 mm is present in half of the women



with a history of cesarean section. After repeated cesarean sections, there may be two or more niches. Adhesions can be visualized on MRI as hypointense bands between the anterior uterine wall and the bladder and between the uterus and the anterior abdominal wall<sup>(25)</sup>.

Currently, women are seeking their first pregnancy at an older age. The association between maternal age  $\geq 35$  years and adverse outcomes in 169,583 low-risk primiparas with singleton and cephalic births  $\geq 37$  weeks has been examined over 10 years in Norway. Adverse outcomes increased with advancing maternal age, mainly in emergency operative deliveries, and with 3 times more moderate bleeding<sup>(26)</sup>.

The World Health Organization (WHO), in 1985 concluded that the acceptable national rate of primary cesarean sections should not exceed 10-15%<sup>(27)</sup>. In the U.S., more than 30% of births are by cesarean section<sup>(11)</sup>. Latin America has the highest rates of cesarean sections in the world. In a study of 85,605 births in 5 Latin American countries, 38.1% were by cesarean section, 5,763 (6.7%) experienced extreme maternal morbidity<sup>(28)</sup>. In Latin America and the Caribbean, 43% of births were by cesarean section in 2021<sup>(29)</sup>. In Brazil, cesarean sections account for 57% of births<sup>(30)</sup>, and in Peru, 37.8%<sup>(31,32)</sup>. In Iran, 47.9% of births are by cesarean section<sup>(33)</sup>.

In a secondary analysis of the WHO Multinational Survey on Maternal and Newborn Health in 173,124 multiparous women, previous cesarean section was associated with a higher risk of uterine rupture (aOR 7.74), morbidly adherent placenta (aOR 2.60), extreme maternal morbidity (aOR 1.91), severe maternal complications (aOR 1.80), and placenta previa (aOR 1,76). In neonates, previous cesarean section was related with a higher risk of admission to the neonatal ICU (aOR 1.31), extreme neonatal morbidity (aOR 1.19), and preterm birth (aOR 1,07). Additionally, previous cesarean section was interrelated with severe morbidity in future pregnancies<sup>(34,35)</sup>.

Women undergoing cesarean section develop a mild degree of irritable bowel syndrome<sup>(36)</sup>. Acute colonic pseudo-obstruction (ACPO) is an uncommon complication after a cesarean section. It requires imaging studies and periodic observation if the patient's management is conservative. If it does not improve, consider early

endoscopic decompression. The clinical signs of peritonitis or the radiological signs of ischemia or perforation require immediate surgical intervention<sup>(37)</sup>.

A Swedish study conducted between 2005 and 2017 included 140,128 women (209,391 births) in the cesarean group and 614,355 primiparous women (973,429 births) in the vaginal control group. The reference group consisted of 411,201 nulliparous women of the same age. In the cesarean group, 410 (0.20%) had a serious cardiovascular incident within the 42 days following delivery, and in the vaginal control group, the figure was 857 (0.09%), with a significantly higher risk in the cesarean group (OR 2.23). The associated risk factors were a high body mass index, preeclampsia, advanced maternal age, tobacco use, and urgent cesarean delivery<sup>(38)</sup>.

## THE PLACENTA

Cesarean delivery increases complications with the placenta in a subsequent pregnancy<sup>(39)</sup>. The cause of placenta previa is unknown, except for its association with endometrial damage and uterine scarring. Risk factors include advanced maternal age, multiparity, smoking, cocaine use, previous curettages including uterine aspiration, assisted reproductive technology, history of cesarean section, and placenta previa. During the implantation of the fertilized egg, the trophoblast can adhere to the uterine scar causing the placenta to cover the cervical os or infiltrate the myometrium<sup>(40)</sup>.

The increase in cesarean sections and pregnancies at older ages is associated with a rise in cases of placenta previa and the spectrum of placenta accreta, which complicate with difficulty in controlling hemorrhage at the placental separation surface, disseminated intravascular coagulation, and the need for hysterectomy.

The blood supply of placenta previa and the spectrum of placenta accreta is complex. The blood flow would enter not only from the internal iliac artery but also through anastomosis of the external iliac artery, the inferior mesenteric artery, the lumbar artery, and the median sacral artery<sup>(41)</sup>. A history of antepartum hemorrhage at  $< 29$  weeks or if there are recurrent episodes ( $\geq 3$ ), a thick placental edge covering (or near) the cervical os, a short cervical length ( $< 3$  cm with



placenta previa, < 2 cm with low-lying placenta), and a previous cesarean section are risk factors for deciding on an urgent/preterm cesarean delivery<sup>(42)</sup>. Suspected or imaging-detected cases of placenta previa should be managed in emergency-prepared surgical centers with blood banks, laboratories and protocols for massive transfusions, as well as care from specialists experts in cesarean-hysterectomies and abdominopelvic surgery.

