



The Trends of C- Section Rates between the Past and Recent around the world (especially in Egypt) from 2008-2022

by

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Abstract:

This research paper explains the history of C-Section and its trends around the world in Europe, America, China and Egypt (2008-2022). It's clear that the trends and rates of caesarean section for mothers of childbearing age and childbirth are increasing nowadays for many reasons, including for example, persuasion by doctor itself, the mothers desire, mother being exposed to previous caesarean section, and risks to mother itself or to the child on the other hand. At the end, the Egyptian Governorates are ordering according to the C- Section percentage. Finally, from my personal point of view, as a result of following up on many cases from my relatives, the main reasons related to high rates of caesarean sections in all governorates of Arab Republic of Egypt compared with the past years from 2008 and also before that, all of which were natural vaginal births, and this is due to main financial reasons.

Key words: C- Section, Caesarean Sections, Vaginal Birth, Awake, Under General Anesthesia, Risks, live Woman, Mother, Child, Resuscitative Hysterectomy or per mortem Caesarean Section, Twins, Vaginal Birth after Cesarean (VBAC), womb, Elective repeat caesarean section (ERCS).

1. Introduction:

Caesarean Sections historically, performed to a live woman usually resulted in the mother death. ^[1]It was considered an urgent measure, only performed when the mother was already dead or considered to be at risk.

In the old Chinese records, there are six sons for Empero, all born by "Body cutting." The sixth son, Jilian, was founded in the House of Mi that ruled the State of Chu (c. 1030–223 BC). ^[2]

In the Sanskrit medical treatise Sushruta Samhita, dating back to the early 1st millennium CE, a caesarean section was mentioned after the mother's death. ^[3] The earliest known non-mythical record of a C-section was that of Bindusara's mother, who accidentally consumed poison and died while giving birth. Chanakya, the teacher and adviser of Chandragupta, made the decision to save the baby's life by cutting open the queen's belly and delivering the baby. ^[4]

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An old account of cesarean birth in Iran is documented in *Shahnameh*, an ancient Persian book written around 1000 AD.^[5]^[6] It mentions the birth of Rostam, a renowned hero in Iran, and describes how the Simurgh instructed Zal on how to perform a cesarean section to save Rudaba and her baby Rostam. The term 'cesarean section' is referred to as 'Rostamina' in Persian literature.^[7]

The Babylonian Talmud, an ancient Jewish religious text, mentions a procedure similar to the cesarean section. The procedure is termed *yotzei dofen*. It also discusses at length the permissibility of performing a C-section on a dying or dead mother.^[4] There is also some basis for supposing that Jewish women regularly survived the operation in Roman times (as early as the 2nd century AD).^[8]

Researcher Pliny the Elder theorized that Julius Caesar's (born 100 BC) name came from an ancestor who was born by cesarean section, but the truth of this is debated (see the discussion of the etymology of Caesar). Some popular misconceptions involve Caesar himself being born from the procedure; which is considered false because the procedure was lethal to mothers in ancient Rome and Caesar's mother Aurelia Cotta lived until he was an adult.^[9] The Ancient Roman cesarean section was first performed to remove a baby from the womb of a mother who died during childbirth, a practice sometimes called the Caesarean law.^[10]

The Spanish saint Raymond Nonnatus (1204–1240) received his surname—from the Latin *non-natus* ('not born')—because he was born by cesarean section. His mother died while giving birth to him.^[11]

There is some indirect evidence that the first cesarean section that was survived by both the mother and child was performed in Prague in 1337.^[12]^[13] The mother was Beatrice of Bourbon, the second wife of the King of Bohemia John of Luxembourg. Beatrice gave birth to the king's son Wenceslaus I, later the duke of Luxembourg, Brabant, and Limburg, and who became the half-brother of the later King of Bohemia and Holy Roman Emperor, Charles IV.

In an account from the 1580s, Jakob Nufer, a veterinarian in Siegershausen, Switzerland, is supposed to have performed the operation on his wife after a prolonged labour, with her surviving. His wife allegedly bore five more children, including twins, and the baby delivered by cesarean section purportedly lived to the age of 77.^[14]^[15]^[16]

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For most of the time since the 16th century, the procedure had a high mortality rate. In Great Britain and Ireland, the mortality rate in 1865 was 85%. Some Key steps in reducing mortality were denoted to reduce the mortality rates of C-section.

The first successful caesarean section to be performed in the United States took place in Rockingham County, Virginia in 1794. The procedure was performed by Dr. Jesse Bennett on his wife Elizabeth.^[17]

Caesarean section, also known as **C-section** or **caesarean delivery**, is the surgical procedure by which one or more babies are delivered through an incision in the mother's abdomen. It is often performed because vaginal delivery would put the mother or child at risk.^[18] Reasons for the operation include obstructed labor, twin pregnancy, high blood pressure in the mother, breech birth, shoulder presentation, and problems with the placenta or umbilical cord.^{[18][19]} A caesarean delivery may be performed based upon the shape of the mother's pelvis or history of a previous C-section.^{[18][19]} A trial of vaginal birth after C-section may be possible.^[18] The World Health Organization recommends that caesarean section be performed only when medically necessary.^{[19][20]}

