Chapter

Caesarean Section in Low-, Middle- and High-Income Countries

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Abstract

Caesarean section (CS) refers to delivery of a foetus through surgical incisions made through abdominal and uterine walls. It's a life-saving procedure when complications arise during pregnancy. It may be an emergency or a planned procedure. Although desirable, CS may be medically unnecessary. CS is a major procedure associated with immediate and long-term maternal and perinatal risks and may have implications for future pregnancies. Since 1985, international healthcare community considers ideal rate for CS to be 10–15%. However, in the last decade, there has been concern about the rising rates of CS from as low as 2% in Africa to as high as 50–60% in Dominican Republic and Latin America. To this effect, there have been attempts to regulate the rates, and the Ten Group Classification System under the Robson criteria is such an attempt. CS rates are on the increase due to varying reasons ranging from patient, institutional, care provider and societal factors. There have been modifications in the CS technique and the drugs used postoperatively from Pitocin to addition of Misoprostol. Need has developed from Reproductive Health Specialists to review indications, rates and terminologies used and evaluate practices in low-, middle- and high-income countries regarding CS.

Keywords: caesarean section, rates, LMICs

1. Definition

Caesarean delivery commonly referred to as caesarean section and occasionally caesarean birth is defined as the delivery of a foetus(es) through surgical incisions made through the anterior abdominal wall (technically referred to as laparotomy) and the anterior uterine wall (technically denoted to as hysterotomy) [1, 2]. This definition considers only the intrauterine location of the foetus and not whether the foetus is delivered alive or dead [3]. Since the words "caesarean" and "section" are both derived from verbs that mean to cut, some authors [1] urge that the phrase "caesarean section" is a tautology. Consequently, the terms "caesarean delivery" and "caesarean birth" are preferable.

Although infrequent, there are reports of foetal survival from advanced abdominal pregnancies resulting into live birth [4]. The procedure for delivery of such foetus(es) is not caesarean section but rather laparotomy. It is technically challenging to assign the type of procedure carried when simultaneous abdominal and intrauterine pregnancy is encountered [5]. Considering the definitions above, it would be urged that the procedure is caesarean section for the intrauterine foetus

and laparotomy for the abdominal pregnancy. However, laparotomy alone would suffice. Confusion also arises among medical students when a foetus before the age of viability has to be delivered through abdominal surgery. Most obstetricians and gynaecologists refer to this procedure as hysterotomy rather than caesarean section.

2. Origin of word caesarean section and additional background of caesarean section

Caesarean section has been recorded in history since ancient times in both Western and non-Western literature. Although the first use of the term in obstetrics was from the seventeenth century, its early history is obscured by mythology [6]. Many historians believe that the origin of the term caesarean section rather than caesarean is from the birth of Gaius Julius Caesar [3]. This belief has been challenged by many.

To start with, Gaius Julius Caesar certainly was not the first person born via caesarean section. The procedure, or something close to it, is mentioned in the history and legend of various civilizations from Europe to the Far East well before his birth. He was not even the first Roman born that way. By the time Gaius Julius Caesar entered the world, Romans were already performing caesarean sections, and the Roman law reserved the operation for women who died in childbirth (so that the woman and her baby could be buried separately) and as a last resort for living mothers in order to save the baby's life during deliveries with complications. In ancient times, it was performed only when the woman was dead or dying as an attempt to rescue the foetus. This annuls further the origin of the term from Gaius Julius Caesar because his mother Aurelia Cotta is known to have lived long enough to see her son reach adulthood and serve him as a political advisor. Some sources even suggest she outlived him and he had two sisters, one of whom at least was younger than him [2].

Another possible source for the term is the Latin verb *caedare*, meaning to cut, or the term for the children who were born by postmortem caesarean sections, who were called *caesones*. The Roman law, Lex Regis, which dates from 600 BC, required that infants be delivered abdominally after maternal death to facilitate separate burial. This has also been proposed as the origin of the term. The specific law in question was called the Lex Cesare [7].

