Chapter

# Magnitude, Factors Associated with Cesarean Delivery and Its Appropriateness

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## Abstract

Inappropriate use of CS can have profoundly negative consequences for women and the broader community. A recent meeting of the International Confederation of Midwifes, the International Federation of Gynecologists and Obstetrics and the Gates Foundation to discuss the impact of rising CS rates on maternal and infant mortality in LMICs highlights the international importance of the issue. Knowledge of CS determinants is a first step in the effort to define strategies to reduce unnecessary CSs. Previous studies showed that the main reasons for performing CS are clinical factors. However, non-clinical factors such as demographic, health system factors, organizational variables were overlooked determinants that best predicted which women have a higher risk of CS.

**Keywords:** Caesarean delivery, appropriateness, low income countries

## 1. Introduction

Worldwide, 830 women die every day due to pregnancy or childbirth-related complications, and almost all maternal deaths (99%) occur in developing countries [1]. In Africa and South Asia, it is the leading cause of death for women of reproductive age. Another 5.7 million suffer severe or long-lasting illnesses or disabilities caused by complications during pregnancy or childbirth every year globally [1, 2]. Half of the world's maternal, newborn, and child deaths occur in sub-Saharan countries. The maternal mortality ratio in developing countries is 240 per 100,000 births versus 16 per 100,000 in developed countries [1, 2]. The risk of a woman dying in sub-Saharan Africa as a result of pregnancy or childbirth is 1 in 39, as compared to 1 in 4,700 in industrialized countries. In sub-Saharan Africa, children under the age of five are 15 times more likely to die than in high-income countries [1]. However, an estimated 74% of maternal deaths could be averted if all women had access to emergency obstetric care [2, 3]. The consequences of maternal mortality have a ripple effect in families, communities and nations. Children without mothers are less likely to receive proper nutrition, health care and education. The implications for girls tend to be even greater, leading to a continued cycle of poverty and poor health. And every year, over $15 billion in productivity is lost due to maternal and newborn death, placing a huge burden on developing nations [2].

Preventable maternal morbidity and mortality is associated with the absence of timely access to quality care, defined as too little, too late (TLTL) which refers

to either inadequate access to services, resources, care that is unavailable until too late to help or a combination of these factors [4]. Caesarean section (CS) is the most common obstetric intervention designed to prevent or treat life-threatening pregnancy or childbirth-related complications [5]. When it is done on a timely basis CS provides an appropriate opportunity to prevent adverse obstetric outcomes, including maternal death, stillbirth and neonatal death [6–8]. According to World Health Organization (WHO), a maximum of 15% of births have a medical justification for a caesarean section, rates above this do not improve maternal and fetal outcomes and are considered inappropriate and unnecessary [9].

However, CS used inappropriately is an obstetric intervention described as too much, too soon (TMTS) which refers the over-medicalisation of normal pregnancy and birth. TMTS includes unnecessary use of non-evidence-based interventions, as well as use of interventions that can be lifesaving when used appropriately, but harmful when applied routinely or overused [4]. CS carries risks for both the mother and her child and therefore the reason for conducting the surgery must outweigh any potential adverse outcome [10]. Maternal deaths and perinatal deaths following caesareans sections are disproportionately high in lower and middle income countries (LMIC) [11]. The maternal mortality after caesarean birth in Africa is 50 times higher than that of high-income countries [10]. Mothers in Sub-Saharan countries are 37 times more likely to die than those from LMIC in European and Central Asia after caesarean section, and the risk is high in countries with low caesarean section rates. The rates of stillbirths and perinatal deaths in caesarean section births were 56.6 and 84.7 per 1000 CS procedures respectively [11]. Compared to vaginal birth CS has an eightfold higher mortality risk for the mother with increased risk of infection and bleeding, and similarly, CS is associated with a high risk of infant death, preterm birth, breathing difficulties and iatrogenic injury [9, 12–15]. Other complications believed to contribute to mortality were intraoperative hypotension (75%), operative hemorrhage (53%), ventilation difficulty (14%), regurgitation of stomach contents (13%), pre-eclampsia (8%), and difficult intubation (1%) [10]. Furthermore, CS is associated with post-surgical complications such as postpartum hemorrhage and deep vein thrombosis which are major contributors to maternal mortality worldwide. CS is also a profitable surgical procedure for physicians and hospitals, despite the high cost of caesarean birth resulting in significantly increased health expenditure for individuals and families [16, 17]. In comparison, vaginal birth is associated with fewer risks, fewer interventions such as anesthesia pose a lower potential for postpartum morbidity, involves a shorter hospital stay, is more affordable, and encourages earlier and better bonding between mother and infant [18]. The inappropriate use of CS is likely to contribute to the disease burden of poor obstetric outcome rather than improve it [10].

