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Cesarean Delivery on Maternal Request

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List of Abbreviations:

- WHO: World Health Organization
- OECD: Organization for Economic Co-operation and Development

- CDMR: Caesarean delivery on Maternal Request
- ACOG: American College of Obstetricians and Gynecologists
- NICE: National Institute for Health and Care Excellence
- APGAR: Appearance, Pulse, Grimace, Activity, Respiration
- AAP: American Academy of Pediatrics
- UNICEF: United Nations Children's Fund
- OASIS: Obstetric Anal Sphincter Injuries
- E-PAD: Early Intervention of Pelvic Floor Dysfunction After Delivery
- EU: European Union
- UI: Urinary Incontinence
- POP: Pelvic Organ Prolapse
- SSI: Surgical Site Infection
- PAS: Placenta Accreta Spectrum
- HDI: Human Development Index
- TOLAC: Trial of Labour After Caesarean Section

1. Summary

The caesarean section is one of the most frequently performed operations worldwide. Although it is generally considered a safe procedure with low morbidity and mortality rates, a caesarean section rate above 10% does not improve the mortality of mother and child, as stated by the World Health Organization (WHO). However, there has been an alarming increase in the rates of caesarean sections in recent decades. One significant factor that affects caesarean section rates is the increase in elective caesarean sections requested by mothers. The reasons for requesting a caesarean section on maternal request are multifactorial and often include the fear of pain, fear of failure, concern for fetal injury and pelvic floor injuries that can lead to urinary and faecal incontinence, as well as vaginal and rectal prolapse. Other reasons can include prior negative birth experiences, feelings of abandonment by medical staff, increasing maternal age, and decreasing level of religiosity, the increasing presence of patient autonomy in the medical field, financial reimbursement, and legal actions against physicians.

2. Keywords

Caesarean delivery, elective caesarean, maternal request, patient autonomy, delivery complications, tokophobia, skin-to-skin contact, litigations, patient autonomy

3. Introduction

The birth of the first child is an emotional experience for all women. However, selecting the “right” delivery method can be challenging for young women, family members and clinicians. This is because the mode of delivery is a crucial predictor of delivery satisfaction (1). Despite the WHO’s statement that a caesarean section rate above 10% does not improve maternal and fetal mortality (2), there has been a significant increase in caesarean births.

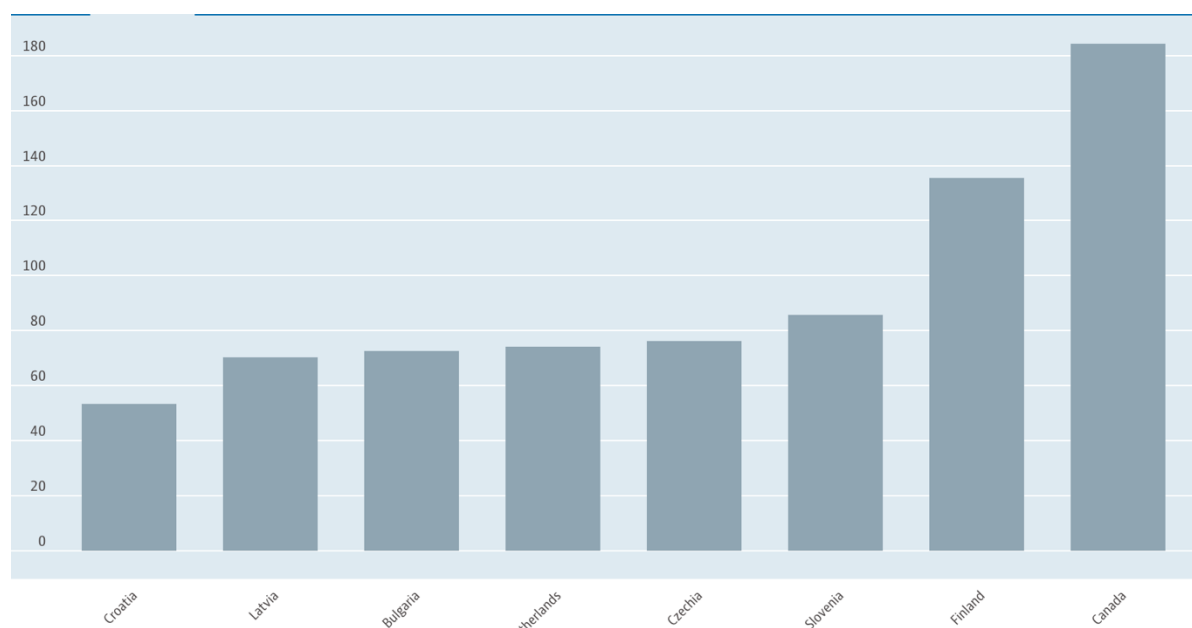


Figure 1- Caesarean sections: Total per 1000 live births 1990 (3)