In the etiology of the placenta accreta spectrum, a defect in the endometrium-myometrium interface would lead to failure of normal decidualization in the area of the uterine scar, allowing for abnormally deep anchoring villi and infiltration of trophoblasts. It is associated with maternal morbidity and mortality due to severe hemorrhages<sup>(43)</sup>.

#### IMMEDIATE COMPLICATIONS OF THE NEWBORN

Women who give birth by cesarean section are less likely to see, hold, and feed their newborns shortly after delivery compared to those who have their baby vaginally ( $p < 0,001$ ); they report less positive birth experiences ( $p < 0,001$ ). When they see, hold, and feed their newborns shortly after birth, the birth experiences are more positive than when they have their baby vaginally ( $p = 0,010$ )<sup>(44,45)</sup>.

Sometimes, pregnant women request an elective cesarean delivery due to fears of serious morbidities during a vaginal delivery. Elective cesarean section before 39 weeks increases respiratory complications, hypoglycemia, neonatal sepsis, and admission to the neonatal ICU. A different intestinal colonization in neonates born by cesarean section would explain the higher incidence of food allergies, asthma, and possibly the occurrence of type 1 diabetes. Epigenetic changes could be responsible, among others, for childhood neoplasms<sup>(46)</sup>.

In more than 2,100 articles from the last 10 years of Ovid Medline, the impact on neonatal morbidity and mortality has been analyzed in women who opt for elective cesarean delivery at 39 weeks of gestation, a time when more than 70% of births in the U.S. occur annually. The cesarean section at the mother's request, in addition to the risk of prolonged hospitalization can cause

possible complications in a future pregnancy, respiratory problems in children, and delays in breastfeeding<sup>(47)</sup>. The rate of brachial plexus paralysis in vaginal delivery ranges from 0.047% to 0.6%, while in cesarean section it ranges from 0.0042% to 0.095%. In the 3 million births at > 39 weeks, there would be +4,500 cases of brachial plexus paralysis with vaginal delivery, and between 1 in 5,000-10,000 permanent injuries would be avoided with an elective cesarean. Fetal trauma is greater with surgical vaginal delivery than with cesarean section. The neonatal mortality of 9.1% is apparently due to intrapartum hypoxia<sup>(48)</sup>.

Paixao in Brazil studied 17,838,115 live births between 2012 and 2018. Live births from women at low risk (Robson groups 1 to 4) had a higher infant mortality rate (25%) up to 5 years compared to those born by vaginal delivery (HR = 1.25;  $p < 0.001$ )<sup>(49-51)</sup>.

#### POSSIBILITY OF LONG-TERM COMPLICATIONS IN NEONATES DUE TO CESAREAN SECTION

Babies born by cesarean section have different hormonal, physical, bacterial, and medical exposures that can subtly alter neonatal physiology.

Between 1997 and 2011, in New Jersey, U.S., elective births more than doubled and were associated with neonatal morbidity, even at gestational ages of 39-40 weeks. The rates of cesarean sections and induced births, which currently account for more than a third and a quarter of births in the U.S., respectively, seem to have decreased thanks to delaying births until a gestational age of 39 weeks. The findings suggest that delaying delivery beyond 39 weeks and avoiding interventions during labor when not medically necessary would improve child health and reduce healthcare costs<sup>(52)</sup>.

In a systematic review on PubMed, Science Direct, and Google Scholar, it was observed that cesarean section was a risk factor for respiratory infections in offspring (pooled OR = 1.30;  $p = 0.001$ ), asthma (pooled OR = 1.23;  $p < 0.00001$ ), and obesity (pooled OR = 1.35;  $p < 0.00001$ )<sup>(53)</sup>. The short-term risks (3 years) included having altered immune development, a higher likelihood of allergy, atopy and asthma, type 1 diabetes, and overweight and obesity in childhood<sup>(54-56)</sup>.



In a meta-analysis of 35 studies (12 cohort studies and 23 case-control studies) from PubMed, Web of Science, Embase, and Cochrane Library databases on the relationship between cesarean sections and autism spectrum disorders (ASD)/attention deficit hyperactivity disorder (ADHD) in neonates, the statistical results showed a higher risk of ASD (odds ratio [OR] = 1.25;  $p < 0,001$ ) and ADHD (OR = 1.11;  $p < 0,001$ ) in the offspring of cesarean-delivered women compared to the vaginal delivery group, more so in female neonates. The risk of ASD was higher in the offspring of cesarean sections performed under general anesthesia<sup>(57)</sup>.