Historical records claim that the earliest authenticated report of a child who survived caesarean birth is a document describing the birth of Gorgias in Sicily in approximately 508 BC [7]. During this time period, the caesarean operation remained crude at best. The abdominal incision was made lateral to the rectus muscles, and the uterus was incised at whichever portion was accessible through the laparotomy incision. The uterine musculature was not reapproximated, and the patient had to be physically restrained during the procedure because of unavailability of anaesthesia [2]. As operative techniques improved, caesarean section became safer and could be used at an earlier stage in difficult labours. Further modifications emerged including emptying the bladder and rectum preoperatively with catheters and enemas, respectively, to decrease the volume of these organs in the operative field, thereby reducing the risk of injury during the surgical procedure [2].

3. Indications for caesarean section

Caesarean delivery is performed when the clinician and patient feel that abdominal delivery is likely to provide a better maternal and/or foetal outcome than vaginal delivery. Indications for caesarean delivery vary depending on the clinical

situation, resources available for patient care, and individual physician management techniques. There are no definitive algorithms available to the practicing obstetrician to direct when an abdominal delivery will benefit the mother and/or the foetus in every clinical situation. The decision to perform an abdominal delivery therefore remains a joint judgement between the physician and patient after carefully weighing the pros and cons of a caesarean delivery versus continued labour and/or operative or spontaneous vaginal delivery [3]. Some authors have suggested that the term "elective caesarean delivery" should probably be eliminated because a caesarean delivery is either "medically/obstetrically indicated" or "on maternal request" and never truly "elective" [8].

The decision to perform an indicated caesarean delivery may be made antepartum (scheduled caesarean delivery) or as a result of concerns identified after labour has begun ("unscheduled caesarean delivery" or "unplanned caesarean delivery"). The terms "scheduled caesarean delivery" and "planned caesarean delivery" are used when the decision to perform a caesarean delivery does not occur as a consequence of a complication of labour but is planned antepartum such as in the case of repeat caesarean delivery, foetal malpresentation or placenta praevia. This therefore means that indications for caesarean delivery can be divided into indications that are of benefit to the mother (maternal indications), the foetus (foetal indications) or both (circumstances in which both foetal and maternal indications exist).

The indications can be further divided into absolute and relative indication in each of the maternal and foetal categories. Indications for caesarean delivery for maternal benefit include any situation in which it is inadvisable to continue to strive for a vaginal delivery out of concern for maternal outcome. In these situations, the woman undergoes a major abdominal operation for indications that are likely to decrease her risk for morbidity and/or mortality. In contrast, when a caesarean section is performed for foetal indications, the mother is undergoing major abdominal surgery when there is no immediate benefit to her but there is potential benefit to the neonate. In these situations, foetal health would be compromised if further efforts toward vaginal delivery were pursued [3].

3.1 Maternal indications

1. Previous hysterotomy (usually related to caesarean delivery, but also related to myomectomy or other uterine surgery). In the case of prior caesarean delivery, two prior caesarean deliveries are an absolute indication. However, women with one prior caesarean delivery can be offered trial of labour if there is no additional risk to vaginal delivery [1, 3, 8, 9].

2. Obstructive lesions in the lower genital tract including malignancies, condyloma acuminata, severely displaced pelvic fracture and leiomyomas of the lower uterine segment that interfere with the engagement of the foetal head.

3. Maternal infection (e.g. herpes simplex virus or human immunodeficiency virus (HIV)).

4. Prior classical hysterotomy.

5. Unknown uterine scar type.

6. Uterine incision dehiscence.

7. Prior full thickness myomectomy.

8. Genital tract obstructive mass.

9. Invasive cervical cancer.

10. Prior trachelectomy.

11. Permanent cerclage.

12. Prior pelvic reconstructive surgery.

13. Prior significant perineal trauma.

14. Pelvic deformity.

15. Cardiac or pulmonary disease.

16. Cerebral aneurysm or arteriovenous malformations.

17. Pathology requiring concurrent intra-abdominal surgery.

18. Perimortem caesarean delivery.

3.2 Foetal indications

1. Non-reassuring foetal status [1].

2. Foetal malpresentation.

3. Foetal bleeding diathesis.

4. Funic presentation or cord prolapse [3].

5. Macrosomia.

6. Abnormal lies or nonvertex presentations [8].

7. Multiple pregnancies: the first twin in a nonvertex presentation or higher-order multiples (triplets or greater).

8. Some congenital anomalies.

9. Foetal compromise [9].

10. Maternal infection: primary genital herpes and HIV.

11. Abnormal umbilical cord Doppler study.

12. Thrombocytopenia.

13. Prior neonatal birth trauma.

14. Caesarean delivery may be performed but is not routinely indicated for foetal issues, such as extremely or very low birth weight (<1000 g and ≤ 1500 g, respectively) [10].

