

# Cesarean Delivery, Review Article

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## ABSTRACT

The rates of cesarean section (CS) in Egypt have increased from 10.3 percent in 2000 to 19.9 percent in 2005, 27.6 percent in 2008, and 51.8 percent in 2014. Rates reached as high as 63% by the year 2015. A cesarean section entails the delivery of a fetus via an abdominal incision (laparotomy) and a uterine incision (hysterotomy). The classification of cesarean sections pertains to the urgency required to preserve the mother's or fetus's life, with the mother's life always prioritized over that of the fetus, unless in circumstances where the surgical intervention cannot alter the mother's prognosis. Cesarean section is the most prevalent surgical intervention. Numerous factors exist that may preclude or contraindicate vaginal delivery of a pregnancy. A cesarean section is a viable option if the pregnant patient is deceased or in critical condition, or if the fetus is deceased or in critical condition. Undergoing a cesarean section subjects the pregnant patient to the inherent hazards of the procedure without providing any advantages for the fetus. The same principles are applicable in cases where the fetus presents with serious abnormalities that are incompatible with life. Various strategies are delineated, including the classic Pfannenstiel-Kerr methodology, the Joel-Cohen method, and the Misgav Ladach technique. Hemorrhage is the most common complication associated with cesarean sections, occurring either during or after the procedure, along with urological injuries, intestinal lesions, and anesthesia issues. Early postoperative complications include hemorrhage, infection, and thromboembolism, as well as late postoperative issues.

**Keywords:** Cesarean; Fetus; Hemorrhage; Pregnant; Uterus; Thromboembolisms.

## INTRODUCTION

The fetus is delivered by a hysterotomy and an open abdominal incision in a cesarean section. Since its first recorded use in 1020 AD, the cesarean section has seen remarkable development. More than one million women receive cesarean delivery every year, making it the most common surgical procedure in the US. From 1970 to 2016, the rate of cesarean deliveries increased from five percent to 31.9 percent. Several reasons have contributed to this dramatic rise, such as changes in maternal age, new medical techniques that enable more complex pregnancies to go forward, and new approaches to obstetric care. Experts believe that a substantial fall in the cesarean rate will not occur for at least another decade or more, despite continuous efforts to do so through programs such as encouraging natural labor when safe and promoting vaginal deliveries after cesarean sections. Cesarean sections include the risk of both short-term and long-term problems, yet they may be the best (or only) option for certain mothers to ensure a healthy baby is born <sup>(1)</sup>.

### Clinical significance

The mother's life should be the primary target of resuscitative hysterotomy. By enhancing venous return and minimizing gravid uterine compression of the IVC (Inferior Vena Cava), PMCS (perimortem cesarean section) increases maternal survival. In addition to enhancing diaphragmatic displacement, which boosts respiratory dynamics, PMCS <sup>(2)</sup>.

### Classification of cesarean sections

Classification is based on the relative urgency of the two lives in danger—the mother's and the fetus's. Unless absolutely necessary, the surgical treatment should always

put the mother's life ahead of the fetal life. Many different meanings can be attached to the term "emergency," each with its own level of seriousness. After the choice to give birth has been made, the mother and infant should be protected, and the delivery should be carried out as quickly as possible. It is important to aim for a shorter decision-to-delivery time in these types of situations <sup>(3)</sup>.

**Table 1.** Classification of cesarean sections according to the degree of urgency <sup>(3)</sup>.

Category	Description
1	Immediate danger to the mother or fetus's life
2	Maternal or fetal compromise, no immediate threat to the mother's or the fetus' life
3	No risk to mother or child, but early delivery is necessary.
4	The option to give birth whenever it is most convenient for the mother and the maternity services

### Epidemiology

The most common surgical procedures are cesarean sections. Since the number of live births should be 22 weeks rather than stillbirths, it is clear that this definition does not adhere to the statistical guideline. Consequently, the denominator should reflect the number of pregnant women who have reached this point in their pregnancies. In contrast to elective cesarean sections, most cesarean sections are performed in response to medical emergency. Compared to the United States, where 63 percent of

cesarean sections were emergencies, 80.9% of operations in South Africa were considered to be emergencies <sup>(3)</sup>.