## 2. Prevalence and factors associated with CS

Low-income countries (LICs) especially sub-Saharan Africa have historically had very low CS rates, probably reflecting inadequate availability [19–21], whereas high income countries (HICs) generally have higher CS rates, indicating overuse [22]. In 2010, an estimated 3.5–5.7 million unnecessary caesarean sections were done in high and middle income countries (HMICs), whereas 1–3.5 million caesarean sections were needed, but not performed in LICs which is an indication of global extremes [23]. However, the burden of maternal mortality was high in countries with low caesarean section rates. In regions such as Sub-Saharan Africa, despite only 3.5% of all pregnant women delivering by caesarean section, 20% of all who died from any cause were delivered by caesarean section [11, 24]. The very high

rates of stillbirths and perinatal deaths in caesarean section births are of concern, particularly in Sub-Saharan region where up to one in ten babies delivered by caesarean section are stillborn. When the fetus is no longer alive, caesarean section is considered only if the birth needs to be rapidly expedited to avoid complications, or when vaginal birth is not appropriate. The high stillbirth and perinatal mortality may reflect conditions where caesarean sections were carried out despite a diagnosis of stillbirth or when the procedure was done far too late to save the baby [11]. Evidence shows increasing overuse of potentially harmful interventions especially caesarean section in facility births and one of the critical knowledge gaps identified for research priority in LMIC is over-medicalization of birth leading to increased rates of unnecessary CS [4, 25]. Overall, CS rates are lower in poorer women and tend to increase with rising economic status [26]. Disparities within countries and hospital-level variations in CS rates even within the same socio-demographic or economic groups, implied that TLTL and TMTS can coexist within countries and facilities [27, 28]. These indicates that, some women might be exposed to unnecessary CS while others do not get the CS they need [29]. Therefore, optimizing and ensuring the availability of a CS service while reducing the unnecessary CS for women is a global concern [30].

In Ethiopia physician-led obstetric care is provided by a four-tier healthcare system organized as primary health care units or health centers, district hospitals, general hospitals, and specialized hospitals. Ethiopia is one of the countries where CS practice is rising and reached 46% in the private for-profit sector and 18% in government institutions [31, 32]. The population-based CS rate of Ethiopia is still one of the lowest in the world (2%), since many women in need of CS never reach facilities (institutional delivery rate of 26%) and the disparities within a country might masked the national averages [29, 33]. This overall low coverage of CS indicates TLTL, however, a stark disparities with higher rates in private practice and higher wealth quintiles, suggesting TMTS for wealthy women [4, 29]. These differences have been linked to insufficient adherence to, or absence of, clear evidence-based guidelines and reflect weak regulatory capacity especially in the private sector [4, 34–36]. Previous research undertaken by the applicant in support of this proposal reported a higher CS rate (47.6%) in Dessie town, Ethiopia with a significant discrepancy between public (18.2%) and private (76.1%) sectors. Fetal distress was the leading cause of caesarean birth possibly due to over-diagnosis of abnormal fetal heart rate patterns in the absence of an electronic fetal monitoring system. Additionally, mothers having a history of previous caesarean birth had higher odds of having caesarean birth which may be associated with the obstetrician's fear of attempting a trial of vaginal birth in facilities with limited fetal monitoring capabilities. Furthermore, mothers whose labour was not monitored using partograph (a labour monitoring tool used to identify and intervene abnormal labour) had higher odds of CS as most of these women were referred from the primary health care facility to the nearby hospitals with a labour complication where emergency CS would be done without further monitoring of progress [37].

Evidences have shown the contribution of non-clinical factors to the rising trend of CS and suggested that identifying the determinants of caesarean birth is the priority to improve the efficacy of this obstetric intervention [38]. However, the determinants of CS are very complex and include not only clinical indications, but also multiple factors: demographic, economic, social, logistical, and health system affect CS rates. On the other hand, most of the clinical indications are not absolute and very subjective, and disagreement sometimes exists between clinicians about when to use CS. This nature of clinical factors coupled with multiple non clinical factors including providers' practice differences at facility and individual levels, financial incentives (private providers), and inadequate adherence to clear evidence-based

guidelines contributes to significant variability among hospitals and countries concerning CS rates for particular medical indications [27, 39]. This, in turn, leads to inequities in the use of the procedure, not only between countries but also within countries with an additional financial burden upon the overstretched health system particularly in LMIC [40, 41]. Therefore, rising trends of caesarean birth impose an inappropriate allocation of scarce resources in the poor economy countries [40, 41].