15. Some individuals also consider caesarean delivery for certain congenital anomalies (e.g. open neural tube defects, some skeletal dysplasia and gastroschisis with herniated liver) [11, 12].

3.3 Both maternal and foetal indications

1. Failure to progress during labour [1].

2. Abnormal placentation (e.g. placenta praevia, vasa praevia, placenta accreta) [3].

3. Obstructed labour.

4. Cephalopelvic disproportion.

5. Failed operative vaginal delivery [8].

6. Abruption placenta with a live baby [9].

There are no absolute contraindications to caesarean delivery. In contrast to other types of surgery, the risks and benefits of the procedure need to be considered as they apply to two patients. However, many pregnant women have a low tolerance for accepting any foetal risk from vaginal birth, irrespective of the maternal risks associated with operative intervention [13].

4. Classification of caesarean section

Traditionally, caesarean section has been classified as emergency or elective. However, with advanced practice in obstetrics and more complicated deliveries encountered, this definition has become too simplistic, and more detailed categories are needed. Some authors have also suggested that the term "elective caesarean delivery" should probably be eliminated because a caesarean delivery is either "medically/obstetrically indicated" or "on maternal request" and never truly "elective" [8]. Such authors advocate for terms as *scheduled or planned* caesarean delivery in which the decision to perform an indicated caesarean delivery may be made antepartum and *unscheduled or unplanned* caesarean section where decision to perform an indicated caesarean delivery is made as a result of concerns identified after labour has begun. The decision to perform an unscheduled caesarean section may also arise even when labour has not occurred such as in abruption placentae with a live baby and no labour pains or absent foetal movement with abnormal umbilical artery Doppler studies not in labour.

Also distinguishing between prelabour caesarean section (which may be scheduled/elective or emergency/unscheduled) and intrapartum caesarean delivery (which is, by default, emergency) is preferable [14].

Lucas and colleagues [15] developed the classification of caesarean delivery based on urgency approved by the Royal College of Obstetricians and Gynaecologists (RCOG) and the Royal College of Anaesthetists in the UK after it was developed further into the most consistent method recommended by National Confidential Enquiry into Perioperative Deaths [16].

The initial classification by Lucas et al. [15] was a four-grade classification system including:

Classification	Indication
Grade 1: emergency caesarean section	Immediate threat to the life of the woman or the foetus, i.e. placental abruption (antepartum) or uterine rupture (intrapartum)
Grade 2: urgent caesarean section	No immediate risk to the life of the woman or baby, but delivery should be achieved as soon as possible, e.g. three previous caesarean sections, membranes are ruptured with meconium-stained liquor (antepartum) or non-reassuring cardiotocograph and foetal blood sampling are not possible or contraindicated
Grade 3: nonscheduled caesarean section	Delivery is needed but can fit in with delivery suite workload and allow for fasting/steroid administration and some degree of planning, e.g. preterm intrauterine growth restriction, preeclampsia, etc.
Grade 4: scheduled, also referred to as elective caesarean section	No urgency whatsoever and procedure planned to suit the mother, staff, delivery suite, etc. and carried out at 39 weeks' gestation during the working day (i.e. not out of hours)

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Table 1.
Classification of caesarean section.

1. Immediate threat to life of woman or foetus

2. Maternal or foetal compromise which is not immediately life-threatening

3. Needing early delivery but no maternal or foetal compromise

4. At a time to suit the patient and maternity team

Based on this the following classification of caesarean delivery was proposed (**Table 1**) [3].

5. Techniques for caesarean section

Caesarean operation has undergone a number of technical changes as the procedure has evolved. Many different practitioners extol the benefits of various techniques of skin incision, uterine incision, uterine closure, and many other technical aspects of the operation. However, there are relatively few randomised trials to support many of the commonly used practices at caesarean section. As such there is no standard technique for caesarean delivery although there are a few evidence-based recommendations for the surgical technique.