### Indications

Numerous factors exist that may preclude or contraindicate vaginal delivery of a pregnancy. Some of these reasons are rigid, as vaginal delivery may pose risks in specific clinical situations <sup>(4)</sup>.

**Maternal Indications for Cesarean** <sup>(4)</sup>: Cesarean section, history of pelvic or anal/rectal reconstructive surgery, maternal request, perineal trauma, heart or lung disease, herpes simplex virus or HIV infection, cerebral aneurysm or arteriovenous malformation, pathology requiring concurrent intraabdominal surgery, and perimortem cesarean section are all reasons for a cesarean section to be performed.

**Uterine/Anatomic Indications for Cesarean** <sup>(4)</sup>: Placental abruption, abnormal placentation (such as placenta previa or accreta), a history of invasive cervical cancer, a history of uterine incision dehiscence, a previous trachelectomy, a mass obstructing the vaginal tract, and persistent cerclage are all potential complications.

**Fetal Indications for Cesarean** <sup>(4)</sup>: A positive fetal status (such as a normal fetal cardiac trace or aberrant fetal umbilical cord Doppler study), abnormal fetal presentation, macrosomia, congenital abnormalities, thrombocytopenia, previous newborn birth trauma, and umbilical cord prolapse are all causes for concern.

### Contraindications

True medical contraindications to cesarean sections do not exist. A cesarean section can be considered if the mother or the unborn child is in critical condition. When the pregnant woman declines, it is morally wrong to perform a cesarean section. Contraindications to cesarean section may exist in certain medical contexts. These comparable contraindications might be taken into account. Surgery poses a particularly high risk to pregnant patients due to conditions such as severe coagulopathy. Then a vaginal birth might be the best option. On the flip side, a patient's surgical suitability could be compromised if they have a lengthy record of abdominal surgeries. There is no benefit to the fetus from having a cesarean section performed, and the pregnant patient is put at danger of complications. Similarly, if the fetus has serious abnormalities that cannot support life, the same factors must be taken into account <sup>(4)</sup>.

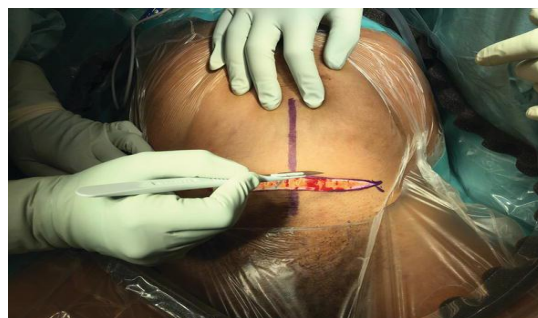
### The Surgical Technique of cesarean section

Methods such as the traditional Pfannenstiel-Kerr technique, the Joel-Cohen method, as well as the Misgav Ladach methodology are described <sup>(5)</sup>.

CS are performed utilizing a multi-faceted approach. The Pfannenstiel incision, seen in **Figures 1-3**, is the foundation of **the Pfannenstiel-Kerr surgery**. Two fingers above the symphysis pubis is where the transverse skin incision begins. Next, it continues along the path of the anterior superior iliac spine (ASIS) and ends two to three centimeters medial to the ASIS on each side. A shallow uterine incision, blunt entrance, fascial extension, and sharp dissection are utilized to open the subcutaneous layer. After the placenta is removed physically, the uterine closure is accomplished by interrupting the single layer of closure. Continuous suturing of the skin and uninterrupted suturing of the subcutaneous layer follow the closure of the peritoneum and fascia <sup>(5)</sup>.



**Figure (1):** A thirty seven-year-old IGOP who is thirty eight weeks and five days <sup>(5)</sup>.



**Figure (2):** The incision on the skin is indicated <sup>(5)</sup>.



**Figure (3):** A complete incision has been made in the skin <sup>(5)</sup>.

In the **Joel-Cohen procedure**, the subcutaneous tissue is only cut in the three centimeters on the medial side, and the lateral tissue is manually separated. After making a deep incision with the knife, put both index fingers into the fascial space to produce a blunt division. The new skin incision is made three centimeters higher than the previous Pfannenstiel incision. The following step

is to use blunt pliers to open the peritoneum, cut into the uterine cavity, and then use two blunt pliers to further widen the incision laterally <sup>(5)</sup>.