Other researchers explored PubMed, Embase and Web of Science for the association of cesarean section with overweight/obesity in childhood (3-8 years), adolescence (9-18 years), and/or adulthood (>19 years). The overall pooled odds ratio (OR) for overweight/obesity in children born by cesarean section compared to those born by vaginal delivery was 1.33, a moderate association that included OR 1.32 for children, 1.24 for adolescents, and 1.50 for adults<sup>(58,59)</sup>. In the follow-up of mother-child dyads from the Boston Birth Cohort up to the age of 5 years, out of 1,441 mothers, 961 gave birth vaginally and 480 by cesarean section. Those born by cesarean section were 1.4 times more likely to suffer from overweight or obesity in childhood<sup>(60)</sup>.

#### THE VAGINAL MICROBIOTA AND ITS TRANSMISSION FROM MOTHER TO CHILD DURING VAGINAL BIRTH AND CESAREAN SECTION

Babies born vaginally are colonized by maternal vaginal and fecal microbiota, while those born by cesarean section are colonized by environmental microorganisms. A study in China has determined the fecal microbiota and fecal metabolome of 60 infants. The feces of babies born by vaginal delivery had a higher abundance of *Bifidobacterium*, *Lactobacillus*, *Bacteroides*, and *Parabacteroides*, while those born by cesarean section had more *Klebsiella*. By metabolomics, the feces of newborns born vaginally had an abundance of DL-norvaline and DL-citrulline, while those born by cesarean section had abundant trans-vaccenic acid and cis-aconitic acid. Moreover, the feces of newborns delivered vaginally showed a significant positive correlation with tryptophan and pyruvate metabolism, while the feces of newborns delivered by cesar-

ean section had a positive correlation with ABC transporters<sup>(61)</sup>. Cesarean delivery prevents the newborn from acquiring vaginal microbiota<sup>(62,63)</sup>.

In 335 mother-infant pairs from a birth cohort in New Hampshire, USA, fecal microbiome data from 6-week-old infants were generated using Illumina 16s rRNA gene sequencing (V4-V5 region). In the vaginal delivery group, maternal overweight or obesity was associated with greater diversity of the infant gut microbiome and a higher relative abundance of 15 operational taxonomic units (OTUs), including *Bacteroides fragilis*, *Escherichia coli*, *Veillonella dispar*, and OTUs from the genera *Staphylococcus* and *Enterococcus*. In the cesarean delivery group, no significant associations were observed between pre-pregnancy BMI and the diversity of the infant microbiome or in the 15 OTUs<sup>(64)</sup>.

In the Canadian Healthy Infant Longitudinal Development (CHILD) birth cohort, the association between the mode of delivery and the gut microbiota in 935 term infants was studied using 16s ribosomal RNA gene sequencing on fecal samples collected at a mean age (SD) of 3.7 (1.0) months. At the ages of 1 and 3 years, 382 (40.9%) were overweight, 69 (7.5%) were overweight at one year old, and 90 (10.4%) at three years old. Compared to those born by vaginal delivery to mothers with normal weight, babies born by vaginal delivery to obese or overweight mothers were three times more likely to be overweight at one year, while babies born by cesarean section to overweight mothers had a five times higher risk of being overweight at one year (ORa 5,02)<sup>(65)</sup>.

Recent data suggest the presence of a microbiota in the uterus, particularly in the placenta, which could trigger immune responses in the fetus and program the immune development of the infant during fetal life<sup>(66)</sup>.

The rates of preterm and premature births increased from 2014 to 2022 (12% and 20%, respectively), while term and post-term births decreased (6% and 28%, respectively)<sup>(67)</sup>. Prematurity is associated with a higher risk of long-term health and neurodevelopmental problems<sup>(68)</sup>. The increasing use of assisted reproductive technology (ART) is one factor contributing to the rise in multiple birth rates and premature births of infants conceived through



ART, primarily those born by cesarean section. In a meta-analysis that included nine studies, the risk of cerebral palsy more than doubled after assisted reproductive technology<sup>(69)</sup>.

## CONCLUSIONS

Labor and delivery are unique experiences that test the mother's physical and emotional energy. Obstetricians must keep in mind that there may be fear and uncertainty on the part of women regarding vaginal delivery. And other pregnant women show strong discontent and distrust towards providers and the healthcare system, as well as reject objective information about the consequences of cesarean sections<sup>(70)</sup>.

The consequences of cesarean sections are known, as outlined in this database review, although with the limitation of exploring only some of them, which must be considered by obstetricians for the appropriate decision.