A C-section typically takes 45 minutes to an hour.^[18] It may be done with a spinal block, where the woman is awake, or under general anesthesia.^[18] A urinary catheter is used to drain the bladder, and the skin of the abdomen is then cleaned with an antiseptic.^[18] An incision of about 15 cm (6 inches) is then typically made through the mother's lower abdomen.^[18] The uterus is then opened with a second incision and the baby delivered.^[18] The incisions are then stitched closed.^[18] A woman can typically begin breastfeeding as soon as she is out of the operating room and awake.^[21] Often, several days are required in the hospital to recover sufficiently to return home.^[18]

C-sections result in a small overall increase in poor outcomes in low-risk pregnancies.^[19] They also typically take longer to heal from, about six weeks, than vaginal birth.^[18] The increased risks include breathing problems in the baby and amniotic fluid embolism and postpartum bleeding in the mother.^[19] Established guidelines recommend that caesarean sections not be used before 39 weeks of pregnancy without a medical reason.^[22] The method of delivery does not appear to have an effect on subsequent sexual function.^[23]

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In 2012, about 23 million C-sections were done globally.^[24] The international healthcare community has previously considered the rate of 10% and 15% to be ideal for caesarean sections.^[20] Some evidence finds a higher rate of 19% may result in better outcomes.^[24] More than 45 countries globally have C-section rates less than 7.5%, while more than 50 have rates greater than 27%.^[24] Efforts are being made to both improve access to and reduce the use of C-section.^[24] In the United States as of 2017, about 32% of deliveries are by C-section.^[25] The surgery has been performed at least as far back as 715 BC following the death of the mother, with the baby occasionally surviving.^[26] A popular idea is that the Roman statesman Julius Caesar was born via caesarean section and is the namesake of the procedure, but if this is the true etymology, it is based on a misconception: until the modern era, C-sections seem to have been invariably fatal to the mother, and Caesar's mother Aurelia not only survived her son's birth but lived for nearly 50 years afterward.^{[27][28]} There are many ancient and medieval legends, oral histories, and historical records of laws about C-sections around the world, especially in Europe, the Middle East and Asia.^{[29][30]} The first recorded successful C-section (where both the mother and the infant survived) was performed on a woman in Switzerland in 1500 by her husband, Jakob Nufer, though this was not recorded until 8 decades later.^[29] With the introduction of antiseptics and anesthetics in the 19th century, survival of both the mother and baby, and thus the procedure, became significantly more common.^{[26][31]}

2. Uses

Caesarean section (C-section) is recommended when vaginal delivery might pose a risk to the mother or baby. C-sections are also carried out for personal and social reasons on maternal request in some countries.

3. Medical Uses

Complications of labor and factors increasing the risk associated with vaginal delivery include:

- Abnormal presentation (breech or transverse positions)
- Prolonged labor or a failure to progress (obstructed Labour, also known as dystocia)
- Fetal distress
- Cord prolapse
- Uterine rupture or an elevated risk thereof

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- Uncontrolled hypertension, pre-eclampsia,^[32] or eclampsia in the mother
- Tachycardia in the mother or baby after amniotic rupture (the waters breaking)
- Placenta problems (placenta praevia, placental abruption or placenta accreta)
- Failed labor induction
- Failed instrumental delivery (by forceps or ventouse (Sometimes, a trial of forceps/ventouse delivery is attempted, and if unsuccessful, the baby will need to be delivered by caesarean section.))
- Large baby weighing > 4,000 grams (macrosomia)
- Umbilical cord abnormalities (vasa previa, multilobate including bilobate and succenturiate-lobed placentas, velamentous insertion)

Other complications of pregnancy, pre-existing conditions, and concomitant disease, include:

- Previous (high risk) fetus
- HIV infection of the mother with a high viral load (HIV with a low maternal viral load is not necessarily an indication for caesarean section)
- An outbreak of genital herpes in the third trimester^[17] (which can cause infection in the baby if born vaginally)
- Previous classical (longitudinal) caesarean section
- Previous uterine rupture
- Prior problems with the healing of the perineum (from previous childbirth or Crohn's disease)
- Bicornuate uterus
- Rare cases of posthumous birth after the death of the mother
- Decreasing experience of accoucheurs with the management of breech presentation. Although obstetricians and midwives are extensively trained in proper procedures for breech presentation deliveries using simulation mannequins, there is decreasing experience with actual vaginal breech delivery, which may increase the risk.^[33]

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4. Prevention

The prevalence of caesarean section is generally agreed to be higher than needed in many countries, and physicians are encouraged to actively lower the rate, as a caesarean rate higher than 10–15% is not associated with reductions in maternal or infant mortality rates,^[20] although some evidence support that a higher rate of 19% may result in better outcomes.^[24]

Some of these efforts are: emphasizing a long latent phase of labor is not abnormal and not a justification for C-section; a new definition of the start of active labor from a cervical dilatation of 4 cm to a dilatation of 6 cm; and allowing women who have previously given birth to push for at least 2 hours, with 3 hours of pushing for women who have not previously given birth, before labor arrest is considered.^[19] Physical exercise during pregnancy decreases the risk.^[34] Additionally, results from a 2021 systematic review of the evidence on outpatient cervical ripening found that in women with low-risk pregnancies, the risk of cesarean delivery with harms to the mother or child were not significantly different from when done in an inpatient setting.^[35]