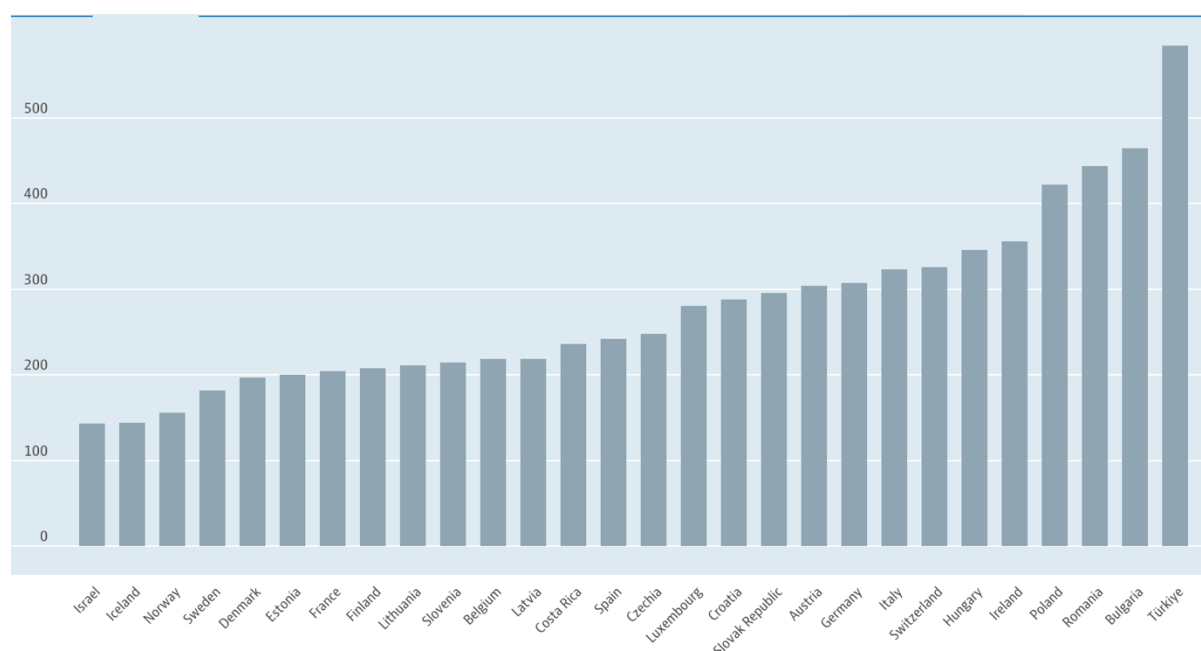


Figure 2- Caesarean sections: Total per 1000 live births 2021 (3)

Figures 1 and 2 show that the rates of caesarean sections in Organization for Economic Co-operation and Development (OECD) countries have almost tripled since 1990. This trend is also evident in Germany, where in 1991, 15.3% of pregnant women chose caesarean section as their preferred mode of birth. In 2020, almost one-third (29.7%) of pregnant women opted for caesarean section (4), of which less than 10% were performed for medical reasons (5). Despite the increasing rates of caesarean sections, the total number of live births in the European Union (EU) has decreased from 6.66 million in 1961 to 3.89 million in recent years (6). When looking at the combined fertility rate in the EU, only Turkey surpasses two births per woman (as of 2020) (7). A fertility of less than two births per woman in the EU, coupled with a significant increase in the demand for caesarean sections when planning for only one child (8), and the avoidance of risk factors during subsequent births, may contribute to a rise in caesarean sections on maternal request. Caesarean delivery on maternal request (CDMR) is defined by the American College of Obstetricians and Gynecologists (ACOG) as a “primary caesarean delivery on maternal request in the absence of any maternal or fetal indications” (9). This request is most often made due to fear of childbirth (10). It is difficult to draw a conclusion on how much CDMR increases the total caesarean section rates due to infrequent reporting and heterogeneous definitions of caesarean delivery on maternal request. Alarming projections indicate that by 2030, 28.5% of all women will deliver their babies via a caesarean section (11, 17). Caesarean delivery on maternal request rates varies widely, ranging from 0.2% in Ireland to 42% in some countries (12). In China, the rate is particularly high at 24.7% (10). Between 2015 and 2018, the CDMR rate in Italy was 8.60% (13). In Sweden, a country with the 5th lowest caesarean section rates in the OECD (3) experienced an 80% increase in CDMR (3) in between 1990 and 2001 (14). One possible reason for the increase in CDMR is that a caesarean section is perceived as an operation with low morbidity and mortality. This perception may be due to the use of antibiotics, the application of the Pfannenstiel incision or Joel-Cohen incision, and the use of proper anaesthesia administered as a peridural anaesthesia. Factors such as the increasing awareness of patient autonomy in the medical field and the subsequent right to make one's own decision on the mode of birth contributes greatly to a rise in caesarean section (15). Other reasons include the fear of physical trauma such as pelvic floor injuries, the need for an episiotomy and the fear of pain. Demographic changes such as

maternal age, later onset of first birth, and declining religiosity also affect CDMR (15, 16, 17). This work examines the benefits and drawbacks of vaginal and caesarean section, the reasons for a caesarean delivery on maternal request, and the increasing awareness of patient autonomy in the medical field, which has led to concerning rates of caesarean sections.

4. Advantages of vaginal delivery

4.1. Delivery method by nature

The first pregnancy is a significant emotional and spiritual experience for most women. When selecting vaginal delivery as the preferred method of birth, religiosity and sociocultural factors play a big role. Roudsari et al. 2015 showed that natural vaginal delivery is perceived as a “symbol of woman's power and ability, a guarantee for woman's health, and a symbol of God's power” (18). In Ghana, there is a strong connection between religiosity and healthcare during pregnancy. Women often intensify their prayers in the hope of having a healthy child and a safe delivery. Due to the fear of dying during caesarean section, it is stigmatized, and many women seek out spiritual and traditional options to avoid it at any cost and give birth via a spontaneous natural delivery (19). According to Liu et al. 2013, vaginal delivery is viewed as a “healthy natural rite of passage from womanhood to motherhood”. The study suggests that pain during delivery is viewed positively by some women as it allows them to experience and feel the childbirth process, highlighting the natural aspect of physiological birth (20, 21). According to Liu et al. 2013, most pregnant women want a natural vaginal delivery (20). Similarly, Loke et al. 2015 found that over three-quarters of the pregnant women choose natural delivery as their preferred method of giving birth (22).

4.2. Trust, safety, and shorter hospital stay

An increased level of religiosity and sociocultural factors, as mentioned in section 4.1, influence women to choose natural delivery as their preferred mode of birth. Other important factors include maternal and newborn health, the increased perception of being in control, avoiding the side effects of anaesthesia, and a shorter hospital stay. Loke et al., 2015 demonstrated that 85% of pregnant women preferred natural delivery due to “concern for health of the newborn”, while 73.2% choose it due “concern for maternal health” (22). Nulliparous women interviewed in the study conducted by Liu et al., 2013 preferred vaginal delivery due to concerns about caesarean sections, as evidenced by their

desire to avoid surgical risks, regain independence quickly, and have immediate contact with the newborn (20). Guittier et al. 2014 hypothesize that women who have a natural vaginal delivery without taking analgesic medication have a “higher perceived control” during their delivery and “are more satisfied than others” (23). When comparing the mean days of hospital stay after CDMR and after planned vaginal delivery, a longer hospital stay of 3.6 days was observed in CDMR compared to 2.8 days in planned vaginal delivery (8). In comparison to a caesarean section, lower rates of puerperal and wound infections were observed (24). The effect of delivery type on haemorrhage is controversial (24) due to the low quality of evidence supporting this finding. According to the 2011 NICE clinical guidelines on caesarean section, “no difference in blood loss than 1000ml or 1500ml was detected when comparing planned caesarean section (0.5%) and planned vaginal delivery (0.7%). However, when comparing blood loss higher than 1500ml, 2% of caesarean deliveries and none of vaginal deliveries had this level of blood loss. A UK cohort study found that caesarean sections carry a greater risk of haemorrhage in excess of 1000ml compared to women who had spontaneous vaginal delivery (25).

