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Review Paper

Epidemiological Trends of Cs Rates: Global Projections and Regional Disparities

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ABSTRACT

Caesarean section (CS) is a critical obstetric intervention that significantly reduces maternal and neonatal morbidity and mortality when performed for well-defined medical indications. However, over the past few decades, CS rates have increased disproportionately across the globe, particularly in tertiary care hospitals, raising concerns regarding the excessive medicalization of childbirth and deviation from evidence-based obstetric practice. This rising trend highlights the need for systematic evaluation of institutional delivery patterns. The present study aims to assess the epidemiological trends of caesarean section in a tertiary care hospital and to analyze the indications contributing to its increasing prevalence. By examining temporal trends and categorizing indications using standardized classification systems, this study seeks to identify both clinical and non-clinical factors influencing CS rates. Understanding these determinants is essential to differentiate medically justified procedures from potentially avoidable caesarean deliveries. The findings of this study are expected to provide actionable insights into prevailing obstetric practices, identify major contributors to primary and repeat caesarean sections, and support evidence-based strategies to optimize delivery outcomes. Promoting rational use of caesarean section while ensuring maternal and fetal safety is essential for improving overall maternal and neonatal health indicators.

INTRODUCTION

Caesarean section (CS) is one of the most commonly performed surgical procedures worldwide and remains an essential intervention for preventing maternal and neonatal mortality when medically justified. Over the past few decades, however, global CS rates have increased at a pace that far exceeds clinical necessity, raising concerns about the medicalization of childbirth. According to the World Health Organization, the worldwide prevalence of CS has risen from 7% in

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1990 to more than 21% in 2023, and is projected to approach 29% by 2030 if current trends continue.[1] This pattern highlights a dual challenge faced by many health systems: underuse of CS in low-resource settings where it is most needed, and overuse in wealthier regions driven largely by non-medical factors.

The rise in CS rates is influenced by a combination of clinical and non-clinical determinants. Clinically, increasing maternal age, higher rates of obesity, greater burden of high-risk pregnancies, decline in instrumental deliveries, and reduced acceptance of vaginal birth after caesarean (VBAC) have contributed to the trend. Non-clinical influences—including maternal fear of labour pain, preference for planned birth, convenience for healthcare providers, medico-legal pressures, and financial incentives in private healthcare—play an equally important role in many countries. These factors together have created significant variation in CS rates both between and within countries, reflecting disparities in access, decision-making, and healthcare practices.[2]

Although CS can be life-saving, unnecessary procedures introduce avoidable risks. Maternal complications associated with CS include postpartum hemorrhage, surgical site infection, thromboembolism, and longer recovery times. Repeated CS increases the likelihood of placenta previa, placenta accreta spectrum, and uterine rupture in subsequent pregnancies. Neonates delivered via CS—especially elective procedures conducted before 39 weeks—are at higher risk for respiratory distress, altered microbiome development, and NICU admission. Given these short- and long-term consequences, optimizing and rationalizing the use of CS is a global priority.[3]

To improve monitoring and guide decision-making, standardized classification systems such as the Robson Ten-Group Classification System are widely recommended.2 These frameworks allow healthcare institutions to audit CS practices, identify target groups contributing to rising rates, and implement evidence-based strategies to reduce unnecessary procedures while ensuring timely access for those who need it.[4]

This review synthesizes updated evidence on epidemiological trends, determinants, clinical indications, and maternal–neonatal outcomes related to CS. It also highlights strategies aimed at achieving safe, equitable, and judicious use of caesarean delivery in alignment with international standards.

EPIDEMIOLOGICAL TRENDS

GLOBAL PERSPECTIVE

Global CS rates have risen dramatically over time, from around 7% in 1990 to 21% in 2023, above the WHO's recommended tolerable range of 10% to 15%. Overuse and unmet demands are predicted to coexist in the present decade, with a projected worldwide rate of 29% by 2030.