5. Risks

Adverse outcomes in low-risk pregnancies occur in 8.6% of vaginal deliveries and 9.2% of caesarean section deliveries.^[19]

5.1 Risks to Mother

In those who are low risk, the risk of death for caesarean sections is 13 per 100,000 vs. for vaginal birth 3.5 per 100,000 in the developed world.^[19] The United Kingdom National Health Service gives the risk of death for the mother as three times that of a vaginal birth.^[36]

In Canada, the difference in serious morbidity or mortality for the mother (e.g. cardiac arrest, wound hematoma, or hysterectomy) was 1.8 additional cases per 100.^[37] The difference in in-hospital maternal death was not significant.^[37]

A caesarean section is associated with risks of postoperative adhesions, incisional hernias (which may require surgical correction), and wound infections.^[38] If a caesarean is performed in an emergency, the risk of the surgery may be increased due to a number of factors. The patient's stomach may not be empty, increasing the risk of anaesthesia.^[39] Other risks include severe blood loss (which may require a blood transfusion) and post-dural-puncture spinal- headaches.^[38]

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Wound infections occur after caesarean sections at a rate of 3–15%.^[40] The presence of chorioamnionitis and obesity predisposes the woman to develop a surgical site infection.^[40]

Women who had caesarean sections are more likely to have problems with later pregnancies, and women who want larger families should not seek an elective caesarean unless medical indications to do so exist. The risk of placenta accreta, a potentially life-threatening condition which is more likely to develop where a woman has had a previous caesarean section, is 0.13% after two caesarean sections, but increases to 2.13% after four and then to 6.74% after six or more. Along with this is a similar rise in the risk of emergency hysterectomies at delivery.^[41]

Mothers can experience an increased incidence of postnatal depression, and can experience significant psychological trauma and ongoing birth-related post-traumatic stress disorder after obstetric intervention during the birthing process.^[42] Factors like pain in the first stage of labor, feelings of powerlessness, intrusive emergency obstetric intervention are important in the subsequent development of psychological issues related to labor and delivery.^[42]

5.1.1 Subsequent pregnancies

Further information: Delivery after previous caesarean section

Women who have had a caesarean for any reason are somewhat less likely to become pregnant again as compared to women who have previously delivered only vaginally.^[43]

Women who had just one previous caesarean section are more likely to have problems with their second birth.^[19] Delivery after previous caesarean section is by either of two main options:^[44]

- Vaginal birth after caesarean section (VBAC)
- Elective repeat caesarean section (ERCS)

Both have higher risks than a vaginal birth with no previous caesarean section. A vaginal birth after caesarean section (VBAC) confers a higher risk of uterine rupture (5 per 1,000), blood transfusion or endometritis (10 per 1,000), and perinatal death of the child (0.25 per 1,000).^[45] Furthermore, 20% to 40% of planned VBAC attempts end in caesarean section being needed, with greater risks of complications in an emergency repeat caesarean section than in an elective repeat caesarean section.^{[46][47]} On the other hand, VBAC confers less maternal morbidity and a decreased risk of complications in future pregnancies than elective repeat caesarean section.^[48]

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5.1.2 Adhesions

There are several steps that can be taken during abdominal or pelvic surgery to minimize postoperative complications, such as the formation of adhesions. Such techniques and principles may include:

- Handling all tissue with absolute care
- Using powder-free surgical gloves
- Controlling bleeding
- Choosing sutures and implants carefully
- Keeping tissue moist
- Preventing infection with antibiotics given intravenously to the mother before skin incision

Despite these proactive measures, adhesion formation is a recognized complication of any abdominal or pelvic surgery. To prevent adhesions from forming after caesarean section, adhesion barrier can be placed during surgery to minimize the risk of adhesions between the uterus and ovaries, the small bowel, and almost any tissue in the abdomen or pelvis. This is not current UK practice, as there is no compelling evidence to support the benefit of this intervention.

Adhesions can cause long-term problems, such as:

- Infertility, which may end when adhesions distort the tissues of the ovaries and tubes, impeding the normal passage of the egg (ovum) from the ovary to the uterus. One in five infertility cases may be adhesion related (stoval)
- Chronic pelvic pain, which may result when adhesions are present in the pelvis. Almost 50% of chronic pelvic pain cases are estimated to be adhesion related (stoval)
- Small bowel obstruction: the disruption of normal bowel flow, which can result when adhesions twist or pull the small bowel.

The risk of adhesion formation is one reason why vaginal delivery is usually considered safer than elective caesarean section where there is no medical indication for section for either maternal or fetal reasons.