5.1 Abdominal opening

Abdominal opening is accomplished through either transverse (Pfannenstiel and Joel-Cohen) or vertical skin incisions, each of which has advantages and disadvantages. Incision of about 12–15 cm is usually adequate for access [3, 14]. Historically, a vertical midline skin incision was implemented; however, this scar is cosmetically less acceptable and is associated with higher incidence of postoperative wound discomfort, dehiscence, infection, and hernia formation [3]. It may still be necessary if access is required to the upper uterus or to other abdominal organs. At present, the most frequently used type of skin incision is the Pfannenstiel incision since it is associated with less postoperative pain, greater wound strength and better cosmetic results than the vertical midline incision [17]. The use of scalpel is preferred although there are no randomised trials comparing scalpel to electrocautery which can also be used during caesarean delivery.

Opening the subcutaneous tissue layer is achieved bluntly preferred to sharp dissection as blunt dissection has been associated with shorter operative times and less chance of injury to vessels [18]. However, there are no randomised trials comparing techniques for incision and dissection of the subcutaneous tissues at caesarean delivery.

There are no randomised trials comparing different techniques of opening the fascia. A small transverse incision is usually made medially with the scalpel and then extended laterally with scissors. Alternatively, the fascial incision can be extended bluntly by inserting the fingers of each hand under the fascia and then pulling in a cephalad-caudad direction [17, 18].

Rectus muscles are separated bluntly in most cases. Avoiding transection of muscles preserves muscle strength. Dissection of the rectus fascia from the rectus sheath and muscles is unnecessary [19] but has not been studied separately in a randomised trial.

Opening the peritoneum can be achieved using the fingers bluntly to minimise the risk of inadvertent injury to the bowel, bladder or other organs that may be adherent to the underlying surface [18, 19]. However blunt versus sharp entry into the peritoneum has not been compared in a randomised trial.

5.2 Hysterotomy/opening the uterus

Opening of the bladder flap may or may not be performed. Some surgeons choose to open the bladder flap if difficult delivery is anticipated such as when the foetal head is deep in the pelvis or when the bladder is attached well above the lower uterine segment after a previous caesarean delivery. In these cases, creation of the bladder flap may help to keep the bladder dome out of the surgical field if the uterine incision extends.

The uterine incision may be transverse or vertical. The type of incision depends upon several factors, including the position and size of the foetus, location of the placenta, presence of leiomyomas and development of the lower uterine segment. The principal consideration is that the incision must be large enough to allow atraumatic delivery of the foetus. Transverse incision along the lower uterine segment is recommended. Compared with vertical incisions, advantages of the transverse incision include less blood loss, less need for bladder dissection, easier approximation and a lower risk of rupture in subsequent pregnancies [19]. Low vertical and classical incisions may also be performed in certain circumstances. Low vertical incision is performed in the lower uterine segment and appears to be as strong as the low transverse incision [20]. The major disadvantage of the low vertical incision is the possibility of extension cephalad into the uterine fundus or caudally into the bladder, cervix or vagina. It is also difficult to determine that the low vertical incision is truly low, as the separation between lower and upper uterine segments is not easily identifiable clinically. Classical incision is rarely performed at or near term because in subsequent pregnancies it is associated with a higher frequency of uterine dehiscence/rupture than low vertical and low transverse incisions. The generally accepted indications for considering a vertical uterine incision are:

- Poorly developed lower uterine segment in a setting in which more than normal intrauterine manipulation is anticipated (e.g. extremely preterm breech presentation, back down transverse lie)

- Lower uterine segment pathology that precludes a transverse incision (e.g. large leiomyoma, anterior placenta praevia or accreta)

- Densely adherent bladder

- Postmortem delivery

5.3 Delivery of the baby and placenta

Extraction of the foetus at caesarean delivery is usually uncomplicated but may be made more difficult by extreme prematurity, a deeply impacted or floating foetal head or an abnormal lie. However, careful attention to the duration of prolonged uterine incision to delivery time is important especially in a foetus with a non-reassuring foetal heart rate assessment prior to the onset of surgery.

Cord clamping. Delayed, rather than immediate, cord clamping results in greater neonatal haemoglobin levels and appears to be beneficial for preterm, and some term, infants. However, in asphyxiated baby, the cord should be quickly clamped and cut.