The lack of autonomy in decision-making can generate decision conflicts and is one of the main determinants of the high cesarean rates in low- and middle-income countries<sup>(71)</sup>. This fear increases when a woman with a previous cesarean and without proper instruction is allowed vaginal delivery or is subjected to a trial of labor. However, under appropriate conditions, the risk of uterine rupture during labor or associated complications is low through proper patient selection and good clinical practices by the physician and the organization of the healthcare institution<sup>(72)</sup>.

The communication between the doctor, the pregnant woman, and the family must be constant during pregnancy and especially at the end of the pregnancy and during childbirth, that is, person-centered obstetrics<sup>(73)</sup>. The psychoprophylactic preparation of the pregnant woman and the support during pregnancy and childbirth are important resources to improve childbirth outcomes. When the time comes, the woman has the autonomy to decide between a vaginal birth and a cesarean section if the pregnancy or labor progresses normally and there are no complications in maternal or fetal health. But the obstetrician cannot be satisfied if he has not communicated to the mother and her companion the maternal and perinatal outcomes associated with the pregnant woman's

choice on how to terminate her pregnancy. The consequences of an unnecessary cesarean section require reflection from all parties involved. And the decision to perform a cesarean section should be based on the net clinical benefit for everyone: the mother, the child, and the future adult<sup>(74)</sup>.

## REFERENCES

1. Agrawal A, Wenger NK. Hypertension During Pregnancy. *Curr Hypertens Rep.* 2020 Aug 27;22(9):64. doi: 10.1007/s11906-020-01070-0
2. Lugones Botell M. La cesárea en la historia. *Rev Cubana Obstet Ginecol.* 2001;27(1):53-6.
3. Sung S, Mahdy H. Cesarean Section. *StatPearls (Internet)* Updated July 9, 2023. Copyright © 2024, StatPearls Publishing LLC. <https://www.ncbi.nlm.nih.gov/books/NBK546707/>
4. Guevara Ríos E. Cesárea a solicitud materna. *Rev peru ginecol obstet.* 2023;69(2). doi: 10.31403/rpgo.v67i2302
5. Hoxha I, Lama A, Bunjaku G, Grezda K, Agahi R, Beqiri P, Goodman DC. Office hours and caesarean section: systematic review and Meta-analysis. *Res Health serv Reg.* 22 June 2022;1(4). Doi: 10.1007/s43999-022-00002-6
6. Faundes A. La evolución histórica de la tasa de la cesárea: de una excepción en la antigüedad a un exceso en la actualidad. *Rev peru ginecol obstet.* 2021;67(1). <https://doi.org/10.31403/rpgo.v67i2302>
7. Cífková R. Hypertension in Pregnancy: A Diagnostic and Therapeutic Overview. *High Blood Press Cardiovasc Prev.* 2023;30:289–303. doi: 10.1007/s40292-023-00582-5
8. Amorim MMR, Souza AR, Katz L. Planned caesarean section versus planned vaginal birth for severe pre-eclampsia. *Cochrane Database of Systematic Reviews* 2017, Issue 10. Art. No.: CD009430. DOI: 10.1002/14651858
9. Lavender T, Hofmeyr GJ, Neilson JP, Kingdon C, Gyte GM. Caesarean section for non-medical reasons at term. *Cochrane Database Syst Rev.* 2012 Mar 14;2012(3):CD004660. doi: 10.1002/14651858.CD004660.pub3
10. Ramírez Cabrera J, Cabrera Ramos S, Campos Siccha G, Peláez Chomba M, Poma Morales C. Histerectomía obstétrica en el Hospital San Bartolomé, Lima, 2003 – 2015. *Rev peru ginecol obstet.* 2017;63(1):27–33.
11. Berghella V, Lockwood CJ, Barss VA. Patient education: C-section. *UpToDate.* <https://www.uptodate.com/contents/6728#:~:text=%E2%97%8F%20Cesarean%20delivery%20is%20associated%20with%20a%20higher,interfere%20with%20mother-infant%20interaction%20in%20the%20delivery%20room>
12. de Brito Cançado TO, Omais M, Ashmawi HA, Torres ML. Chronic pain after cesarean section. Influence of anesthetic/surgical technique and postoperative analgesia. *Rev Bras Anesthesiol.* 2012 Nov-Dec;62(6):762-74. doi: 10.1016/S0034-7094(12)70177-0
13. Budny-Winska J, Pomorski M. Uterine niche after cesarean section: a review of diagnostic methods. *Ginekol Pol.* 2021;92(10):726-30. doi: 10.5603/GP.a2021.0195