The placenta is pushed out of the body after the baby is born. A single interrupted layer is used for uterine closure, the peritoneal closure is skipped, and the fascial closure is equally disrupted. Continuous suturing of the skin replaces the subcutaneous suture (**Figures 4 and 5**) <sup>(5)</sup>.

Compared to the Pfannenstiel-Kerr approach, the Joel-Cohen procedure is said to be quicker, utilize less anesthesia, reduce postoperative discomfort, shorten the hospital stay, decrease postoperative infection, be more economical, and save more staff time <sup>(5)</sup>.



**Figure (4).** After the cesarean section, the skin is being sutured <sup>(5)</sup>.

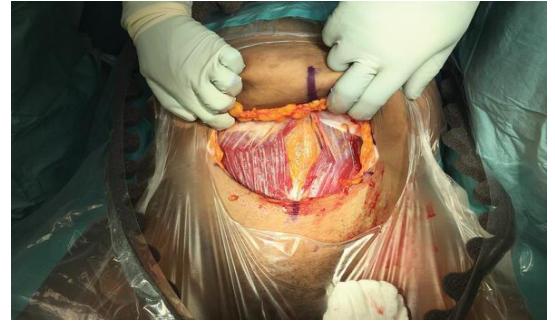


**Figure (5).** View completed cesarean section <sup>(5)</sup>.

**Michael Stark** originally detailed the **Misgav Ladach method** of cesarean section using the Joel-Cohen incision. Its debut was at Israel's Misgav Ladach Hospital. **Figures 6 and 7** show the fascia and uterus being sharply incised prior to the abrupt dissection of all abdominal walls, which follows a transverse uterine incision five centimeters over the symphysis pubis (**Figure 8**) <sup>(6)</sup>.



**Figure (6):** Dissection of the fascia and blunt dilation of the abdominal rectus muscles <sup>(5)</sup>.

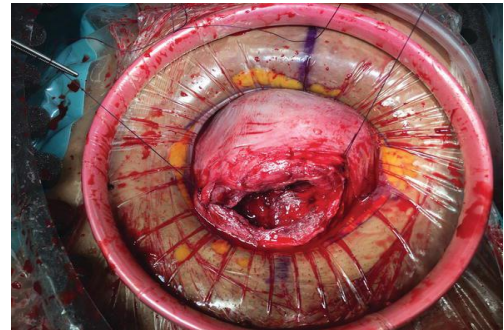


**Figure (7):** Additional cranial digital preparation <sup>(5)</sup>.

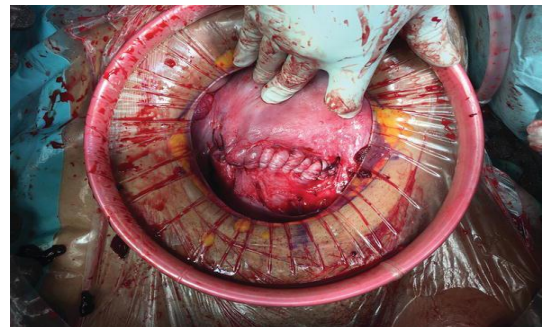


**Figure (8):** Following uterine incision, myometrial dilatation <sup>(5)</sup>.

After the infant is born, the placenta is carefully removed by hand. Many people in the 1990s also thought it was permissible to suture the uterus with one running layer (**Figures 9 and 10**), and not close the peritoneum. A mattress suture is used to seal the skin, the subcutaneous layer is left unstitched, and the fascia is continually sutured. In 1995, **Stark** <sup>(7)</sup> proposed an adaptation of the **Misgav Ladach method** <sup>(7)</sup>.



**Figure (9):** After the baby is extracted and the edges are fastened, the procedure of continuous uterine suture will begin <sup>(5)</sup>.



**Figure (10):** Uterine suture completion <sup>(5)</sup>.

The **Misgav Ladach** technique is purported to offer numerous advantages over the **Pfannenstiell-Kerr** technique. The primary distinctions include computerized manual manipulation rather than the use of sharp instruments, resulting in minimal tissue trauma, reduced blood loss, expedited recovery, shorter anesthetic duration, and decreased suture material utilization. The method has been associated with fewer cases of fever and UTIs, a quicker recovery to normal bowel function, a shorter hospital stay for the mother, and less postoperative adhesion formation, among other benefits. Both planned and unplanned cesarean sections can be performed using the **Misgav Ladach** method. In contrast to the original **Misgav Ladach** method, the modified version makes use of a Pfannenstiell skin incision, which allows for the placenta to be delivered spontaneously, peritoneal closure, and continuous skin closure<sup>(8)</sup>.