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5.2 Risks to Child

Non-medically indicated (elective) childbirth before 39 weeks gestation "carry significant risks for the baby with no known benefit to the mother." Newborn mortality at 37 weeks may be up to 3 times the number at 40 weeks, and is elevated compared to 38 weeks gestation. These early term births were associated with more death during infancy, compared to those occurring at 39 to 41 weeks (full term).^[49] Researchers in one study and another review found many benefits to going full term, but no adverse effects in the health of the mothers or babies.^{[49][50]}

The American Congress of Obstetricians and Gynecologists and medical policy makers review research studies and find more incidence of suspected or proven sepsis, RDS, hypoglycemia, need for respiratory support, need for NICU admission, and need for hospitalization > 4–5 days. In the case of caesarean sections, rates of respiratory death were 14 times higher in pre-labor at 37 compared with 40 weeks gestation, and 8.2 times higher for pre-labor caesarean at 38 weeks. In this review, no studies found decreased neonatal morbidity due to non-medically indicated (elective) delivery before 39 weeks.^[49]

For otherwise healthy twin pregnancies where both twins are head down a trial of vaginal delivery is recommended at between 37 and 38 weeks.^{[51][52]} Vaginal delivery, in this case, does not worsen the outcome for either infant as compared with caesarean section.^[52] There is some controversy on the best method of delivery where the first twin is head first and the second is not, but most obstetricians will recommend normal delivery unless there are other reasons to avoid vaginal birth.^[52] When the first twin is not head down, a caesarean section is often recommended.^[52] Regardless of whether the twins are delivered by section or vaginally, the medical literature recommends delivery of dichorionic twins at 38 weeks, and monochorionic twins (identical twins sharing a placenta) by 37 weeks due to the increased risk of stillbirth in monochorionic twins who remain in utero after 37 weeks.^{[53][54]} The consensus is that late preterm delivery of monochorionic twins is justified because the risk of stillbirth for post-37-week delivery is significantly higher than the risks posed by delivering monochorionic twins near term (i.e., 36–37 weeks).^[55] The consensus concerning monoamniotic twins (identical twins sharing an amniotic sac), the highest risk type of twins, is that they should be delivered by caesarean section at or shortly after 32 weeks, since the risks of intrauterine death of one or both twins is higher after this gestation than the risk of complications of prematurity.^{[56][57][58]}

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In a research study widely publicized, singleton children born earlier than 39 weeks may have developmental problems, including slower learning in reading and math.^[59]

Other risks include:

- Wet lung (Transient Tachypnea of the Newborn): Failure to pass through the birth canal does not expose the baby to cortisol and epinephrine which typically would reverse the potassium/sodium pumps in the baby's lung. This causes fluid to remain in the lung.^[60]
- Potential for early delivery and complications: Preterm delivery may be inadvertently carried out if the due-date calculation is inaccurate. One study found an increased complication risk if a repeat elective caesarean section is performed even a few days before the recommended 39 weeks.^[61]
- Higher infant mortality risk: In caesarean sections performed with no indicated medical risk (singleton at full term in a head-down position with no other obstetric or medical complications), the risk of death in the first 28 days of life has been cited as 1.77 per 1,000 live births among women who had caesarean sections, compared to 0.62 per 1,000 for women who delivered vaginally.^[62]

Birth by caesarean section also seems to be associated with worse health outcomes later in life, including overweight or obesity, problems in the immune system, and poor digestive system.^{[63][64]} However, caesarean deliveries are found to not affect a newborn's risk of developing food allergy.^[65] This finding contradicts a previous study that claims babies born via caesarean section have lower levels of *Bacteroides* that is linked to peanut allergy in infants.^[66]

6. Classification

Caesarean sections have been classified in various ways by different perspectives.^[52] One way to discuss all classification systems is to group them by their focus either on the urgency of the procedure (most common), characteristics of the mother, or as a group based on other, less commonly discussed factors.^[67]

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6.1 By Urgency

Conventionally, caesarean sections are classified as being either an elective surgery or an emergency operation.^[68] Classification is used to help communication between the obstetric, midwifery and anaesthetic team for discussion of the most appropriate method of anaesthesia. The decision whether to perform general anaesthesia or regional anaesthesia (spinal or epidural anaesthetic) is important and is based on many indications, including how urgent the delivery needs to be as well as the medical and obstetric history of the woman.^[68] Regional anaesthetic is almost always safer for the woman and the baby but sometimes general anaesthetic is safer for one or both, and the classification of urgency of the delivery is an important issue affecting this decision.

A planned caesarean (or elective/scheduled caesarean), arranged ahead of time, is most commonly arranged for medical indications which have developed before or during the pregnancy, and ideally after 39 weeks of gestation. In the UK, this is classified as a 'grade 4' section (delivery timed to suit the mother or hospital staff) or as a 'grade 3' section (no maternal or fetal compromise but early delivery needed). Emergency caesarean sections are performed in pregnancies in which a vaginal delivery was planned initially, but an indication for caesarean delivery has since developed. In the UK they are further classified as grade 2 (delivery required within 90 minutes of the decision but no immediate threat to the life of the woman or the fetus) or grade 1 (delivery required within 30 minutes of the decision: immediate threat to the life of the mother or the baby or both.)^[69]

Elective caesarean sections may be performed on the basis of an obstetrical or medical indication, or because of a medically non-indicated maternal request.^[51] Among women in the United Kingdom, Sweden and Australia, about 7% preferred caesarean section as a method of delivery.^[51] In cases without medical indications the American Congress of Obstetricians and Gynecologists and the UK Royal College of Obstetricians and Gynaecologists recommend a planned vaginal delivery.^[70] The National Institute for Health and Care Excellence recommends that if after a woman has been provided information on the risk of a planned caesarean section and she still insists on the procedure it should be provided.^[51] If provided this should be done at 39 weeks of gestation or later.^[70] There is no evidence that ECS can reduce mother-to-child hepatitis B and hepatitis C virus transmission.^{[71][72][73][74][75]}