14. Timor-Tritsch IE, Monteagudo A. Unforeseen consequences of the increasing rate of cesarean deliveries: early placenta accreta and cesarean scar pregnancy. A review. *Am J Obstet Gynecol.* 2012 Jul;207(1):14-29. doi: 10.1016/j.ajog.2012.03.007. Epub 2012 Mar 10. Erratum in: *Am J Obstet Gynecol.* 2014 Apr;210(4):371-4. PMID: 22516620
15. Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, Gibbons D, Kelly NM, Kennedy HP, Kidanto H, Taylor P, Temmerman M. Short-term and long-term effects of caesarean section on the health of women and children. *Lancet.* 2018 Oct 13;392(10155):1349-57. doi: 10.1016/S0140-6736(18)31930-5
16. Dahlquist K, Stuart A, Källén K. Planned cesarean section vs planned vaginal delivery among women without formal medical indication for planned cesarean section: A retrospective cohort study of maternal short-term complications. *Acta Obstet Gynecol Scand.* 2022 Sep;101(9):1026-32. doi: 10.1111/aogs.14408
17. Carrapato MRG, Ferreira AM, Wataganara T. Cesarean section: the pediatricians' views. *J Matern Fetal Neonatal Med.* 2017 Sep;30(17):2081-5. doi: 10.1080/14767058.2016.1237496
18. Suarez-Easton S, Zafran N, Garmi G, Salim R. Postcesarean wound infection: prevalence, impact, prevention, and management challenges. *Int J Womens Health.* 2017 Feb 17;9:81-88. doi: 10.2147/IJWH.S98876
19. Suárez-Torres I, Reyna-Villasmil E. Compresa quirúrgica retenida posterior a cesárea electiva. *Rev peru ginecol obstet.* 2017;63(1):109-12.
20. Poole JH. Adhesions following cesarean delivery: a review of their occurrence, consequences and preventative management using adhesion barriers. *Womens Health (Lond).* 2013 Sep;9(5):467-77. doi: 10.2217/whe.13.45
21. Garvi Morcillo J, Monzón Castillo EP, Tejada Martínez G, Gutiérrez Salas N, Páucar Espinal G. Gestación ectópica sobre cicatriz de cesárea. *Rev peru ginecol obstet.* Nov 2022;68(4). doi: 10.31403/rpgo.v68i2460
22. Gao L, Chen H, Liu J, Wang M, Lin F, Yang G, Lash GE, Li P. Extravillous trophoblast invasion and decidualization in cesarean scar pregnancies. *Acta Obstet Gynecol Scand.* 2022 Oct;101(10):1120-8. doi: 10.1111/aogs.14435
23. Kennedy A, Debbink M, Griffith A, Kaiser J, Woodward P. Cesarean Scar Ectopic Pregnancy: A Do-Not-Miss Diagnosis. *Radiographics.* 2024 Jul;44(7):e230199. doi: 10.1148/rg.230199
24. Fernández-Navarro M, Pinillos-Peralta M, Mires-Montoro V, Urbina-Gordillo C. Embarazo ectópico en cicatriz de cesárea: reporte de un caso. *Acta med Peru.* Oct. 2023;40(3). doi: 10.35663/amp.2023.403.2562
25. Bekiesinska-Figatowska M. Magnetic resonance imaging of the female pelvis after Cesarean section: a pictorial review. *Insights Imaging.* 2020 May 27;11(1):75. doi: 10.1186/s13244-020-00876-5
26. Herstad L, Klungsøyr K, Skjærven R, Tanbo T, Forsén L, Åbyholm T, Vangen S. Elective cesarean section or not? Maternal age and risk of adverse outcomes at term: a population-based registry study of low-risk primiparous women. *BMC Pregnancy Childbirth.* 2016 Aug 17;16:230. doi: 10.1186/s12884-016-1028-3
27. Organización Mundial de la Salud. Declaración de la OMS sobre tasas de cesáreas. WHO/RHR/14 de abril de 2015;8 pag. [https://iris.who.int/bitstream/handle/10665/161444/WHO\\_RHR\\_15.02\\_spa.pdf?sequence=1](https://iris.who.int/bitstream/handle/10665/161444/WHO_RHR_15.02_spa.pdf?sequence=1)