4.3. Newborn’s health condition

85% of pregnant women choose vaginal delivery due to the belief that is a safer option for the new-born's health. The newborn’s health is typically assessed immediately after birth by checking their pulse, appearance, grimace, activity, and respiration using the APGAR-score. Both the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP), recognise this method of assessing the health condition of newborns. The APGAR-score is measured in the first minute and the fifth minutes after birth. A score of 7-10 indicates a healthy child with a reassuring prognosis, while a score of 4-6 indicates an abnormal neonatal health condition. A score of 0-3 indicates a critical health condition for the neonate with a typically worse prognosis (26). When comparing vaginal deliveries and caesarean sections, a higher risk of foetal complications such as respiratory distress and neonatal asphyxia can be observed in caesarean sections. These complications can be explained by the physiological differences in mode of birth and the complications caused by anaesthesia and are characterised by a lower APGAR-score (27, 28). Eyowas et al. 2016 found that women who gave birth via caesarean section had a statistically significant lower APGAR-score after one minute compared to those who had a vaginal delivery. However, there was no statistically

significant difference in APGAR-scores after 5 minutes (27). It is interesting that another study which compared APGAR-scores and oxygen saturation levels between caesarean sections and vaginal deliveries found no statistically significant difference at one minute and five minutes after birth (29). This finding is consistent with Rahmanian et al's. 2014 study (28). Both studies, however, have limitations – from restricting the study population to newborns who do not require immediate medical attention and appear healthy, to using a case-control design that can be prone to selection bias if the groups are not carefully matched – that prevents them from conclusively demonstrating not impact of delivery mode on APGAR-scores. More research with larger, diverse samples, addressing various c-section types, and controlling for potential confounding factors is needed to provide clearer answers. Skin-to-skin contact immediately after delivery has proven to be beneficial for both mother and newborn. According to the WHO and the United Nations Children's Fund (UNICEF), skin-to-skin contact should be initiated immediately “following vaginal birth, and as soon as the mother is alert and responsive after a caesarean section” (30). These benefits include faster breastfeeding initiation and better mother-child bonding (30, 32). Machold et al. 2021 state that immediate skin-to-skin contact increases cardiopulmonary stability, improves central nervous system control, and reduces the newborns cortisol levels (31). Additionally, women who breastfeed their babies experience a protective effect against breast cancer, and potential protection against ovarian cancer and diabetes mellitus type 2 (32). While immediate skin-to-skin contact after vaginal delivery is common practice and is usually feasible, immediate skin-to-skin contact after caesarean delivery in the operating room is a challenge for some hospitals (33).

4.4. Mother's satisfaction

The impact of the mode of delivery on maternal satisfaction is a widely discussed and highly controversial topic. According to Schrittenloher 2015, 68.9% of women who gave birth via natural spontaneous delivery reported the highest satisfaction (34). However, Wiklund et al. 2010 contradicted this finding and showed that women who had a CDMR experienced a better birth experience than those who gave birth via a natural delivery (means= 8.3 versus 6.7; $p < 0.001$) (8). One possible explanation is that women who had their preferred mode of caesarean delivery fulfilled were more satisfied with their birth experience. This is supported by Dr. Christine Klapp who is a senior physician

specialised in gynaecology and psychosomatics at Charite Center for Obstetric Medicine. She states that “the satisfaction is the greatest when you have the birth you imagined” (35). Wiklund et al., Blomquist et al. 2011 also demonstrated a statistically significant difference regarding satisfaction in the planned caesarean section group postpartum ($p=0.014$) and eight weeks postpartum ($p=0.023$) (36).

A fulfilled CDMR request, however, is not a guarantee for higher satisfaction and a positive birth experience, as shown in a comparative study (37). The satisfaction of mothers can be affected not only by the mode of birth but also by support they receive from medical staff. A Chinese study also found a positive correlation between maternal satisfaction and perceived support from medical staff members ($p<0.001$) (38).

5. Risks of vaginal delivery

5.1. Pelvic floor injuries and pelvic floor dysfunction

Pelvic floor injuries and dysfunction are common in women who undergo natural delivery. These injuries include perineal lacerations resulting from spontaneous delivery or episiotomy, and account for approximately 85% of all complications arising from a natural delivery (39). A German study reported similar estimates, with 86.7% of women who gave birth naturally delivery experiencing a birth-related injury (40). Blomquist et al. 2011 conducted a study on 160 women who had planned natural births. 95 had a spontaneous natural delivery, while 48 women underwent unplanned caesarean sections and 17 had operative assisted deliveries. An episiotomy was performed on 42 out of 85 women (49.5%) who had a spontaneous delivery and 16 out of 17 women (94.1%) who had an operative assisted delivery received an episiotomy (36). A study conducted in Chinese found that 42 % of 88 women who had a planned natural delivery received an episiotomy (38). Regarding pelvic floor dysfunction, a German E-PAD study showed an increase of 3.7 % in organ prolapse symptoms three months postpartum, as well as an 11.8% increase in urinary incontinence with a marked urinary frequency rate six months postpartum when comparing women’s pre- and postpartum conditions (40). A Spanish study compared women who had a healthy pelvic floor before delivery and after delivery. The results showed that 33-40% of women experienced symptoms of organ prolapse (40). Complications such as obstetric anal sphincter injury (Oasis) and levator ani muscle avulsions occur in 1% to 11% and 13 to 26% of cases, respectively. The higher risk of levator ani avulsion can be expected in cases of operative assisted deliveries, particularly forceps deliveries, and perineal laceration III° and IV° (41, 42). Bailit et al. 2016 found