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6.2 By characteristics of the mother: Caesarean Delivery on Maternal Request, Caesarean delivery on maternal request (CDMR) is a medically unnecessary caesarean section, where the conduct of a childbirth via a caesarean section is requested by the pregnant patient even though there is not a medical indication to have the surgery.^[76] Systematic reviews have found no strong evidence about the impact of caesareans for nonmedical reasons.^{[51][77]} Recommendations encourage counseling to identify the reasons for the request, addressing anxieties and information, and encouraging vaginal birth.^{[51][78]} Elective caesareans at 38 weeks in some studies showed increased health complications in the newborn. For this reason ACOG and NICE recommend that elective caesarean sections should not be scheduled before 39 weeks gestation unless there is a medical reason.^{[79][80][70]} Planned caesarean sections may be scheduled earlier if there is a medical reason.^[80]

6.2.1 After previous caesarean: Mothers who have previously had a caesarean section are more likely to have a caesarean section for future pregnancies than mothers who have never had a caesarean section. There is discussion about the circumstances under which women should have a vaginal birth after a previous caesarean.

Vaginal birth after caesarean (VBAC) is the practice of birthing a baby vaginally after a previous baby has been delivered by caesarean section (surgically).^[81] According to the American College of Obstetricians and Gynecologists (ACOG), successful VBAC is associated with decreased maternal morbidity and a decreased risk of complications in future pregnancies.^[48] According to the American Pregnancy Association, 90% of women who have undergone caesarean deliveries are candidates for VBAC.^[46] Approximately 60–80% of women opting for VBAC will successfully give birth vaginally, which is comparable to the overall vaginal delivery rate in the United States in 2010.^{[64][47][82]}

6.2.2 Twins

For otherwise healthy twin pregnancies where both twins are head down a trial of vaginal delivery is recommended at between 37 and 38 weeks.^{[51][52]} Vaginal delivery in this case does not worsen the outcome for either infant as compared with caesarean section.^[37] There is controversy on the best method of delivery where the first twin is head first and the second is not.^[52] When

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the first twin is not head down at the point of labor starting, a caesarean section should be recommended.^[52] Although the second twin typically has a higher frequency of problems, it is not known if a planned caesarean section affects this.^[51] It is estimated that 75% of twin pregnancies in the United States were delivered by caesarean section in 2008.^[83]

6.2.3 Breech Birth

A breech birth is when a baby is born bottom first instead of head first, as it is normal.

Babies are usually born head first. If the baby is in another position the birth may be complicated. Babies born bottom-first are more likely to be harmed during a normal (vaginal) birth than those born head-first. For instance, the baby might not get enough oxygen during the birth. Having a planned caesarean may reduce these problems.

The bottom-down position presents some hazards to the baby during the process of birth, and the mode of delivery (vaginal versus caesarean) is controversial in the fields of obstetrics and midwifery.

7. The C-section Technique

Antibiotic prophylaxis is used before an incision. The uterus is incised, and this incision is extended with blunt pressure along a cephalad-caudad axis. The infant is delivered, and the placenta is then removed. The surgeon then makes a decision about uterine exteriorization. Single-layer uterine closure is used when the mother does not want a future pregnancy. When subcutaneous tissue is 2 cm thick or more, surgical suture is used.^[84] Discouraged practices include manual cervical dilation, any subcutaneous drain,^[85] or supplemental oxygen therapy with intent to prevent infection.

Anesthesia, both general and regional anaesthesia (spinal, epidural or combined spinal and epidural anaesthesia) are acceptable for use during caesarean section.

8. Rates and Trends of C-Section in Egypt and some foreign countries

Global rates of caesarean section are increasing. It doubled from 2003 to 2018 to reach 21%, and is increasing annually by 4%. The trend towards increasing rates is particularly strong in middle and high income countries.^[86] In southern Africa, the cesarean rate is less than 5%; while the rate is almost 60% in some

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parts of Latin America.^[87] The Canadian rate was 26% in 2005–2006.^[88] Australia has a high caesarean section rate, at 31% in 2007.^[89] At one time a rate of 10% to 15% was thought to be ideal;^[20] a rate of 19% may result in better outcomes.^[24] The World Health Organization officially withdrew its previous recommendation of a 15% C-section rate in June 2010. Their official statement read, "There is no empirical evidence for an optimum percentage. What matters most is that all women who need caesarean sections receive them."^[90]

More than 50 nations have rates greater than 27%. Another 45 countries have rates less than 7.5%.^[24] There are efforts to both improve access to and reduce the use of C-section.^[8] Globally, 1% of all caesarean deliveries are carried out without medical need. Overall, the caesarean section rate was 25.7% for 2004–2008.^{[91][92]}

There is no significant difference in caesarean rates when comparing midwife continuity care to conventional fragmented care.^[93] More emergency caesareans—about 66%—are performed during the day rather than the night.^[94]