28. Sosa C, de Mucio B, Colomar M, Mainero L, Costa ML, Guida JP, et al. The impact of maternal morbidity on cesarean section rates: exploring a Latin American network of sentinel facilities using the Robson's Ten Group Classification System. *BMC Pregnancy Childbirth* 2023;23:605. Doi: 10.1186/s12884-023-05937-3
29. Nações Unidas, Brasil, Estudo a OMS revela que número de cesarianas aumenta, mas desigualdades no acesso persiste. 17 junio 2021. <https://brasil.un.org/pt-br/131934-estudo-oms-revela-que-n%C3%BAmero-de-cesarianas-aumenta-mas-desigualdade-no-acesso-persiste>
30. Cambricoli F. Índice de cesáreas volta a subir no Brasil e bate recordé durante a pandemia; entenda por qué. *Estadão.* Jan 12, 2023. <https://www.estadao.com.br/saude/numero-de-cesareas-volta-a-subir-no-brasil-e-bate-recorde-durante-a-pandemia/>
31. Instituto Nacional de Estadística e Informática Perú. El 37,8% de los nacimientos registrados se dieron mediante cesárea en el año 2023. 23/05/2024. <https://www.inei.gov.pe/prensa/noticias/el-378-de-los-nacimientos-registrados-se-dieron-ante-cesarea-en-el-ano-2023-15173/>
32. Barrena Neyra M, Quispesaravía Ildelfonso P, Flores Noriega M, Leon Rabanal C. Frecuencia e indicaciones del parto por cesárea en un hospital docente de Lima, Perú. *Rev peru ginecol obstet.* 2020;66(2). <https://doi.org/10.31403/rpgo.v66i2246>
33. Shirzad M, Shakibazadeh E, Hajimiri K, Betran AP, Jahanfar S, Bohren MA, et al. Prevalence of and reasons for women's, family members', and health professionals' preferences for cesarean section in Iran: a mixed-methods systematic review. *Reprod Health.* 2021 Jan 2;18(1):3. doi: 10.1186/s12978-020-01047-x
34. Kietpeerakool, C., Lumbiganon, P., Laopaiboon, M., Ratanakanokchai S, Vogel JP, Gülmezoglu M. Pregnancy outcomes of women with previous cesarean sections: Secondary analysis of World Health Organization Multicountry Survey on Maternal and Newborn Health. *Sci Rep.* 2019;9:9748. Doi: 10.1038/s41598-019-46153-4
35. Guise JM, McDonagh MS, Osterweil P, Nygren P, Chan BK, Helfand M. Systematic review of the incidence and consequences of uterine rupture in women with previous cesarean section. *BMJ.* 2004 Jul 3;329(7456):19-25. doi: 10.1136/bmj.329.7456.19
36. Christensen K, Ostensen LH, Glavind K, Krarup AL, Kjærgaard N. Acute colonic pseudo-obstruction after cesarean section and gastrointestinal symptoms. *Eur J Obstet Gynecol Reprod Biol.* 2020 Sep;252:418-23. doi: 10.1016/j.ejogrb.2020.06.011
37. Reynolds IS, McDermott E, Liddy R, Aird JJ, Flood K, McCormack O, Geoghegan T, Brannigan AE. Acute colonic pseudo-obstruction post-cesarean section is not a benign entity: A case series and review of the literature. *Int J Gynaecol Obstet.* 2024 Apr;165(1):59-66. doi: 10.1002/ijgo.15086
38. Larsson C, Matsson A, Mooe T, Söderström L, Tunón K, Nordin P. Cardiovascular complications following cesarean section and vaginal delivery: a national population-based study. *J Matern Fetal Neonatal Med.* 2022 Dec;35(25):8072-9. doi: 10.1080/14767058.2021.1941851
39. Mayo Clinic Staff. C-section. Tests and Procedures. June 16, 2022. <https://www.mayoclinic.org/tests-procedures/c-section/about/pac-20393655>
40. Anderson-Bagga FM, Sze A. Placenta Previa. [Updated 2023 Jun 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. <https://www.ncbi.nlm.nih.gov/books/NBK539818/>