## 3. Optimizing the use of caesarean section

To rationalize the use of this major procedure in obstetrics practice, individual providers, professional associations, facilities, and health-care systems should seek a path beyond TLTL and TMTS, which means reducing unnecessary CS while ensuring the availability of caesarean birth for women who required it [4]. However, the challenge is to keep CS rates low while maintaining safe outcomes for the mother and infant. This requires continuous auditing of CS and increasing adherence to guidelines [4, 42].

For such endeavor identifying the clinical and non-clinical factors contributing to caesarean birth and the appropriate consideration of risks and alternatives used in the decision to undertake a CS is an important activity. This is supported by evidence that indicates the main reasons for performing a CS were clinical factors and the doctor's role in decision making [43]. Other non-clinical factors may also contribute, though these are more challenging to identify. For example, studies conducted to evaluate the appropriateness of decisions made for CS in Tehran and Uganda hospitals showed that more than half of CS performed was considered inappropriate with a significant difference between public and private hospitals. Conducting clinical audit would examine in more detail the clinical conditions for which they need for CS is questionable or inappropriate [39, 44, 45].

Therefore, auditing the clinical factors related to the use of CS is strongly recommended in all hospitals to reduce unnecessary interventions, to improve decision-making and consistency of practice among care providers particularly in resource-limited countries [43]. These in turn will increase adherence to guidelines and protocols in using the procedure, and to enable the development of guidelines or protocols that consider the difference of contextual factors [4]. Even though, global organizations are creating guidelines for interventions to reduce caesarean section rates evidence is insufficient for most strategies [4, 46]. More research is urgently needed on interventions for reducing unnecessary caesarean section and increasing vaginal birth after caesarean section rates [4].

Vaginal Birth After Cesarean Section (VBAC) is another mechanism of reducing CS rates since a repeat CS after caesarean birth is the major contributor to rising trends of CS rate globally [47]. However, limited numbers of mothers with a previous CS are allowed to attempt VBAC and factors behind this and its success was not well-understood [18]. Furthermore, perinatal outcomes of children born by caesarean section in LMIC are not known and the risks of maternal death after caesarean section in countries with low and high rates of the procedure are not known. Unless the key risk factors for complications in women undergoing caesarean section are known, it is difficult to target efforts to improve pregnancy outcomes [11, 48, 49]. In Ethiopia little information is locally available regarding outcomes between vaginal, VBAC and CS birth, and most of these studies provide limited evidence on maternal and perinatal outcomes occurred before hospital discharge and use secondary data which suffers from incompleteness and unreliable information [50].

The difficulty with monitoring and comparing CS rates, as well as planning or instituting interventions to modify CS rates, requires information about the

indications for CS and the appropriateness of surgical birth. A major part of the problem is that there is no agreed-upon international standard of classification of indications for CS. After conducting several systematic reviews, the WHO concluded that the Robson classification as a global standard tool for international use which is important to know which groups of women are mainly contributing to the increase in CS rate [51]. The Robson classification also called the Ten Group Classification System (TGCS), classifies women into 10 mutually exclusive and exhaustive groups based on the category of the pregnancy, the previous obstetric record of the woman, the course of labour and delivery, and the gestational age of the pregnancy [6]. Multiple studies have examined rising CS rates in high and middle-income countries using the Robson classification system, though few studies involving low-income countries have been conducted [52–56]. In Ethiopia only one study has been conducted using Robson classification among women who underwent CS. The study was limited to one public hospital site which excludes the influences of private obstetric care [29]. Therefore, a prospective study involving both women receiving both public and private hospital care is recommended to understand the proportion of CS within each Robson group. Furthermore, as TGCS is not an audit of the appropriateness of indications for CS, further research is required to assess the suitability of the clinical indications [29]. Whilst small number of studies have reported maternal and perinatal outcomes in Ethiopia [31, 32, 50] no previous research has explored the institutional and decision making factors influencing CS use despite a high rate of post-CS mortality and morbidity.

## 4. Conclusions

Inappropriate use of CS can have profoundly negative consequences for women and the broader community. A recent meeting of the International Confederation of Midwifes, the International Federation of Gynecologists and Obstetrics and the Gates Foundation to discuss the impact of rising CS rates on maternal and infant mortality in LMICs highlights the international importance of the issue. Knowledge of CS determinants is a first step in the effort to define strategies to reduce unnecessary CSs. Previous studies showed that the main reasons for performing CS are clinical factors. However, non-clinical factors such as demographic, health system factors, organizational variables were overlooked determinants that best predicted which women have a higher risk of CS. Therefore, auditing the clinical factors related to the use of CS is strongly recommended in all hospitals to reduce unnecessary interventions, to improve decision-making and consistency of practice among care providers particularly in resource-limited countries.

## Conflict of interest

The authors declare no conflict of interest.

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