The rate has risen to 46% in China and to levels of 25% and above in many Asian, European and Latin American countries.^[95] In Brazil and Iran the caesarean section rate is greater than 40%.^[96] Brazil has one of the highest caesarean section rates in the world, with rates in the public sector of 35–45%, and 80–90% in the private sector.^[97]

8.1 Europe

Across Europe, there are differences between countries: in Italy the caesarean section rate is 40%, while in the Nordic countries it is 14%.^[98] In the United Kingdom, in 2008, the rate was 24%.^[99] In Ireland the rate was 26.1% in 2009.^[100]

In Italy, the incidence of caesarean sections is particularly high, although it varies from region to region.^[101] In Campania, 60% of 2008 births reportedly occurred via caesarean sections.^[102] In the Rome region, the mean incidence is around 44%, but can reach as high as 85% in some private clinics.^{[103][104]}

8.2 United States

In the United States, cesarean deliveries began rising in the 1960s and started becoming routine in the 1960s and 1970s.^[86]

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In the United States the rate of C-section is around 33%, varying from 23% to 40% depending on the state.^[19] One of three women who gave birth in the US delivered by caesarean in 2011. In 2012, close to 23 million C-sections were carried out globally.^[24]

With nearly 1.3 million stays, caesarean section was one of the most common procedures performed in U.S. hospitals in 2011. It was the second-most common procedure performed for people ages 18 to 44 years old.^[105] Caesarean rates in the U.S. have risen considerably since 1996.^[106] the rate has increased in the United States, to 33% of all births in 2012, up from 21% in 1996.^[19] In 2010, the caesarean delivery rate was 32.8% of all births (a slight decrease from 2009's high of 32.9% of all births).^[107] a study found that in 2011, women covered by private insurance were 11% more likely to have a caesarean section delivery than those covered by Medicaid.^[108] the increase in use has not resulted in improved outcomes, resulting in the position that C-sections may be done too frequently.^[3] It is believed that the high rate of induced deliveries has also led to the high rate of C-sections because they are twice as likely to lead to one.^[109]

Hospitals and doctors make more money from C-section births than vaginal deliveries. Economists have calculated that hospitals may make a few thousand dollars more and doctors a few hundred. It has been found that for-profit hospitals do more C-sections than non-profit hospitals.^[127] One study looked at the rate of C-sections done for women who were themselves doctors. It found that there was a 10 percent decrease to the rate of C-sections vs the general population. But if the hospital paid their doctors a flat salary removing the incentive to do the surgical procedures, which take more time, the rate of C-sections done on women who were themselves physicians exceeded that of the procedure done on non-medically knowledgeable mothers, suggesting that some women who actually needed C-sections were not getting them.^[110]

Concerned over the rising number of cesarean deliveries and hospital costs, in 2009 Minnesota introduced a blended payment rate for either vaginal or cesarean uncomplicated births (i.e., a similar payment regardless of delivery mode). As a result, the prepolicy cesarean rate of 22.8% dropped 3.24 percentage points. The cost of childbirth hospitalizations in Minnesota dropped by \$425.80 at the time the policy was initiated and continued to drop by \$95.04 per quarter with no significant effects on maternal morbidity.^[111]

The rise of cesarean births in the United States has coincided with counter-movements emphasizing natural childbirth with a lesser degree of medical intervention.^[86]

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8.3 China

The rate of cesarean sections began to sharply increase in China in the 1990s. This increase was driven by the expansion of China's modern hospital infrastructure, and occurred first in urban areas. The rise in cesarean deliveries has also resulted in social critique of the medical establishment over the medical necessity of performing cesarean sections. ^[86]

8.4 Egypt

This section related to the C-Section trends in Egypt from the Egyptian Demographic Health Survey (EDHS) during the period from 2008-2022 and how the caesarean section trends increased from 2008-2022 through the past 14 years in Egypt.

8.4.1 Egypt DHS 2014 and 2021 Results:

The 2014 EDHS obtained information on the frequency of caesarean sections. The data on caesarean deliveries are presented in Table 1.

Slightly more than half of the live births in the five-year period before the 2014 EDHS were by caesarean section. Women delivering in a private health facility were more likely than women delivering in a government facility to have a caesarean delivery (66 percent and 45 percent, respectively). Women who were less than 20 years at the time of the delivery were only slightly less likely than older women to deliver by caesarean section. Sixty percent of first births were delivered by caesarean section, almost twice the rate among births of order six or higher. Six in 10 urban births were caesarean deliveries compared to 48 percent of rural births. Considering place of residence, urban Lower Egypt had the highest proportion of caesarean deliveries (71 percent) followed by the Urban Governorates (62 percent). The likelihood of a caesarean delivery increased with the mother's educational status and was slightly greater among women working for cash than among other women. Two-thirds of births among women in the highest wealth quintile were caesarean deliveries compared to 38 percent among women in the lowest quintile.