Delivery of the placenta is best achieved with controlled cord traction and aided by oxytocin administration instead of manual delivery which is associated with postoperative endometritis and greater blood loss. To ensure that all of the placenta has been removed, the uterus is usually explored with one hand holding a sponge to remove any remaining membranes or placental tissue, while the other hand is placed on the fundus to stabilise the uterus. These manipulations further stimulate uterine contraction.

5.4 Closure of the uterus

The uterus may or may not be exteriorized. No approach is superior to the other. Closing the uterus after caesarean section is best performed with a double-layer technique using continuous closure with delayed absorbable synthetic suture incorporating all of the muscle in order to avoid bleeding from the incision edges. Some obstetricians prefer locking the sutures instead of continuous [21]. Recently, Lambert's suture technique for the second layer is being promoted. The bladder peritoneum may or may not reperitonised.

5.5 Closure of the abdomen

The peritoneal layer may or may not be closed. Nonclosure might allow the enlarged uterus to adhere to the anterior abdominal wall or impede spontaneous closure of the peritoneum, while closure might cause a foreign body reaction to sutures and tissue damage [22]. A systematic review of peritoneal nonclosure and adhesion formation after caesarean delivery found some evidence that nonclosure was associated with greater adhesion formation than closure of the parietal layer or both visceral and parietal layers [23].

Rectus muscles are believed to reapproximate naturally, and suturing them together may cause unnecessary pain when the woman starts to move after surgery [17]. There is no randomised trial that has evaluated rectus muscle closure versus nonclosure.

Fascial closure is a critical aspect of incisional closure as this provides the majority of wound strength during healing. Care should be taken to avoid too much tension when closing the fascia since reapproximation, not strangulation, is the goal. The closure is best achieved with a simple running technique using no 1 or 2 delayed absorbable monofilament suture [22].

The subcutaneous adipose layer is closed with interrupted delayed absorbable sutures if the layer is ≥2 cm. Closure of the dead space seems to inhibit accumulation of serum and blood, which can lead to a wound seroma and subsequent wound breakdown [24]. The point of this layer is to support the skin layer, so Scarpa's fascia should be deliberately included in it [14].

Reapproximation of the skin may be performed with staples or subcuticular suture. No approach is superior to the other [25] although stables are associated with a doubling of wound complications (infection and wound separation) [26]. Subcuticular stitches have been associated with less immediate postoperative pain and are more cosmetically appealing at 6 weeks than the stapling device [27]. For subcuticular suture, absorbable sutures such as Vicryl may be used.

6. Complications of caesarean section

Although a life-saving procedure for either the mother or the baby or both, caesarean section comes with a number of complications including but not limited to [28]:

1. Infections including endometritis and wound infections. Necrotizing fasciitis is rare but can occur after caesarean section.

2. Septic pelvic thrombophlebitis including ovarian vein thrombophlebitis and deep septic pelvic thrombophlebitis.

3. Haemorrhage. The mean blood loss at caesarean is approximately 1000 mL; however, estimates of blood loss are not very reliable.

4. Urinary tract and blood problems including ileus, urinary tract and bowel injuries.

5. Venous thrombosis and embolism whose risk is increased during the postoperative period. Early ambulation and thromboprophylaxis for high-risk mothers are recommended to decrease the risk of thromboembolism.

6. Disruption (or opening) of the caesarean laparotomy wound is common, especially in women with risk factors such as obesity, diabetes, history of wound disruption, vertical incision, etc.

7. Foetal and neonatal birth risks such as iatrogenic prematurity and birth trauma, transient tachypnea of the newborn, respiratory distress syndrome, etc.

8. Maternal mortality.

9. Abnormal placentation in subsequent pregnancy.

10. Subfertility. Women whose first birth is by caesarean are less likely to have a subsequent pregnancy than women whose first birth is a spontaneous vaginal delivery.

11. Scar complications including hysterotomy scar pregnancy, numbness and incisional endometriosis.

12. Uterine rupture in a subsequent pregnancy.

13. Abdominal adhesions that may predispose to bowel obstruction, strangulation, infertility and visceral injury during subsequent abdominal operations.