According to study conducted by Fatema A. Redha Hasan et al. Global CS rates have been rising for years; in 2018, this study's rate was 32.8%, which is double the WHO's recommended rate. In some regions, the rate has surpassed more over half of births in Brazil, Egypt, and Turkey. Certain nations, including South Africa's 6.2% and West and Central Africa's 4%, stayed below the suggested rate. CS rates in the country of Bahrain have dropped from 77.2% to 62.5% among Bahraini women and climbed from 22.8% to 37.5% among non-Bahraini women. Research has indicated that CS increases with advanced maternal age. In this study, the advanced maternal age group had the lowest CS rate in both years, whereas the 26–30 age group had the highest rate. Similar to Brazil, the majority of CS were among the third gravidity in both years, which suggests the possibility that demand for CS and anxiety over delivery experiences are to blame.[5]

In Southern Asia and sub-Saharan Africa, women's mode of birth is a complex scenario with morbidity and mortality associated with unmet need, unsafe CS provision, and instances of overuse of the surgical procedure that drains resources and adds avoidable morbidity and mortality. If the SDGs are to be achieved within the next ten years, comprehensively addressing the CS issue is a global priority. Current trends and projections of CS use worldwide reveal that modern societies are constantly moving towards medicalization of childbirth.[6]

Between 2015 and 2019, CS rates and trends in Europe differed greatly between nations. In contrast to global trends over the previous few decades, CS rates declined in a number of European nations, typically declining more in those that were able to adopt the Robson TGCS. Stakeholders should keep advocating for legislation targeted at lowering the amount of CSs conducted without a clinical reason since it is crucial. These initiatives might be informed by a thorough and comprehensive analysis of CS rates and trends in light of national policy, given the different tendencies.[7]

In the last 20 years, Rwanda's CS rate has witnessed a seven-fold increase in trend between 2000 and 2019–20 at the population and health facility levels, with enduring regional differences over time.[3]

INDIAN PERSPECTIVE

In a study conducted by Anuj Kumar Padney et al. prevalence of CS deliveries in India has increased over the past few decades, from 8.5% (4777/56,438) in 2005–06 to 21.5% (49,634/2,30,870) in 2019–21, according to an analysis of secondary data from a nationally representative sample of 230,870 women nested within 707 districts from 36 states and union territories of India.[8]

People with lower levels of education have seen a dramatic increase in C-section births, and the pattern of growth was essentially the same in both the south and non-south regions of India. All backward castes and tribes have seen a far greater increase in C-section deliveries. Nonetheless, it is remarkable that the ST population in south Indian states has increased by 261.7%.[9]

DETERMINANTS OF INCREASING C-SECTION RATE

The rise of CS worldwide can be attributed to several factors. Both clinical and non-clinical elements. The growth in CS rates in many countries is attributed to non-medical variables, such as social, cultural, and economic considerations, as well as changes in women's risk profiles and a putative increase in medical indication. One Another factor linked to the growth in CS rates is the "physician factor," which relates the rise in CS to institutional and physician-related variables rather than obstetric risk factors.[10]

MEDICAL

Advanced mother age, high-risk pregnancies (such as those with gestational diabetes or hypertension), obesity, prior caesarean operations, and the increased probability of treatments like induction and fetal monitoring are among the medical factors contributing to the rise in caesarean section rates. Reduced incidence of aided vaginal births, a decrease in vaginal birth after cesarean (VBAC), and modifications to obstetric techniques are further variables.[11]

NON- MEDICAL

The higher CS rates in private hospitals compared to public hospitals can be explained by a number of nonmedical factors, such as increased maternal requests due to presumed anxiety or fear of pain

from VD or a desire to have a baby on a particular day, physician preference or convenience, and financial incentives for physicians or hospitals with higher CS rates compared with VD. In many civilizations, maternal requests for caesarean sections have been shown to be influenced and discouraged by various social-cultural and religious factors. Furthermore, it has been discovered that one of the main and important variables influencing doctors' choice to administer CS as a defense, which in turn increases CS delivery, is fear of legal repercussions and lawsuits due to VD bad results.[12]