### **Complications of cesarean section**

#### **Trans-surgical complications**

Most complications involving cesarean sections occur either during or after the procedure, although the most common of them is hemorrhage. On a global scale, nevertheless, estimates put the percentage of obstetric hemorrhages that occur during cesarean sections at about 75%<sup>(9)</sup>.

#### **Urological injuries**

The bladder is delicate and might be damaged during cesarean sections because of the meticulous dissections required to remove it. Although ureteral injury can occur from angulation, ligation, or partial or complete section, this is the most common urinary organ lesion. During surgery, a bladder injury is easy to spot, but a ureteral injury, which needs to be suspected in order to be detected quickly, is more difficult. There is a dramatic decrease in morbidity when damage is repaired promptly<sup>(10)</sup>.

**Intestinal lesions:** Intestinal lesions during cesarean sections are exceedingly uncommon, typically arising as a consequence of an urgent abdominal intervention involving intestinal adhesions to the front wall, sometimes due to prior non-obstetric procedures<sup>(11)</sup>.

**Anesthetic complications:** Their occurrence is exceedingly uncommon; however, they are frequently accompanied by severe morbidity, which can be fatal. One of the most prevalent complications of regional anesthesia is hypotension, which is exacerbated by aorto-caval compression as a result of sympathetic nerve block<sup>(12)</sup>.

#### **Early postsurgical complications**

**Hemorrhage:** Hypotonia or uterine atony is the primary cause of postsurgical hemorrhage, which is typically

treated with sustained uterotonic medications in the hours following the surgery<sup>(13)</sup>.

**Infection:** Factors such as the length of labor, the time it takes for the chorioamniotic membranes to rupture, the number of vaginal examinations performed, the patient's nutritional status, inadequate aseptic procedures, and the amount of time spent surgically all contribute to the majority of patients contracting an infection caused by their own microflora. A major cause of hospital readmission and, by extension, higher healthcare expenditures, is infection during cesarean section<sup>(14)</sup>.

Quinolones are an excellent choice for treating endometritis when it is associated with infections of the urinary tract or surgical site<sup>(15)</sup>.

**Thromboembolisms:** Thromboembolisms occur more frequently in cesarean sections than in vaginal deliveries, exacerbated by the common triad of venous stasis, hypercoagulability, and endothelial damage related to gestation<sup>(16)</sup>.

**Late postsurgical complications:** Postoperative consequences may include abdominal wall endometriosis at the surgery site, adhesion formation, and significant risks such as low placental insertion, placental accreta, or uterine rupture in subsequent pregnancies<sup>(17)</sup>.

### **Awareness, Knowledge, and Attitude of Egyptian Women toward Cesarean Delivery**

Worldwide, cesarean sections (CS) rank high among the most prevalent types of major surgeries. The treatment is essential for preventing complications during pregnancy and the delivery of a healthy baby, but it is not without risks, both immediate and later on. Cesarean sections should constitute no more than ten to fifteen percent of all births, says the World Health Organization. No reduction in maternal and newborn mortality is observed when the CS rate is between nine and sixteen percent, as determined by a recent systematic review. Nevertheless, the rates in numerous countries appear to significantly exceed the recommended optimal rate and, regrettably, continue to escalate. Between 2000 and 2015, global CS rates nearly doubled, with the largest rates observed in Argentina, Colombia, the Dominican Republic, and Egypt. In contrast to many impoverished African nations where cesarean section rates are remarkably low, often below two percent of all deliveries, Egypt exhibits a significantly elevated rate<sup>(18)</sup>.

Multiple interconnected causes may contribute to the significant increase in the rate of unindicated CDs in Egypt. Remarkably, the healthcare system in Egypt is nearly devoid of national or institutional practice norms. Furthermore, childbirth classes, education, as well as counseling are not included in standard antenatal care<sup>(19)</sup>.