that episiotomies were more frequent in vacuum pump-assisted deliveries ($p < 0.001$) and had a statistically higher frequency in unplanned caesarean sections than forceps-assisted deliveries ($p = 0.04$) (43). The study also found a statistically significant perineal laceration III° and IV° risk when forceps assisted delivery is performed ($p = 0.001$) (43). Perineal laceration III° is classified as a “laceration involving the anal sphincter muscles and is subdivided in less than 50% external anal sphincter involvement, more than 50% external anal sphincter involvement and external and internal anal sphincter involvement whereas IV° perineal laceration is classified as a laceration involving the anal sphincter complex and the rectal epithelium” (44). According to Longo et al. 2023 women who had IV° perineal laceration had statistically significant worse bowel control compared to women with III° perineal laceration (30.8% versus 3.6%; $p = 0.001$) (42). A cohort study conducted on a large Scottish population revealed that women who had a vaginal delivery after a caesarean section had a more than two-fold increased risk of pelvic floor surgery compared to those who had a repeated elective caesarean section (adjusted hazard ratio 2.38, 95% CI 2.03 to 2.80, $p < 0.001$). According to Fritzpatrick et al. 2022, women with pelvic organ prolapse and urinary incontinence have a 2-3 times greater risk of requiring pelvic floor surgery if they have a vaginal delivery after a caesarean compared to repeat elective caesarean section (adjusted hazard ratio 3.17, 95% CI 2.47 to 4.09, $p < 0.001$ and adjusted hazard ratio 2.26 95% CI 1.79 to 2.84, $p < 0.001$) (45).

5.2. Effect on sexual well-being

An uninjured perineum has a positive protective effect on female postpartum sexuality and receives special attention in both natural vaginal delivery and caesarean sections. However, natural vaginal deliveries, especially those that use forceps and vacuum pumps, can have a great effect on a women’s sexuality (46). Minor complications such as perineal lacerations I° and II° usually heal with time and without any interventions. However, operative assisted deliveries can lead to more severe complications such as the need for an Episiotomy, perineal lacerations III° and IV°, or levator ani muscle avulsions (40, 42). Those risk factors cause pain, urinary and faecal incontinence. Patients with perineal lacerations III° and IV°, experience longer-lasting urinary and faecal incontinence, which impacts their daily life and quality of life negatively (47). Although caesarean sections appear to protect against pelvic floor injuries and dysfunction, natural vaginal delivery, particularly operative assisted deliveries, can have negative effects on

arousal, desire, onset of sexual activity, pain, and sexual satisfaction (46). The German E-PAD study revealed that 10.6% of sexually active women feel sexually disadvantaged due to urinary incontinence and pelvic organ prolapse, while 12.6% became sexually inactive because of these conditions (40). Eid et al. 2015 found that women who had a natural vaginal delivery reported significantly lower levels of arousal, desire, and lubrication compared to those who had a caesarean section. Additionally, women who had a caesarean section showed significantly lower levels of desire antepartum and three months postpartum (48). Similar results were shown by Kahramanoglu et al. 2017 (49). According to a large systematic review and meta-analysis conducted by Fan et al. 2017, sexual satisfaction was statistically insignificant at three and six months postpartum for women who had a natural vaginal delivery and for those who had a caesarean section. Regarding sexual activity, the group who underwent caesarean section resumed intercourse significantly earlier than women who gave birth naturally, at three months postpartum. However, six months postpartum, no significant difference was observed between the caesarean section and natural delivery groups. At three and six months postpartum, women who underwent a caesarean delivery experienced less dyspareunia compared to those who had a natural vaginal delivery. However, the statistical difference between the two methods of delivery was not proven significant (50). According to Eid et al. 2015, Kahramanoglu et al. 2017 and Fan et al. 2017, there was no significant difference in sexual satisfaction between caesarean section and natural vaginal delivery at six months postpartum (48, 49, 50).

6. Advantages of caesarean section

6.1. Predictability of date of birth

One major advantage of caesarean section is the better predictability of the date of birth. This can be important for some women, leading the choice of an elective caesarean section or even CDMR. Reasons for this choice include convenience and the ability to plan maternity leave, as well as socio-cultural factors (22). Belief in auspicious birth dates is an example of socio-cultural beliefs and is more prevalent in Eastern regions than in Western countries. The significance of the date of birth is evident in Chinese women who give birth in the year of dragon due to the belief in better fate and destiny, resulting in a rise in birth rates during this period (22). The same can be observed in women from Western countries, such as Brazil. Pregnant women in Sao Paulo have statistically significant fewer deliveries on certain days, including Sundays, Christmas, Christmas

Eve, All Souls' Day, New Year's Eve, and International Women's Day, when compared to the average birth rates in 2010. This is attributed to a higher number of caesarean sections. In a 2-week time frame surrounding Christmas and All Soul's Day, including weekends, the birth rate was statistically lower compared to other days ($p < 0.01$). Out of the 5 dates studied, International Women's Day had highest rate of births in only 2 out of 10 years, which was not statistically significant compared to other days (51). Symbolic dates or time frames are significant for some women during child-birth due to socio-cultural beliefs. For instance, in China, women choose a specific date of birth believing in certain benefits, while in Brazil, some women opt for caesarean sections to avoid specific dates of birth.