7. Caesarean section rates and why the increase over the decades

The international healthcare community has considered the ideal rate for caesarean sections to be between 10 and 15% [29] based on a 1985 WHO meeting in Brazil that stated that there is no justification for any region to have a rate higher than 10–15%. Since then caesarean sections have become increasingly common in both developed and developing countries for a variety of reasons [30].

When medically justified, caesarean section can effectively prevent maternal and perinatal mortality and morbidity. However, there is no evidence showing the benefits of caesarean delivery for women or infants who do not require the procedure. The proportion of caesarean sections at the population level is a measure of the level of access to and use of this intervention. It can serve as a guideline for policy-makers and governments in assessing progress in maternal and infant health and in monitoring emergency obstetric care and resource use.

Concerns on the rise in the numbers of caesarean section births and the potential negative consequences for maternal and infant health have been raised [31]. This concern is extended also to cost which is a major factor in improving equitable access to maternal and newborn care, as caesarean sections represent significant expense for overloaded and often weakened health system. However, determining the adequate caesarean section rate at the population level, i.e. the minimum rate for medically or obstetrically indicated caesarean section, while avoiding medically unnecessary operations is a challenging task.

In the United States, the caesarean delivery rate rose from 4.5% in 1970 to 32.9% in 2009. Following this peak, the rate has trended slightly downward, and it was 32.0% in 2015 [9]. In China the caesarean section rate was 42% in 2010 [31] despite the author claiming it had reduced. The rates can be even higher in private clinics. For example, in Brazil, 80–90% of births in private clinics are now caesarean sections, compared with about 30–40% of births in public hospitals [32]. Countries with high caesarean section rates include the Dominican Republic 56.4%, Brazil 55.6%, Egypt 51.8%, Turkey 50.4%, Iran 47.9% and China 47%.

See more at https://www.bellybelly.com.au/birth/highest-c-section-rates-by-country/.

At the other end of the spectrum, sub-Saharan Africa is still struggling to give mothers access to caesarean sections when required. Across this region, the caesarean section rate has changed very little since 2000, hovering right around 5%. This also varies from country to country and from private to public hospitals. In Africa only 7.3% of babies are born via this method. But it is a very mixed picture across the continent. Some countries have very high rates such as Egypt (51.8%) and Mauritius (47%), the highest in Africa. And despite a 2.9% overall increase across the continent from 1990, there has been a decline in some countries like Nigeria and Guinea which now stands at about 2%. Zimbabwe has maintained its caesarean section rates at 6%.

So what is driving the global rise of Caesarean sections? Some scholars claim it is likely three factors working together: financial, legal and technical with some people calling for hospitals to pay doctors equally for vaginal births in order to bring these rates down. However, the reasons for persistently significant caesarean rates are not completely understood, but some explanations include the following [9]:

1. Women are having fewer children; thus, a greater percentage of births are among nulliparous, who are at increased risk for caesarean delivery.

2. The average maternal age is rising, and older women, especially nulliparous, have a higher risk of caesarean delivery.

3. The use of electronic foetal monitoring is widespread. This practice is associated with an increased caesarean delivery rate compared with intermittent foetal heart rate auscultation. Foetal distress accounts for only a minority of all caesarean deliveries. In many more cases, concern for an abnormal or "non-reassuring" foetal heart rate tracing prompts caesarean delivery.

4. Most foetuses presenting breech are now delivered by caesarean section.

5. The frequency of operative vaginal delivery has declined.

6. Rates of labour induction continue to rise, and induced labour, especially among nulliparous, raises the caesarean delivery rate.

7. Obesity, which is a caesarean delivery risk, has reached epidemic proportions.

8. Rates of caesarean delivery in women with preeclampsia have increased, whereas labour induction rates for these patients have declined.

9. The rate of vaginal birth after caesarean (VBAC) has decreased.

10. Elective caesarean deliveries are increasingly being performed for various indications that include maternal request, concern for pelvic floor injury associated with vaginal birth and reduction of foetal injury rates.

11. Assisted reproductive technology is more widely used than in the past and is associated with greater caesarean delivery rates.

12. Malpractice litigation related to foetal injury during spontaneous or operative vaginal delivery continues to contribute to the present caesarean delivery rate.