In the private sector, a substantial number of Egyptian healthcare providers have expressed their unwillingness to opt for obstetric practices that reduce the need for cesarean deliveries, including external cephalic version, breech delivery, trial of labor in cases of mild cephalopelvic disproportion, and instrumental delivery. An additional factor that may encourage healthcare clinicians to recommend cesarean sections to women is the disparity in compensation between vaginal and cesarean deliveries. The erroneous belief that cesarean section is safer for the infant, apprehension regarding pain, prevalent misconceptions about post-delivery urinary and sexual functions, as well as insufficient awareness of the benefits of vaginal delivery may prompt women in labor, their families, and society to favor cesarean delivery<sup>(20)</sup>.

Global variables contributing to the increasing prevalence of cesarean deliveries include convenience for both the lady and doctor, apprehension regarding medicolegal repercussions, insufficient training in aided vaginal deliveries, and excessive reliance on enhanced fetal monitoring. However, other additional elements in Egypt remain unidentified and warrant investigation. Possessing one of the highest cesarean section rates globally, this underscores the impact of inadequate understanding on the prevalence of unindicated cesarean deliveries among women. The elevated prevalence of CDs is documented in Egypt.

**Al-Rifai and Aziz**<sup>(21)</sup> concluded that the foundational understanding of CD among Egyptian women is insufficient. Our hospital<sup>(20)</sup> is a tertiary university facility located in the metropolis, Cairo, with a high cesarean section rate. In 2008, 2009, 2010, 2011, in addition to 2012, our rates reached 38.84%, 37.88%, 39.08%, 37.72%, as well as 41.17%, respectively. Other studies undertaken at university hospitals in different governorates indicate similarly elevated cesarean section rates, with figures of 41%, 45%, and 46% recorded in 2013, 2014, and 2015 at Tanta University Hospital. Mansoura University Hospital had a rate of 42.65% in 2006, which increased to 55.33% by 2010. General district hospitals have similarly elevated rates: 57.9% in Alexandria in 2004, 36.5% in Al Mattaria in 2008, and 32.6% in Beni-Suef during 2015–2016. The predominant indication for cesarean delivery was recurrent cesarean sections. Patients' records occasionally omitted essential information, including prenatal data and the rationale for cesarean delivery<sup>(22)</sup>.

Surprisingly, 19 percent of the examined women were either unaware of or not informed about the indication for their cesarean section, while merely 33% received their information from a healthcare provider. These data may indicate a deficiency in patient counseling within the Egyptian healthcare system. Ninety percent of Egyptian women attend at least one antenatal appointment during their pregnancy; nevertheless, this visit appears to be inadequate. The private sector accounted for 48.5 percent

of primary CDs among the examined population, a result typical in nations with elevated CS rates. This may signify the urgent necessity for explicit rules and norms for standard procedures for the CS in all Egyptian hospitals, particularly private institutions<sup>(18)</sup>.

In 2003, the United States estimated that 2.6 percent of all cesarean deliveries were performed at the mother's desire, which was seen as elevated. Cesarean sections performed at the request of the mother accounted for 9.1% of primary cesarean deliveries in our survey<sup>(23)</sup>, which is significantly elevated at 3.5 times the rate observed in the United States. Until further data is accessible, the American College does not endorse cesarean section on maternal request as a substitute for scheduled vaginal delivery due to potential negative mother and newborn outcomes. Approximately two-thirds of participants indicated a preference for cesarean delivery. Approximately one third of women favored cesarean delivery, while a study examining the knowledge and attitudes of Iranian women regarding delivery methods revealed that one fifth of women had undergone cesarean delivery at their preference. Thai women predominantly favor vaginal delivery due to their aspiration for a natural birthing experience<sup>(24)</sup>.

The primary rationale for favoring cesarean delivery over vaginal birth is the avoidance of labor agony. This apprehension of pain may stem from narratives shared by relatives or friends about inadequate pain management and care during labor, or from their own prior experiences with abortion. Furthermore, the expectant mother lacks enough preparation regarding the stages of labor, the characteristics of labor pain, and the available pain relief methods. Furthermore, there is insufficient utilization of pharmacological and non-pharmacological pain relief treatments in Egyptian healthcare facilities. Furthermore, episiotomy has been found as an additional explanation. It is intimately associated with pain; mothers often fear perineal discomfort resulting from sutures that may impair their capacity to urinate or defecate post-delivery. The parturient lady, particularly in public and educational hospitals, is often subjected to numerous and occasionally superfluous vaginal examinations<sup>(25)</sup>.