6.2. Lower risk for natural delivery complications

Planned caesarean section offers advantages over vaginal delivery in terms of avoiding natural delivery complications such as prolonged labour, the use of operative assisted delivery techniques with vacuum pump or forceps, and the consequences of unplanned caesarean section. 85% of women who have had vaginal deliveries experience birth-related injuries, including perineal laceration I°-IV°, levator ani muscle avulsion, and pelvic dysfunction such as urinary and faecal incontinence or pelvic organ prolapse (POP). Regarding pelvic floor dysfunction, the German E-PAD study found that postpartum women, when compared to their prepartum condition, experienced a 3.7 % increase in organ prolapse symptoms at 3 months postpartum and an 11.8% increase in urinary incontinence, with a marked urinary frequency rate at 6 months (40). Similarly, a Spanish study comparing women with flawless pelvic floors before and after delivery found that 33-40% of women experienced organ prolapse symptoms (40). According to a study on planned elective caesarean section, primiparous women who underwent elective caesarean section had the lowest rate of urinary incontinence (UI) rate at 5% while women with spontaneous vaginal and forceps-assisted deliveries had the highest UI rates at 22% and 33%, respectively (52). These findings are consistent with a systematic review and meta-analysis from Kaeg et al. 2018. Their analysis showed that caesarean section had a significantly lower risk of UI and POP with (1,024/7,306 caesarean delivery versus 7,713/51,594 vaginal delivery; OR 0.56, 95% CI 0.47 to 0.66, $p < 0.000011$; $I^2 = 71\%$; 8 studies) and (116/4,898 caesarean delivery versus 2,055/34,310 vaginal delivery; OR 0.29, 95% CI 0.17 to 0.51, $p = 0.005$, $I^2 = 87\%$; 2 studies) respectively when compared with vaginal delivery (53).

A study by Baud et al. 2020 showed that 6 years after delivery, women who had an elective caesarean section experienced significantly less frequent urge incontinence (adjusted Relative Risk [aRR] 0.55; 95% CI 0.34–0.88) and (aRR 0.53; 95% CI 0.35–0.80) and urinary leakage during physical activity (aRR 0.53; 95% CI 0.35–0.80) when compared to vaginal delivery (54). After 20 years following childbirth, women who had a vaginal delivery have a prevalence of POP more than two times higher than who had a caesarean delivery (14.6% versus 6.3%, odds ratio [OR] 2.55; 95% CI 1.98–3.28) (55). A reduced prevalence of UI was only observed in women who opted for caesarean section for all pregnancies (14%) compared to those who had vaginal deliveries or vaginal delivery after caesarean section (26% and 28% respectively). However, this protective effect disappears in women after the age of 50 (56). Although Vaginal delivery itself is not a risk factor for faecal incontinence, certain obstetric complications such as the use of vacuum pumps, forceps, and the need to perform an episiotomy increase the risk of perineal laceration III^o, IV^o, which in turn increases the risk of anal sphincter injury and subsequent faecal incontinence (42,43,56,57). Repeated vaginal deliveries with previous laceration of the anal sphincter (OR 4.3 95% CI 3.8-4.8) (56), increase the risk of anal sphincter injury. Women who have a vaginal delivery are at a greater risk of requiring pelvic floor surgery and pelvic organ prolapse surgery compared to those who have had elective caesarean sections (45, 58).

7. Risks of caesarean delivery

7.1. Restricted health condition of the mother

Like any other surgical procedure, a caesarean section carries several risks to the mother's well-being. These risks include anaesthesia, haemorrhage, postpartum infections and maternal death (24). As noted in section 4.2, women who undergo a CDMR also tend to have longer hospital stays, averaging 3.6 days compared to 2.8 days for planned vaginal deliveries (8). This can result in a loss of autonomy and the need for reliable family members to provide support (20). Despite the perceived safety of the caesarean section due to the use of antibiotics, the application of the Pfannenstiel incision or Joel-Cohen incision, and the use of proper anaesthesia administered as a peridural anaesthesia (15), it is important to note that it is a major surgery with increased risks of maternal death (OR=3.10, 95%CI 1.92-5.00) and postpartum infection (OR = 2.83, 95%CI, 1.585.06) (24). A surgical site infection (SSI) or infections can significantly contribute to maternal morbidity and mortality. Caesarean sections have an 8-fold increased risk of SSIs

compared to vaginal deliveries (59) and appear in 5% to 12% of caesarean sections (60). However, the incidence of SSI's varies from country to country, ranging from 3.34% in China to 24.3% in Pakistan (59). In countries with limited resources, SSIs can reach alarming numbers, ranging from 4 % to 70 % (60). Infections cause physical pain and emotional distress, disrupt the mother-baby relationship, and strain the healthcare system. SSIs can cost up to 3,529 USD per person affected (60). The risk of developing a SSI after caesarean section is influenced by multiple factors, including emergency caesarean section, preterm rupture of membranes, frequent vaginal examination and chorioamnionitis. Additionally, caesarean sections lasting longer than 60 minutes have been found to double the risk of SSI (59 ,61, 62, 63).

7.2.Placental adhesion and hysterectomy

Placental adhesions, such as placenta accreta or placenta praevia, are associated with serious obstetric complications, including intrapartum and postpartum haemorrhage, and increase the risk of requiring a hysterectomy. A retrospective conducted in Ireland between 1966 and 2005 found that the indication for a hysterectomy was more often placenta accrete 5.4% to 46.5% than for uterine rupture, which decreased as an indicator during the study period from 40.5% to 9.3%. When comparing women who had a vaginal delivery as their first delivery, the risk of needing a hysterectomy was 1:30,000. This risk increased to 1:1700 for women who had a caesarean section, and the highest risk was observed in women with two or more caesarean sections, with a risk of 1:220 (64). In their study, Shellhaas et al. 2009 found that placenta accreta (38%) and uterine atony (34%) were the two most common indications for hysterectomy. Only 4% of uterine atony cases and 71% of placenta accreta cases required a hysterectomy. Of the placenta accrete cases that required a hysterectomy, 18 % had a primary caesarean delivery, while 82% required a hysterectomy after a repeated caesarean section ($p<0.001$). Of the women who required a hysterectomy, 32 % had placenta praevia as a risk factor, and 23% had both placenta praevia and placenta accreta as risk factors (65). The prevalence of peripartum hysterectomy varies between countries. In Italy, the rate of peripartum hysterectomy was 23.2 per 10,000 caesarean sections (95% CI 21.1-25.6), while in Belgium, only 9 per 10,000 caesarean sections required hysterectomies. In comparison to vaginal deliveries, the prevalence of peripartum hysterectomy was highest in Slovakia (4.6 per 10,000 births; 95% CI 3.5-6.1) and lowest in Sweden (0.4 per 10,000 births; 95% CI 0.2-0.9). The study found that the overall relative risk for peripartum hysterectomy