41. Takeda S, Takeda J, Makino S. Cesarean Section for Placenta Previa and Placenta Previa Accreta Spectrum. *Surg J (N Y)*. 2020 Mar 9;6(Suppl 2):S110-S121. doi: 10.1055/s-0039-3402036
42. SOGC Clinical Practice Guideline No. 402: Venu J, Bos H, Bujold E. Diagnosis and Management of Placenta Previa. *J Obstet Gynaecol Canada*, July 2020;42(7):906-17.e1
43. American College of Obstetrics and Gynecology. Placenta Accreta Spectrum. Obstetric Care Consensus Number 7 December 2018 (Replaces Committee Opinion No. 529, July 2012. Reaffirmed 2021) <https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2018/12/placenta-accreta-spectrum>
44. Brubaker LH, Paul IM, Repke JT, Kjerulff KH. Early maternal-newborn contact and positive birth experience. *Birth*. 2019 Mar;46(1):42-50. doi: 10.1111/birt.12378
45. Santos Neto CHD, Oliveira FS, Gomes GF, Araujo Júnior E, Nakamura MU, Souza E. Type of Childbirth and its Association with the Maternal-Filial Interaction. *Rev Bras Ginecol Obstet*. 2020 Oct;42(10):597-606. English. doi: 10.1055/s-0040-1712133
46. Boutsikou T, Malamitsi-Puchner A. Caesarean section: impact on mother and child. *Acta Paediatr*. 2011 Dec;100(12):1518-22. doi: 10.1111/j.1651-2227.2011.02477.x
47. Lupu VV, Miron IC, Raileanu AA, Starcea IM, Lupu A, Tarca E, Mocanu A, Buga AML, Lupu V, Fotea S. Difficulties in Adaptation of the Mother and Newborn via Cesarean Section versus Natural Birth-A Narrative Review. *Life (Basel)*. 2023 Jan 21;13(2):300. doi: 10.3390/life13020300
48. Hankins GD, Clark SM, Munn MB. Cesarean section on request at 39 weeks: impact on shoulder dystocia, fetal trauma, neonatal encephalopathy, and intrauterine fetal demise. *Semin Perinatol*. 2006 Oct;30(5):276-87. doi: 10.1053/j.semperi.2006.07.009
49. Paixao ES, Bottomley C, Pescarini JM, Wong KLM, Cardim LL, Ribeiro-Silva RC, et al. Associations between cesarean delivery and child mortality: A national record linkage longitudinal study of 17.8 million births in Brazil. *PLoS Med*. 2021. doi: 10.1371/journal.pmed.1003791
50. Ticona-Huano D, Ticona-Rendón M, Huano-Apaza D, García-Montenegro V, Vargas-Zeballos J. Análisis de la cesárea según la clasificación de Robson en un hospital público de Perú. *Ginecol obstet México*. 2029;87(10):626-36. doi: 10.24245/gom.v87i10.3301
51. Eftekharian C, Husslein PW, Lehner R. Cesarean Section Rate and Perinatal Outcome Analyses According to Robson's 10-Group Classification System. *Matern Child Health J*. 2021 Sep;25(9):1474-81. doi: 10.1007/s10995-021-03183-7
52. Neonatal Outcomes in Full-Term Pregnancies. *Am J Epidemiol*. 2019 Apr 1;188(4):674-83. doi: 10.1093/aje/kwz014
53. Słabuszewska-Jóźwiak A, Szymański JK, Ciebiera M, Sarecka-Hujar B, Jakiel G. Pediatrics Consequences of Cesarean Section-A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2020 Oct 31;17(21):8031. doi: 10.3390/ijerph17218031
54. Rutayisire E, Wu X, Huang K, Tao S, Chen Y, Tao F. Cesarean section may increase the risk of both overweight and obesity in preschool children. *BMC Pregnancy Childbirth*. 2016 Nov 3;16(1):338. doi: 10.1186/s12884-016-1131-5
55. Zhang S, Zhou J, Yang M, Zhang F, Tao X, Tao F, Huang K. Sex-specific association between elective cesarean section and growth trajectories in preschool children: A prospective birth cohort study. *Front Public Health*. 2022 Sep 20;10:985851. doi: 10.3389/fpubh.2022.985851
56. Magne F, Puchi Silva A, Carvajal B, Gotteland M. The Elevated Rate of Cesarean Section and Its Contribution to Non-Communicable Chronic Diseases in Latin America: The Growing Involvement of the Microbiota. *Front Pediatr*. 2017 Sep 4;5:192. doi: 10.3389/fped.2017.00192
57. Chen M, Lin Y, Yu C, Fu R, Shentu H, Yao J, Huang J, He Y, Yu M. Effect of cesarean section on the risk of autism spectrum disorders/attention deficit hyperactivity disorder in offspring: a meta-analysis. *Arch Gynecol Obstet*. 2024 Feb;309(2):439-55. doi: 10.1007/s00404-023-07059-9
58. Li HT, Zhou YB, Liu JM. The impact of cesarean section on offspring overweight and obesity: a systematic review and meta-analysis. *Int J Obes (Lond)*. 2013 Jul;37(7):893-9. doi: 10.1038/ijo.2012.195
59. Masukume G, McCarthy FP, Russell J, Baker PN, Kenny LC, Morton SM, Khashan AS. Caesarean section delivery and childhood obesity: evidence from the growing up in New Zealand cohort. *J Epidemiol Community Health*. 2019 Dec;73(12):1063-70. doi: 10.1136/jech-2019-212591
60. Mueller NT, Mao G, Bennet WL, Hourigan SK, Dominguez-Bello MG, Appel LJ, Wang X. Does vaginal delivery mitigate or strengthen the intergenerational association of overweight and obesity? Findings from the Boston Birth Cohort. *Int J Obes (Lond)*. 2017 Apr;41(4):497-501. doi: 10.1038/ijo.2016.219
61. Li N, Liang S, Chen Q, Zhao L, Li B, Huo G. Distinct gut microbiota and metabolite profiles induced by delivery mode in healthy Chinese infants. *J Proteomics*. 2021 Feb 10;232:104071. doi: 10.1016/j.jprot.2020.104071
62. Dominguez-Bello MG, De Jesus-Laboy KM, Shen N, Cox LM, Amir A, Gonzalez A, Bokulich NA, Song SJ, Hoashi M, Rivera-Vinas JJ, Mendez K, Knight R, Clemente JC. Partial restoration of the microbiota of cesarean-born infants via vaginal microbial transfer. *Nat Med*. 2016 Mar;22(3):250-3. doi: 10.1038/nm.4039
63. Inchingolo F, Inchingolo AD, Palumbo I, Trilli I, Guglielmo M, Mancini A, Palermo A, Inchingolo AM, Dipalma G. The Impact of Cesarean Section Delivery on Intestinal Microbiota: Mechanisms, Consequences, and Perspectives-A Systematic Review. *Int J Mol Sci*. 2024 Jan 15;25(2):1055. doi: 10.3390/ijms25021055
64. Singh SB, Madan J, Coker M, Hoen A, Baker ER, Karagas MR, Mueller NT. Does birth mode modify associations of maternal pre-pregnancy BMI and gestational weight gain with the infant gut microbiome? *Int J Obes (Lond)*. 2020 Jan;44(1):23-32. doi: 10.1038/s41366-018-0273-0
65. Tun HM, Bridgman SL, Chari R, Field CJ, Guttman DS, Becker AB, Mandhane PJ, Turvey SE, Subbarao P, Sears MR, Scott JA, Kozyrskyj AL; Canadian Healthy Infant Longitudinal Development (CHILD) Study Investigators. Roles of Birth Mode and Infant Gut Microbiota in Intergenerational Transmission of Overweight and Obesity From Mother to Offspring. *JAMA Pediatr*. 2018 Apr 1;172(4):368-77. doi: 10.1001/jamapediatrics.2017.5535
66. Butel MJ, Waligora-Dupriet AJ, Wydau-Demattis S. The developing gut microbiota and its consequences for health. *J Dev Orig Health Dis*. 2018 Dec;9(6):590-7. doi: 10.1017/S2040174418000119