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The EFHS-2021 obtained information on the frequency of caesarean sections. Results presented in table 1 indicate that 7 in 10 births in the five-year period before the survey were by caesarean section. Women delivering in a private health facility were facility to have a caesarean delivery (81% and 63%, respectively). Women who were less than 20 years at the time of the delivery were only slightly less likely than older women to deliver by caesarean section. Seventy-six percent of first births were delivered by caesarean section which is 13 percentage points higher than the rate among births of order six or higher. Considering variations by place of residence, urban Lower Egypt had the highest proportion of caesarean deliveries (84%) followed by the urban Upper Egypt (76%). The likelihood of a caesarean delivery increased with the mother's educational status and was slightly higher among women working for cash than among other women. Also, results show more than 80% of births among women in the highest wealth quintile were caesarean deliveries compared to 60% among women in the lowest quintile.

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Table 1: Caesarean Deliveries

Percentage of live births in the five-year period before the survey that were delivered by caesarean section, according to selected background characteristics, Egypt 2014 and 2021.

Statement	2014-2021		2014-2021	
Background Characteristic	Caesarean Delivery	Caesarean Delivery	Number of Births	Number of Births
Place of delivery				
1.Public health facility	45.3	63	4007	3123
2.Private health facility	65.7	80.8	9576	8926
3.At home/other	N/A	N/A	2085	677
Mother's age at birth				
<20	45.7	67.6	1468	1378
20-34	52.4	72.6	12868	9930
35-49	52.7	74.2	1332	1418
Birth order				
1	60	75.8	4962	3300
2-3	51.9	73.7	7731	6635
4-5	38.8	64.7	2452	2375
6+	33	63	524	417
Urban-rural residence				
Urban	60.1	77.4	4845	4265
Rural	48.1	69.6	10823	8461
Place of residence				
1.Urban Governorates	62	75	1599	1546
2.Lower Egypt	60.3	78.5	7431	5183
Urban	70.6	83.8	1430	1198
Rural	57.8	76.9	6001	3985
3.Upper Egypt	39.7	66.4	6484	5829
Urban	50.2	76.2	1733	1407
Rural	35.9	63.3	4751	4422
4.Frontier Governorates	41.1	53.6	154	167
Education				
1.No Education	37	61.6	2798	1407
2.Some Primary	43.5	67	734	538
3.Primary complete/some Secondary	46.4	67.3	2847	3202
4.Secondary complete/higher	58.5	76.6	9289	75799
Work Status				
1. Working for cash	55.9	78	1681	1435
2. Not working for cash	51.3	71.5	13987	11291
Wealth Quintile				
1. Lowest	38	60.3	2820	2124
2.Second	41.8	66.7	3074	2540
3.Middle	52.9	71.2	3906	2685
4.Fourth	59.4	77.9	3279	2804
5. Highest	67.2	82.3	2588	2573
Total	51.5	72.2	15668	12726

N/A= Not Available

Don't include north Sinai Governorate

Data recorder via EDHS 2008-2022 documents

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Table 2 show the Caesarean section, by governorate via EDHS 2014 and 2021

Table 2: Caesarean Section, by Governorate

EDHS	2014	2021	2014	2021
Governorate	Caesarean Section	Caesarean Section	Number of Births	Number of Births
Urban		75.0	1599	1546
1.Cairo	58.6	73.7	1,060	918
2.Alexandria	68.0	76.1	472	488
3.Port Said	76.6	91.3	53	64
4.Suez	59.0	69.0	14	76
Low Egypt		78.5	6231	5183
1.Damietta	76.0	82.5	284	152
2.Dakahlia	65.5	82.3	1,088	747
3.Sharkia	53.1	72.3	1,390	994
4.Kalyubia	57.0	79.5	749	710
5.Kafr-ElSheikh	70.4	88.4	648	411
6.Gharbia	65.0	84.3	924	583
7.Menoufia	59.1	73.0	757	501
8.Behera	56.0	77.8	1,459	921
9.Ismailia	50.4	64.7	132	165
Upper Egypt		66.4	6485	5892
1.Giza	43.1	67.3	1,396	1082
2.BeniSuef	44.3	61.5	581	576
3.Fayoum	38.9	67.0	671	648
4.Menya	41.8	68.5	869	882
5.Assuit	34.8	66.6	981	781
6.Souhag	35.6	65.1	935	859
7.Qena	39.7	63.3	617	598
8.Aswan	39.7	68.3	270	206
9.Luxor	40.2	77.3	165	196
Frontier		53.6	154	167
Red Sea	50.9	70.8	61	43
New Valley	47.7	66.0	37	27
Matroh	26.2	66.7	56	11
Total	51.8	72.2	15,668	12726

Table 3: Show the Egypt governorates ordering according to the Caesarean-Section from smallest to largest to show the more applicable governorates to Caesarean- Section overall the Arab Republic of Egypt via the period 2008-2022.