was 9.1 (95% CI 8.0-10.4) after a caesarean section compared to natural delivery. The risk for hysterectomy with a previous caesarean section was 10.6 (95% CI 9.4-12.1) compared to previous natural delivery. Additionally, a significant correlation between national caesarean section rates and peripartum hysterectomy was observed ($\rho = 0.67, P < .05$) (66). Another study has shown that placenta accreta spectrum (PAS) frequency has increased from 0,8 to 3 per 1000 deliveries between 1980 until recent years. This increase is attributed to the rising rates of caesarean sections, especially repeat caesarean sections, and placenta praevia. Half of all reported PAS cases were unexpected (67). The risk of placenta accreta rises from 3% in women with one repeat caesarean delivery to 67% in women with five or more repeat caesarean sections (67). The incidence of placenta praevia increases with the number of caesarean sections, particularly in women with PAS. For instance, the incidence of placenta praevia is nearly 1% in women with one prior caesarean section, but it increases to 2.8% in women who had more than three caesarean deliveries. Women with placenta praevia, and more than three caesarean sections, have a statistically significant higher risk of placenta accreta, hysterectomy, and maternal morbidity (50% to 67% versus 3.3% to 4%, 50% to 67% versus 0,7% to 4%, and 83% versus 15%, respectively) compared to women with placenta praevia but no prior caesarean sections (68).

7.3. Rupture of uterine scar

Uterine rupture is a severe complication that can result in maternal and neonatal morbidity and mortality. It has a global incidence of 0.07% and is more common in developing countries than developed ones (69). A multicountry survey conducted by the WHO on maternal and neonatal health revealed that the incidence of uterine rupture for women with one or more prior caesarean sections was 0.5%. The incidence was higher in low Human Development Index countries (HDI), with a rate of 1%, compared to high-HDI countries, which had an incidence of 0.2% (70). The risk of uterine rupture increases with the number of caesarean sections, which is associated with a higher degree of uterine scarring (71). The incidence of uterine rupture with an unscarred uterus was 1 in 30,764 (0.0033%) deliveries in an Irish study from 1982-1991. A more recent meta-analysis from 1975-2009 suggests an incidence of uterine rupture with an unscarred uterus of 1 per 8,434 (0.012%) deliveries (72). In an 8-year retrospective study from China, 92.7% of all uterine rupture cases had a scarred uterus, while only 7.2% had an unscarred uterus (69). When comparing trial of labour after caesarean section (TOLAC) and repeated caesarean

section, a higher uterine rupture rate of 0.39% versus 0.16% is observed. Additionally, the risk of uterine rupture was much higher in women who had an unsuccessful vaginal delivery than in women who had a successful TOLAC (1.9% versus 0.22%; OR, 8.9; 95% CI, 1.9-42) (71). The risk of uterine rupture increases with multiple prior caesarean sections. According to the analysed studies, the risk of uterine rupture increases two- to five-fold when comparing TOLAC with two prior caesarean sections versus one previous caesarean section. This reflects a uterine rupture rate of 1.36% in women who attempt a trial of labour after two prior caesarean sections (71). Zwergel et al. 2019 found a dose-dependent association between caesarean section and uterine rupture. The risk of uterine rupture increased with more than three caesarean sections (68).

7.4.Risks of spinal anaesthesia and problems with breastfeeding

The worldwide use of general anaesthesia for elective caesarean section has significantly declined. In the United States, less than 5% of elective caesarean sections are performed using general anaesthesia. However, the use of regional anaesthesia, such as epidural, spinal or combined spinal epidural procedures, has increased in recent decades. This rise can be attributed to several factors, including the avoidance of problems during intubation in patients with a difficult airway, reduced drug requirements for anaesthesia, and the ability to have a more positive childbirth experience by remaining awake and actively participating (73). Women who choose regional anaesthesia, however, may experience complications such as nausea, vomiting, headaches, hip pain, hypotension, and bradycardia (74,75). The incidence rates for hypotension induced by spinal anaesthesia vary globally between 7% to 74% due to the heterogeneous definition of hypotension. In a study conducted by Algarni et al. 2023, 31.4% of women experienced mild hypotension, 23.9% experienced moderate hypotension, and 30.1% experienced severe hypotension. Women with a higher body mass index (BMI) and those requiring higher dosages of local anaesthetic drugs are at a greater risk of experiencing hypotension ($p=0.008$ and $p=0.009$, respectively). Additionally, a puncture site at or below L2 was significantly associated with bradycardia ($p=0.043$) (75). In a separate study, it was found that more than 83% of women who underwent a caesarean section experienced headaches and after delivery hip pain. The study also revealed that women who had a caesarean section were 3.57 and 3.26 times more likely to experience headaches and hip pain respectively when compared to those who had vaginal delivery. Headaches, in particular,

resulted from spinal anaesthesia when the needle is inserted into the subarachnoid space and when fluid leaks through the puncture site (74). The study also indicates that women who have a caesarean section are more likely to face problems in exclusive breastfeeding due to reduced skin-to-skin contact immediately after birth, which results in lowered food demand and sleeping hours in the newborn (74). The mode of birth also impacts the likelihood of breastfeeding. A Canadian study found a significant association between the mode of birth and planning to breastfeed, breastfeed initiation, and successful first attempt at breastfeeding. Women who delivered via caesarean section showed a lower tendency to plan and initiate breastfeeding. The mode of birth also had a significant effect on a successful first attempt at breastfeeding. Women who underwent emergency caesarean sections were less likely to successfully breastfeed on their first attempt, after 24 hours, and were less likely to breastfeed prior to being discharged. Additionally, the duration of breastfeeding for women who had emergency caesarean sections and planned caesarean sections was less likely to be longer than 12 weeks postpartum ($p=0.02$) (76). Erbaydar et al. 2020 found that the incidence of late initiation of breastfeeding was 50.49% in women who underwent a caesarean delivery and 35.34% in women who had a vaginal delivery. This reflects a 1.468 times higher risk for non-exclusive breastfeeding and a 1.428 times higher risk for non-early initiation of breastfeeding in women who underwent a caesarean delivery (77). Breastfeeding problems may arise due to low milk supply (78) or difficulties with infant health/behaviour, particularly in late preterm infants who may have a lower level of alertness and a higher probability of an uncoordinated sucking reflex (76,78).