67. Martin JA, Osterman MJK. Shifts in the Distribution of Births by Gestational Age: United States, 2014-2022. *National Vital Statistical Reports*. Jan, 2024.
68. Cheong JLY, Burnett AC, Treyvaud K, Spittle AJ. Early environment and long-term outcomes of preterm infants. *J Neural Transm (Vienna)*. 2020 Jan;127(1):1-8. doi: 10.1007/s00702-019-02121-w
69. Wang FF, Yu T, Chen XL, Luo R, Mu DZ. Cerebral palsy in children born after assisted reproductive technology: a meta-analysis. *World J Pediatr*. 2021 Aug;17(4):364-74. doi: 10.1007/s12519-021-00442-z
70. Vazquez Corona M, Betrán AP, Bohren MA. The portrayal and perceptions of cesarean section in Mexican media Facebook pages: a mixed-methods study. *Reprod Health*. 2022 Feb 22;19(1):49. doi: 10.1186/s12978-022-01351-8
71. Dumont A, de Loenzien M, Nhu HMQ, Dugas M, Kabore C, Lumbiganon P, Torloni MR, Gialdini C, Carroli G, Hanson C, Betrán AP; QUALI-DEC consortium. Caesarean section or vaginal delivery for low-risk pregnancy? Helping women make an informed choice in low- and middle-income countries. *PLOS Glob Public Health*. 2022 Nov 14;2(11):e0001264. doi: 10.1371/journal.pgph.0001264
72. Turner MJ. Delivery after a previous cesarean section reviewed. *Int J Gynaecol Obstet*. 2023 Dec;163(3):757-62. doi: 10.1002/ijgo.14854
73. Pacheco-Romero J, Távora Orozco L. Woman Centered Medicine and Health. Editorial. *Rev peru ginecol obstet*. 2023;69(3). DOI: 10.31403/rpgo.v69i2562
74. Carrapato MRG, Ferreira AM, Wataganara T. Cesarean section: the pediatricians' views. *J Matern Fetal Neonatal Med*. 2017 Sep;30(17):2081-85. doi: 10.1080/14767058.2016.1237496