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Table3: Egypt Governorates Ranking According to the Caesarean -Section 2008-2022

2014 Caesarean Section			2021 Caesarean Section		
Governorate	Ranking		Governorate	Ranking	
Matroh	26.2	1	Beni Suef	61.5	10
Assuit	34.8	2	Qena	63.3	5
Sohag	35.6	3	Ismailia	64.7	13
Fayoum	38.9	4	Sohag	65.1	3
Qena	39.7	5	New Vally	66.0	11
Aswan	39.7	6	Assuit	66.6	2
Luxor	40.2	7	Matroh	66.7	1
Menya	41.8	8	Fayoum	67.0	4
Giza	43.1	9	Giza	67.3	9
Beni Suef	44.3	10	Aswan	68.3	6
New Valley	47.7	11	Menya	68.5	8
Red Sea	50.9	12	Suez	69.0	18
Ismailia	50.4	13	Red Sea	70.8	12
Sharkia	53.1	14	Sharkia	72.3	14
Behera	56.0	15	Menoufia	73.0	19
Kalyubia	57.0	16	Cairo	73.7	17
Cairo	58.6	17	Alexandria	76.1	22
Suez	59.0	18	Luxor	77.3	7
Menoufia	59.1	19	Behera	77.8	15
Gharbia	65.0	20	Kalyubia	79.5	16
Dakahalia	65.5	21	Dakahlia	82.3	21
Alexandria	68.0	22	Damietta	82.5	24
Kafr-ElSheikh	70.4	23	Gharbia	84.3	20
Damietta	76.0	24	Kafr-ElSheikh	88.4	23
Port Said	76.6	25	Port Said	91.3	25

Source: Researcher ranking according to EDHS Data during 21008-2022

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9. Conclusions and Contribution:

The recorded data in the previous tables 1, 2, and 3 indicates that the increase in Caesarean Section has become a reality among or between the Egyptian Governorates , and at the same time there is a general trend of declining in fertility rates during the period from 2008-2022.

The main difference between them that the trend of declining in fertility rates may be changed with the changes in the economic conditions of the family , this is the dialectical relationship between fertility rates and living conditions, but the fact related to the increase in Caesarean Section has included many factors such that: the mother health condition, the doctors persuasion of the pregnant mother to have a Caesarean Section fear for the child, the child position in mother womb, the desire of the couple to Caesarean Section outside the vagina, repeated Caesarean Section, or other factors affect in increasing Caesarean Section in Egypt and around the world.

Additionally, there are Governorates in Egypt have maintained their position in Caesarean Section since 2008-2022 despite the increase in the number of Caesarean Section such that: Giza Governorates have the ninth order between the Governorates and its percentage changed from 2008-2022 from 43.1 to 67.3, Sharkia have the fourteenth order with increase from 53.1 to 72.3, Dakahlia have the twenty – first order with an increase from 65.5 to 82.3 , and Port Said increased from 76.6 to 91.3 and its takes the twenty fifth order and it's the highest governorates over all Egyptian Governorates.

Additionally, Women who had caesarean sections are more likely to have problems with later pregnancies, and women who want larger families should not seek an elective caesarean unless medical indications to do so exist. The risk of placenta accreta, a potentially life-threatening condition which is more likely to develop where a woman has had a previous caesarean section, is 0.13% after two caesarean sections, but increases to 2.13% after four and then to 6.74% after six or more. Along with this is a similar rise in the risk of emergency hysterectomies at delivery.

Women who had just one previous caesarean section are more likely to have problems with their second birth. Delivery after previous caesarean section is by either of two main options:

- Vaginal birth after caesarean section (VBAC)
- Elective repeat caesarean section (ERCS)

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Finally, from my personal point of view, as a result of following up on many cases from my relatives, the main reasons related to high rates of caesarean sections in all governorates of Arab Republic of Egypt compared with the past years from 2008 and also before that, all of which were natural vaginal births, and this is due to many reasons including the following:

- 1- For financial reasons only, as the cost of caesarean sections is much bigger than the cost of natural or vaginal birth.
- 2- The ease of childbirth is up to the doctor itself, not to the mother, because natural childbirth is undoubtedly easier than cutting into the mother's abdomen.
- 3- There are no any problems that Egyptian mothers faced recently to convert all of births to caesarean sections especially in a governorates like Port Said governorates.

10. Recommendation for Further Researches

For all the above reasons, it is necessary to conduct future researches include the following:

1. Conduct a questionnaire and survey in every Public health facility and Private health facility all over the 25 Governorates in Arab Republic of Egypt to determine the main responsible reason for the rapid increasing in Caesarean Section in Egypt Governorates, with completely confidential and secret data from husband and wife in the following form:

1. Mother Name
2. Father Name
3. Mother Position
4. Father Position
5. Is the First Birth
6. The Mother Desires for Natural Birth
7. The Mother Desire for Caesarean Section
8. Chose the Caesarean Section from the following reasons:
 - Doctor Persuasion,
 - Mother Desire,
 - Father Desire,
 - Mother Health,
 - Child Health,
 - Repeated Caesarean Section,
 - Otherwise

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2. Conducting educational courses for pregnant mother's through periodic bulletins and distributed in the pregnancy follow up medical centers or on social media programs to increase the mother's awareness and to be familiarize with the Caesarean Section process and very closely by the advantages and disadvantages of the Caesarean Section and her need or not for Caesarean Section and conducting a research analysis the collected data to assist in making effective decisions related to Caesarean Section.

3. Conduct a comparison between the results of the last three EDHS for the Arab Republic of Egypt, which were conducted from the years 2008-2015 and 2015-2022 ,m and the new survey which will be conducted between 2023-2028 which will not be completed until now and follow the results related to Caesarean Section continues increasing or not.

4. Conduct a regional survey related to the women health after a Caesarean Section and analysis the results to find if there are risks related to the Caesarean Section or not.

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