7.5. Long term health condition of the child

In addition to iatrogenic injuries such as fetal lacerations that occur as a complication of caesarean sections (79), children born by caesarean section are at a higher risk for chronic diseases such as asthma, obesity, and respiratory tract infections (80). In particular, lower respiratory tract infections in infancy are associated with caesarean sections (80,81). A possible explanation is the lack of pressure on the baby's thorax, which aids in the expulsion of amniotic fluid, but also the decreased catecholamine surge, which is essential for the alveolar fluid absorption at birth (82, 83, 84). Residual amniotic fluid in the lungs can cause transient tachypnoea of the newborn and acute respiratory distress syndrome, which can increase the susceptibility to lower respiratory tract infections later in life (81). As noted above, children born by caesarean section have

an increased risk of asthma (80, 85, 86, 87, 88), regardless of whether the caesarean section was necessary or due to a CDMR (89). This may be related to the “hygiene hypothesis”, which describes the different bacteria in the gut microbiome after caesarean section and vaginal birth. While meconium from vaginally delivered infants is dominated by bacteroides, bifidobacterium and lactobacillus, meconium from caesarean delivered new-borns is dominated by staphylococcus, streptococcus, klebsiella, enterococcus, and clostridium. The combination of high-risk longitudinal cluster microbiome, particularly with reduced faecal bacteroides and bacteroides with sphingolipid (3-kotosphinganine) production, was a significant mediator of the association between caesarean section and asthma (early and any asthma phenotype) $p < 0.05$ (80,90). Sphingolipids are typically involved in maintaining cell membrane integrity and regulating cellular processes and intracellular signalling. In the case of a low amount of sphingolipids or reduced synthesis, an increased susceptibility to asthma is likely.

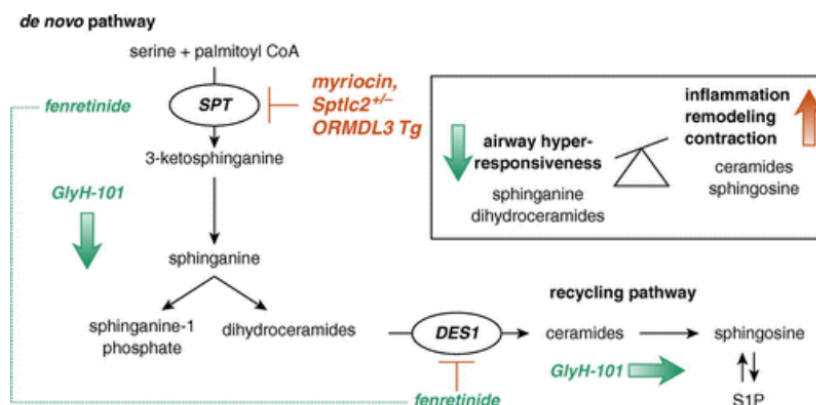


Figure 3-Modulation of de novo and recycling pathways of sphingolipid metabolism (91)

In a murine model, overexpression of orosomucoid-like protein isoform 3 resulted in reduced sphingolipids and increased peri-bronchial smooth muscle and fibrosis, ultimately leading to airway hyperresponsiveness. Prolonged treatment of airway smooth muscles with fenretinide and GlyH-101 stimulated the endogenous sphinganine and dihydroceramide synthesis by human ASM and epithelial cells. This, in turn, reduced bradykinin-induced calcium signalling, thereby opposing airway contraction. An altered balance of sphingolipid synthesis may result in increased sphinganine and dihydroceramide levels, which could potentially reduce airways hyperresponsiveness, counteract inflammation, remodelling and constriction (91).

Other animal trials have demonstrated that bacteroides play an important role in maintaining the integrity of the gut barrier, promoting the maturation of gut-associated lymphoid tissue, enhancing gut immunity and regulating the inflammatory response by suppressing the pro-inflammatory cytokine IL-17 in the intestine (85). Furthermore, administration of lactobacilli in an ovalbumin-induced murine model of asthma has shown that *Lactobacillus rhamnosus* can attenuate airway inflammation and hyperresponsiveness, and may possess the ability to prevent asthma (92). The risk of obesity is also increased in children who are born by caesarean section (80, 85, 93). Yuan et al. 2016, showed that vaginal delivery after caesarean section was associated with a 31% lower risk of obesity in the offspring, and when comparing within-family differences in the mode of delivery, the sibling born by caesarean section was 64% more likely to be obese than their sibling(s) delivered vaginally (85). This could also be explained by the 'hygiene hypothesis'. A reduced number of bacteroides and bifidobacterium species in children born by caesarean section results in reduced levels of short-chain fatty acids, either due to insufficient production from bifidobacteria or due to reduced levels of glycoside hydrolases. This, in turn, leads to a lower level of G protein-coupled receptor activation. Consequently, a reduced amount of peptide YY secretion results in the missing effect of reduced gut motility and a slower intestinal transit, which has the potential to affect the newborn's body weight (80, 94). Breastfeeding for more than six months may have beneficial effects on allergic diseases, asthma, and obesity. A Chinese study demonstrated that the risk of developing asthma in childhood was higher in non-exclusive breastfed children (adjusted OR = 1.91 [95% CI 1.22–2.99]) than in children who were exclusively breastfed (adjusted OR = 1.39 [95% CI 0.92–2.10]). Furthermore, the study indicated that breastfeeding for more than six months may attenuate asthma risk (89). The pathophysiology of allergic diseases is thought to be due to a primary barrier function defect. In infants, the gut barrier function is limited due to insufficient IgA secretion, sparse goblet and paneth cells, elevated epithelial cell permeability, and elevated pro-inflammatory cytokine secretion. Breast milk contains gut trophic factors that enhance villi and crypts and decrease gut barrier permeability. Furthermore, milk growth factors, such as epidermal growth factor and transforming growth factor beta, stimulate tissue repair. However, the milk also contains human milk oligosaccharides, which interfere with microbial signalling and thereby reduce lipopolysaccharide-induced inflammation. In particular, breast milk IgA increases the diversity of the gut microbiome, which shapes the neonate microbiome to that of the mother. Human milk oligosaccharides also act as

substrates for bifidobacterium longum/infantis, which produces short-chain fatty acids and exerts anti-inflammatory effects on epithelial and immune cells. Additionally, it also promotes regulatory T cell differentiation and prevents allergies. Breast milk also contains bifidobacterium DNA, which is beneficial to neonates who were delivered by a caesarean section. This DNA aids in gut colonization and reduces the risk of obesity (95, 96).