13. Fear of birth and labour pain.

14. Belief that caesarean section prevents trauma and damage to the pelvic due to vaginal birth.

15. Belief that caesarean section is less traumatic to the baby.

16. Convenience to the care provider and mother.

17. Low tolerance of anything less than perfect birth outcome.

18. Cultural considerations, e.g. birth date being lucky for future or destiny.

Looking at the different caesarean section rates across the globe, it appears mothers around the world end up with less than optimal care when it comes to caesarean sections. It is either too little too late or too much too soon.

8. Robson's classification for CS

As already discussed, there are concerns over the rising caesarean section rate globally. However, determining the adequate caesarean section rate at the

population level, i.e. the minimum rate for medically indicated caesarean section, while avoiding medically unnecessary operations is a challenging task. At the heart of the challenge in defining the optimal caesarean section rate at any level is the lack of a reliable and internationally accepted classification system to produce standardised data, enabling comparisons across populations and providing a tool to investigate drivers of the upward trend in caesarean section.

The lack of a standardised internationally accepted classification system to monitor and compare caesarean section rates in a consistent and action-oriented manner is one of the factors that has hindered a better understanding of this trend. WHO proposes adopting Robson's classification as an internationally applicable caesarean section classification system [29].

The system classifies all women admitted for delivery into 1 of the 10 groups that are mutually exclusive and totally inclusive. This means that based on a few basic obstetric variables, every woman admitted to deliver in any facility can be classified into 1, and only 1, of the 10 groups and no woman will be left out of the classification. The 10 groups are based on 6 basic obstetric variables which are the only information needed to classify each woman as shown in **Table 2**.

Based on the 6 obstetrics, the 10 groups are as shown in **Table 3**.

WHO expects that this classification will help healthcare facilities to:

1. Optimise the use of caesarean section by identifying, analysing and focusing interventions on specific groups of particular relevance for each healthcare facility.

2. Assess the effectiveness of strategies or interventions targeted at optimising the use of caesarean section.

3. Assess the quality of care, clinical management practices and outcomes by group.

4. Assess the quality of the data collected while raising staff awareness about the importance of the data and its use.

Obstetric characteristic	
1. Parity	• Nulliparous • Multiparous
2. Previous caesarean section	• Yes (one or more) • No
3. Onset of labour	• Spontaneous • Induced • No labour (prelabour caesarean section)
4. Number of foetuses	• Singleton • Multiple
5. Gestational age	• Preterm (less than 37 weeks) • Term (37 weeks or more)
6. Foetal lie and presentation	• Cephalic presentation • Breech presentation • Transverse lie

Reproduced from WHO Robson classification implementation manual 2017.

Table 2.
Obstetric variables for Robson's classification.

Group	Description
Group 1	Nulliparous women with a single cephalic pregnancy ≥37 weeks gestation in spontaneous labour
Group 2	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
Group 3	Multiparous women without a previous uterine scar, with a single cephalic pregnancy ≥37 weeks gestation in a spontaneous labour
Group 4	Multiparous women without a previous uterine scar, with a single cephalic pregnancy ≥37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
Group 5	All multiparous women with at least one previous uterine scar with a single cephalic pregnancy ≥37 weeks gestation
Group 6	All nulliparous women with a single breech pregnancy
Group 7	All multiparous women with a single breech pregnancy, including women with previous uterine scar
Group 8	All women with multiple pregnancies, including women with previous uterine scars
Group 9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scar
Group 10	All women with a single cephalic pregnancy <37 weeks, including women with previous uterine scar

Reproduced from WHO Robson classification implementation manual 2017.

Table 3.
The 10 groups of the Robson classification.

9. Conclusion

Caesarean sections are effective in saving maternal and infant lives but only when they are required for medically indicated reasons. Although the operation continues to become safer, the incidence of maternal mortality and morbidity is still significant. Continued efforts on the part of the obstetrician must be made to ensure that caesarean deliveries are not performed for inappropriate indications and that each woman is counselled carefully according to her individual characteristics. Caesarean section rates have been rising over time due to multifactorial reasons. However, determining the adequate caesarean section rate is challenging due to the absence of reliable and internationally accepted classification system. WHO proposes Robson's classification system as a global standard for assessing, monitoring and comparing caesarean section rates within healthcare facilities and between facilities. However, every effort should be made to provide caesarean sections to women in need, rather than striving to achieve a specific caesarean section rate.

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