Furthermore, the supine position is predominantly the only permissible posture, which may explain why the avoidance of labor positions and numerous vaginal examinations emerged as the second reason for women's preference for cesarean births. Furthermore, the cultural and religious background of Egyptian women induces embarrassment regarding nudity or frequent examinations, particularly in the presence of others or by male practitioners. The influence of "similarity to my relatives and friends" constitutes the third rationale for opting for cesarean delivery. The favorable accounts of cesarean sections and the adverse narratives around vaginal deliveries shared by family, friends, and online sources

significantly influenced the decision to opt for a cesarean birth. Moreover, families interpret the CS style of delivery as indicative of financial capability to afford the higher expenses related to the procedure, which is perceived as more prestigious than vaginal birth<sup>(26)</sup>.

The vaginal delivery may impact their sexual relationship. This aligns with **Haines et al.**<sup>(27)</sup>, who indicated that women favor cesarean delivery as it does not impact their future sexual lives. Furthermore, **Utomo et al.**<sup>(28)</sup> discovered that women encountered varying degrees of female sexual dysfunction following episiotomy, potentially attributable to scarring, tight suturing, and dyspareunia. Furthermore, the participants regarded the cesarean as safer for both the mother and the infant, and believed it could mitigate certain difficulties related to vaginal delivery, such as urinary incontinence. Women generally favor delivery methods that minimize their risk of urine incontinence. Additionally, age, education, and financial status were found to be associated with preferences for cesarean sections. Identical findings were reported by **Ghotbi and his colleagues**<sup>(29)</sup>.

**Maharlouei et al.**<sup>(30)</sup> reported a correlation between higher educational levels of mothers and husbands and the preference for cesarean delivery. **Leone**<sup>(31)</sup> reported that a high socioeconomic level is associated with an increased preference for cesarean birth. Women who underwent C-sections exhibited a lower mean knowledge score regarding their indications and complications compared to those who experienced vaginal delivery exclusively<sup>(32)</sup>.

The global rate of cesarean sections is on the rise, despite the World Health Organization indicating that their prevalence should not surpass 10-15%. A significant proportion of C-sections (46.9%) surpasses the recommended rate. Medical professionals play a significant role in determining the delivery method, with a notable preference for cesarean sections due to their convenience and profitability, attributed to elevated costs, extended hospital stays, and increased pharmaceutical use. Currently, cesarean sections are conducted not only for the safety of the mother and fetus but are also perceived as a luxury by certain communities, leading to requests even when no medical indication exists. **Ahmed et al.**<sup>(33)</sup> conducted a study indicating that the fear of labor pain significantly contributes to the rising rates of C-sections. The increased rate of C-sections can be attributed to several factors, including the rising average maternal age and the prevalence of maternal obesity. Delivery through cesarean section presents a threefold increased risk for both the mother and the fetus compared to vaginal delivery. The principal indication for cesarean birth was a prior cesarean, comprising 19%, followed by non-reassuring fetal monitoring at 15.6%, and abnormal fetal lie and presentation at 14%. A considerable percentage of pregnant women who had C-sections did so due to a previous occurrence of the surgery, representing 35.73%

of cases. Subsequently, non-reassuring fetal monitoring was noted in 19.64% of instances, followed by aberrant fetal lie and presentation at 9.45%. A notable correlation was observed between the chosen delivery method and participants' perceptions of the safety of cesarean sections for their infants. A significant proportion of women (61.7%) who saw C-sections as safer chose it as their preferred mode of birth. **Ibrahim et al.**<sup>(34)</sup> conducted a study revealing that a greater percentage of females who underwent C-section described the surgery as easier, safer, and more convenient<sup>(34)</sup>.

## Ethical Consideration

**The Ethics Committee of the GOTHI Research Centre approved the research protocol. The research was done in compliance with the Declaration of Helsinki, the code of ethics of the World Medical Association.**

## DECLARATIONS

- **Funding:** No fund
- **Availability of data and material:** Available
- **Conflicts of interest:** No conflicts of interest.
- **Competing interests:** None

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