8. Reasons for caesarean section wish

Over recent years, the rate of caesarean sections has risen significantly. This is not due to absolute indications such as placenta praevia or uterine rupture, which account for a minority of cases. Instead, it is largely driven by relative indications, such as a previous caesarean section and the increasing rate of caesarean delivery on maternal request. The rates of caesarean section vary greatly across the globe, with figures ranging from 6 to 8% in the United Kingdom and northern Europe, to 80% in Brazil (5). The reasons for a CDMR are multifactorial and comprise changes in social, cultural, and legal aspects as well as improved scientific prowess and perceived safety of caesarean sections (5, 97). The most common reasons for a CDMR are tokophobia (fear of childbirth), fear of pain during labour, previous caesarean section, and reduced labour time, although the recommendation by physicians is also a factor (97). Further reasons include the fear of incontinence, pelvic floor trauma, negative experiences of previous natural delivery, previous infertility, and the fear of not getting enough support from the medical staff. Demographic factors include higher maternal age, lower levels of religiosity, parity, maternal health condition, education, family status, and household income (98). Furthermore, an Italian comparative study demonstrated that a significantly proportion of women opted for a caesarean section when assisted reproductive technology was used to conceive their child (99).

9. Legal and financial aspects

According to Zewude et al. 2022, 36% of women surveyed considered the choice of mode of birth to be a matter for the doctor, thus giving the physician a significant degree of power, control, and confidence in the correct choice of mode (97). However, obstetrics and gynaecology can be considered a high-risk specialty, with an increased number of malpractice claims and lawsuits against physicians, and therefore physicians in this specialty are more likely to practice defensive medicine to protect themselves (100).

Defensive medicine is defined by the Office of Technology Assessment as: “Defensive medicine occurs when doctors order tests, procedures or visits, or avoid high-risk patients or procedures, primarily (but not necessarily solely) to reduce their exposure to malpractice liability. When physicians do extra tests or procedures to primarily reduce malpractice liability, they are practising positive defensive medicine. When they avoid certain patients or procedures, they are practising negative defensive medicine” (101). Three studies in Italy, Romania, and Brazil showed that defensive medicine is a common practice, mainly because of fear of malpractice lawsuits. These studies showed that physicians who had been sued or who knew someone who had been sued were more likely to perform a defensive caesarean section (102-104). Rudey et al. 2021, indicated that physicians who perceived a higher risk of malpractice suits against obstetricians and who performed a caesarean section to avoid litigation, had a six times higher rate of caesarean section (OR, 6.07; CI, 1.79–26.35, $P < 0,01$) (104). This places an increased burden on the health system, not only because caesarean section is more expensive than a vaginal delivery, but also because children who are born by caesarean section are more likely to have lower respiratory tract infections, which are associated with longer hospital stays and treatment of the underlying condition (105).

10. Patient autonomy

From an ethical perspective, CDMR presents a dilemma between patient autonomy and the principles of beneficence and non-maleficence. Patient autonomy means that patients who have the capacity to make informed decisions have the right to make decisions about events that affect their lives, even if their decisions contradict the recommendations of a physician. This autonomy is only valid if there are no controlling factors, such as coercion or manipulation, and an intentional act can be identified (106). When applying the principles of beneficence and non-maleficence on CDMR, there is a clear controversy and different point of views. While not respecting a pregnant woman's wishes could potentially affect the birth experience, relationship with the healthcare providers and child, a natural birth may not be successful, resulting in an unplanned caesarean or emergency caesarean section, which may be more risky and affect the patient's mental health. Vaginal birth is also more likely to result in incontinence and pelvic floor trauma. In addition, choosing a caesarean section can reduce the fear of childbirth by avoiding the painful contractions of labour. On the other hand, a caesarean section is an operation with several potential adverse health effects. The baby may be at an increased risk if born by

caesarean section, as there is a greater chance of respiratory complications. However, a vaginal birth can also affect the life of the newborn by increasing the risk of shoulder dystocia and brachial plexus injury (107, 108).

11. Conclusion

Caesarean section rates are increasing worldwide and are estimated to reach 28.5% by 2030. Despite the fact that, according to the WHO, a caesarean section rate above 10% doesn't improve maternal or infant mortality, physicians continue to perform them. One of the main reasons for this increase is the CDMR, which is requested due to fear of childbirth, tokophobia, fear of incontinence or pelvic floor trauma, fear of not being helped by medical staff, better predictability of childbirth and, in some cultures, a belief in auspicious birth dates. Patients often request this operation because they are aware of their autonomy and know that doctors cannot force anyone to give birth in a certain way. The fear of malpractice lawsuits also makes doctors more likely to perform a caesarean section to protect themselves. However, there are a considerable number of risk factors associated with caesarean sections, both for the mother and the baby. The operation itself is a major risk factor, but children born via caesarean section are also more likely to have respiratory problems such as asthma and are more likely to be obese. The mother also has an increased risk of surgical site infections, haemorrhage, thromboembolic events, and a higher risk of placenta praevia/accreta and uterine rupture in subsequent pregnancies. From a medical point of view, caesarean section is clearly associated with higher risks for both mother and child than natural vaginal delivery. However, in our modern times, with increasing awareness of patient autonomy, socio-cultural, socio-economic, and medico-legal changes, the CDMR has been widely accepted. Due to the fact that this operation is available in most countries and doesn't require any indication to be performed, the patient must receive a comprehensive explanation of all its risks and benefits, and it must be clear that the patient is not coerced into having this operation and it is out of the patient's free will.

12. Literature

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