CLASSIFICATION SYSTEM

To standardize the evaluation and comparison of cesarean section (CS) rates around the globe, a number of categorization systems have been created. Based on the primary unit being categorized, these systems may be roughly divided into four categories: woman-based (who underwent the CS), urgency-based (when it was conducted), indication-based (why the CS was performed), and other contextual classifications (where, how, or by whom it was performed). Indication-based systems are easy to install and concentrate on obstetric or medical causes, but they frequently have low repeatability and inconsistent definitions. Although they rely on arbitrary time-based cutoffs, urgency-based classifications improve communication among healthcare providers by classifying CS based on the necessary speed of delivery. Maternal and pregnancy factors including parity, presentation, gestational age, and commencement of labor are used in woman-based classifications, such as Robson's 10-group system, which provide mutually exclusive and fully inclusive groups that may be prospectively defined. These are simple to use, very repeatable, and make cross-institution and cross-time comparisons easier. For administrative and policy reasons, organizational or resource-related criteria are included in other classes. The World Health Organization's current guideline for worldwide CS rate monitoring and audit is based on women-based categories, especially Robson's, which were determined to be the most thorough, useful, and globally relevant of all the systems studied.[13][14][15]

INDICATION FOR C-SECTION

Previous cesarean delivery, pelvic deformity, cephalopelvic disproportion, prior pelvic or perineal reconstructive surgery, active genital infections (like HIV or herpes), severe cardiac or pulmonary disease, cerebral aneurysm, or the requirement for concurrent abdominal surgery are common indications for mothers. Abnormal placentation (placenta previa or accreta), placental abruption, previous full-thickness myomectomy or classical hysterotomy, uterine rupture or dehiscence, invasive cervical cancer, and obstructive genital tract tumors are examples of uterine and anatomic causes. Non reassuring fetal state, umbilical cord prolapse, unsuccessful vaginal birth, malpresentation, macrosomia, and significant congenital abnormalities are examples of fetal indications. Despite the possibility of problems, cesarean birth should only be performed in situations that are medically justifiable. By combining professional need with patient autonomy, shared decision-making may be used to evaluate elective cesarean sections at the request of the mother. Since many patients who have an initial cesarean section are likely to need repeat surgeries in later pregnancies, reducing needless primary cesarean sections is crucial.[16]

CLINICAL MANAGEMENT AND TREATMENT PROTOCOLS

A multimodal Enhanced Recovery After Surgery (ERAS) approach that includes preoperative, intraoperative, and postoperative care is used in

the clinical management of cesarean sections. Patients undergo skin preparation, IV access, Foley catheterization, antacid and antibiotic prophylaxis, counseling, and informed consent prior to surgery; elective treatments are planned at ≥39 weeks. Intraoperative regional anesthesia (spinal/epidural) is favored, and uterine and low transverse skin incisions are frequently used. Delayed cord clamping is advised, and the Joel-Cohen procedure reduces blood loss. To stop bleeding, oxytocin is given and the uterus is closed in one or two layers. After delivery, multimodal analgesia using NSAIDs and paracetamol is started. Vital signs, blood, and urine output are monitored after surgery; early walking and oral intake within 12 to 24 hours are advised. Opioids are only used for extreme pain; non-opioid analgesics are used to treat pain. Skin-to-skin contact and early breastfeeding are encouraged, and most patients are released in two to four days. Follow-up is recommended six to twelve weeks after delivery.[17]

MATERNAL AND NEONATAL OUTCOMES

Compared to vaginal birth, C-sections have dangers for both mothers and newborns. Intraoperative bleeding, infection, and damage to nearby organs like the bladder or colon are examples of maternal complications that frequently necessitate extended hospital stays. Long-term concerns include increased risk of thrombosis, placenta and uterine rupture in subsequent pregnancies, and, in rare cases, maternal death. Neonatal hazards include breathing problems such respiratory distress syndrome and transitory tachypnea, especially in preterm or elective C-sections performed before 39 weeks. Additionally, NICU admission rates for respiratory assistance or monitoring are higher in babies born via C-section. Furthermore, immunological and metabolic development may be impacted by a lack of exposure to the mother's vaginal microbiota. All things considered, emergency C-sections are riskier than elective or vaginal births, which highlights the importance of careful indication and the best possible perioperative care.[18]

ECONOMIC AND PUBLIC HEALTH IMPACTS

The increasing rate of caesarean section has profound economic and public health consequences, particularly in low- and middle-income countries. From an economic standpoint, caesarean delivery incurs significantly higher costs compared to vaginal birth due to surgical expenses, anesthesia, prolonged hospitalization, and increased postoperative care requirements. At the health-system level, elevated CS rates place additional pressure on operating facilities, workforce availability, blood bank services, and neonatal intensive care units. From a public health perspective, unnecessary caesarean sections contribute to increased maternal morbidity, including postoperative infections, hemorrhage, thromboembolic events, and complications in subsequent pregnancies such as placenta previa and placenta accreta spectrum disorders. These long-term complications not only increase maternal risk but also lead to repeated surgical interventions, thereby escalating healthcare costs and resource utilization. Neonates delivered via caesarean section—particularly elective procedures before 39 weeks—are at increased risk of respiratory morbidity and NICU admission, further amplifying the public health burden. At the population level, rising CS rates reflect disparities in healthcare access, variations in clinical decision-making, and the growing influence of non-medical factors such as medico-legal concerns and institutional practices. Addressing these trends through standardized auditing tools, adherence to clinical guidelines, and patient-centered counseling is crucial for improving maternal and neonatal outcomes while ensuring

sustainable and equitable healthcare delivery.[19][20][21]

STRATEGIES TO OPTIMIZE C-SECTION RATES

A multidisciplinary, evidence-based prenatal care approach is the main focus of strategies to maximize the rates of cesarean sections. Realistic simulation workshops, regular professional training, and organized clinical procedures for labour management and C-section scheduling (only beyond 39 weeks unless medically required) were implemented. Obstetricians were urged to boost vaginal deliveries through incentive schemes and performance reviews. Updated permission forms, seminars on preparing for labour, and internet resources encouraging a normal birth were all used to improve patient education. Improvements to the facility, such as a dedicated birth center with non-pharmacological pain treatment techniques, increased patient comfort and self-assurance. By actively participating, doulas and midwives reduced needless interventions and offered ongoing labour support. While enhanced communication mechanisms, such WhatsApp groups and frequent meetings, encouraged collaborative practice, electronic medical records guaranteed recording and audit of C-section indications. Maternal-neonatal safety was ensured and progress was sustained via ongoing monitoring of NICU admissions and delivery outcomes.[22][23]

FUTURE DIRECTIONS & RESEARCH GAPS

Despite extensive global data on caesarean section (CS) use, several priority areas require further investigation to ensure safe and appropriate practice. First, there is a need for stronger health-system research that evaluates how policies, workforce distribution, and facility-level capacity influence CS overuse and underuse across diverse populations.1 More high-quality prospective studies are needed to understand the effects of non-medical drivers—such as maternal preference, cultural expectations, and medico-legal pressure—on rising CS trends, as these determinants remain poorly measured and vary widely between countries.[24]Another major research gap involves the long-term consequences of repeated CS, including risks of placenta accreta spectrum, uterine rupture, infertility, and neonatal outcomes extending into childhood. Existing evidence is limited and often retrospective, highlighting the need for large prospective cohorts.3 Additionally, further evaluation is required to determine which interventions—such as midwife-led continuity models, labour support programs, and standardized audit systems—are most effective at reducing unnecessary primary CS in different health settings.[25]Implementation research is also essential to understand how evidence-based strategies can be adapted and scaled in low-resource regions where access to safe CS remains inadequate. Finally, future studies should integrate patient-centered perspectives, ensuring that childbirth policies reflect maternal autonomy while promoting safe, evidence-based care.[13][17]

CONCLUSION

Caesarean section remains a critical intervention for reducing maternal and neonatal morbidity and mortality when medically indicated. However, its rapid and uneven rise across regions reflects a growing imbalance between clinical need and practice. Current evidence demonstrates that both medical factors—such as high-risk pregnancies and declining VBAC rates—and non-medical factors including fear of labour pain, convenience, and financial incentives contribute to unnecessary CS use. While standardized monitoring tools like the Robson classification have improved clinical auditing, significant disparities persist between

public and private sectors, and between high- and low-resource settings.Optimizing CS use requires a multifaceted approach that promotes evidence-based labour management, enhances patient education, and strengthens health-system accountability. Reducing avoidable primary CS, ensuring access where medically necessary, and improving quality of care during vaginal birth are essential for improving maternal and neonatal outcomes. Continued research, surveillance, and implementation of context-specific strategies remain central to achieving safer and more equitable childbirth practices globally.

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