

Review Article

TOWARDS OPTIMIZING CAESAREAN SECTION: THE CHALLENGES OF CONCURRENT UNDERUSE, UNSAFE USE AND OVERUSE IN DEVELOPING COUNTRIES.

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Abstract

Caesarean section is a lifesaving procedure but not without risks. While the developed countries are currently bothered by the rising Caesarean section rates and the feared consequences of repeat Caesarean section on the woman, developing countries are still faced with challenges of ensuring adequate access to safe Caesarean section. Inequalities also exist in the access to Caesarean section within developing countries where adequate access and overuse, especially among the population above low social class and in the urban settings coexists with lack of access and underuse among the poorest of the population usually in rural areas. Too little, too late access to Caesarean section is associated with unsafe Caesarean section procedures. Where access to Caesarean section is below the recommended threshold, maternal and perinatal morbidity and mortality is high. Authors reviewed relevant literatures on the current state of knowledge on underuse, unsafe use and overuse of Caesarean section with a focus on developing countries.

Keywords: Caesarean section rate, Indications for Caesarean section, Underuse, Unsafe use, Overuse, Developing countries.

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INTRODUCTION

Like any major surgical procedure, a Caesarean section (CS) is not without risks. In a low risk pregnancy, CS carries 3-4 times higher risk of maternal and perinatal morbidity and mortality than vaginal delivery.¹ There is a risk of operative morbidity in the immediate, short and long term which increases with each repeat CS.² However, CS is lifesaving when there is an impending obstetric danger or an on-going compromise and threat to the lives of the mother and the foetus.^{2,3} The surgical procedure can be safely performed in many cases and an increased access to CS is associated with improvement in maternal and perinatal outcomes.⁴

Developing countries still battle with the issue of inadequate access to CS.^{3,5} Many women who need a CS to save their lives and/or that of their

babies do not get one, and when they do, many times it is not early enough. Though there has been some increase in CS rate in developing countries recently,^{3,6} population level rates are still below the World Health Organisation (WHO)^{7,8} recommended 10 – 15% especially in Sub-Saharan Africa; and not enough to achieve a significant reduction in maternal and perinatal morbidity and mortality.

As access to CS increases in developing countries, additional challenges of inappropriate use are also emerging in line with global trends of rising CS rates and increasing number of CS done for medically unjustifiable reasons. Overuse and underuse of CS now coexists in many developing countries; especially in urban settings.⁹ An unnecessary CS has no evidence of substantial benefit to the mother or the baby and its

associated risk can easily outweigh any intended benefit.^{7,8} The consequences of an unnecessary CS are usually higher in developing countries because of limited resources for safer surgery and for managing complications if it arises.^{4,5,7,10}

In addition, developing countries are faced with issues of CS performed in settings that lack minimum standards for clinical decision making, surgical safety, counselling and consent due to significant gaps in resources.⁹ Such unsafe use of CS increases risk of preventable iatrogenic morbidity.⁹ Maternal and perinatal deaths following CS are higher in developing countries especially in Africa. A woman has a 1 in 100 chance of dying following a CS in Sub-Saharan Africa; 100 times more than women in the UK.^{4,11}

GLOBAL TRENDS IN CAESAREAN SECTION

Towards the end of the 20th century, the increasing CS rate became a cause for concern for the medical community, and World Health Organization (WHO) in 1985 stated that “there is no justification for any region to have Caesarean section rates higher than 10-15%”.^{7,8} However, by the beginning of the 21st century, the rate of CS has risen significantly above the 10-15% recommended by WHO in many regions of the world especially in developed and middle income countries.^{3,6} Between 1990 and 2014, the more-developed countries have had a rise in CS rate of 12.7%, less-developed countries have had a 14.6% rise and least-developed countries managed a 4.6% rise.⁶ By 2014, the average global CS rate was 18.6%.⁶ Regional analysis showed 40.5% in Latin America and Caribbean (42.9% in the South American sub-region), 32.3% in North America, 25.0% in Europe, 19.2% in Asia, 31.1% in Oceania, 32.3% in Australia and New Zealand, and 7.3% in Africa.⁶ Countries with the highest rates in regions where CS rate had risen above 15% include Dominican Republic with CS rate as high as 56.4%, and Brazil, Egypt, Italy, Iran, Turkey, China, United States of America, United Kingdom, and New Zealand had 55.6%, 51.8%, 38.1%, 47.9%, 47.5%, 36.2%, 32.8%, 24.1% and 33.4% CS rates respectively.⁶

Some European countries such as Finland, Iceland and Norway succeeded in maintaining their CS rates at around 15%.⁶

Factors Influencing Rising Caesarean section rates

The reasons for rising CS rates above threshold are complex and multifactorial,^{7,8,12} and attributable to inappropriate use of CS.¹³ A common factor in rising CS rates is previous CS. A previous CS has significant implications for subsequent pregnancies;¹⁴ it influences decision on the mode of delivery and management of labour. This underscores the importance of ensuring a primary Caesarean delivery is medically justifiable.

Changing risk profile of pregnant women has been identified as a factor in the rising CS rates. More women get pregnant at an advanced age, with medical conditions e.g., diabetes mellitus, obesity, or through fertility treatments and are at higher risk of complication in pregnancy requiring intervention with CS.¹²

In practice however, absolute indications for CS are very few e.g., major degree placenta previa, vasa previa, abruptio placentae with a live baby, cord prolapse with live baby in first stage labour, transverse lie, brow presentation, mento-posterior face presentation, obstructed labour, contracted pelvis etc. Most medical indications are relative and a product of the perception of the emerging situation; its interpretation and recommendation by the health care provider.¹⁴ Indications are becoming increasingly vague and difficult to justify medically e.g. poor progress in labour, suspected foetal distress, elderly primigravida.¹⁵ Of those with specific indications, there are challenges in uniformity of criteria and new evidence has emerged to indicate that CS based on what was previously known is being carried out too soon.¹⁴

Indications for CS prelabour include previous CS, severe preeclampsia/eclampsia with unfavourable cervix, breech presentation, abnormal lie, suspected foetal macrosomia, twin and higher

order multiple pregnancies, placenta previa, abruption placentae, prevention of mother to child transmission of human immunodeficiency virus (HIV), previous myomectomy etc.

Intrapartum CS are usually as a result of failed induction of labour, failed trial of labour, first stage arrest disorders, second stage arrest disorders, abnormal foetal heart rate patterns, cord prolapse, abruption placentae etc. There are regional and hospital level variations in the most common indications for the primary CS.¹⁶ However data from most regions will include labour dystocia, non-reassuring foetal heart rate patterns/suspected foetal distress, breech presentation, hypertensive disorders in pregnancy, suspected foetal macrosomia, and multiple pregnancy.^{16,17,18}

Non-medical factors including health systems factors, health care provider factors, patient factors, social factors and cultural factors usually influence the decisions for CS.^{7,8} Individual obstetrician's and health systems' clinical practice patterns contribute to CS rate. For example, the attitudes to trial of labour after a Caesarean section (TOLAC) differ among obstetricians and so are the regional approaches to delivery options after two previous CS. Other provider and health system factors that have been identified include physician fatigue, workload, anticipated sleep deprivation (reluctance to monitor a slowly progressing labour),¹⁴ inadequate or lack of skill for assisted and operative vaginal deliveries, doctors combining public and private practice needing time to attend to private work, CS done for financial gains (for the physician and the organization); usually in private hospital settings,¹⁹ attitude towards available evidence and need to reduce CS rates, and medico-legal pressure/fear of litigation/defensive obstetric practice.^{12,14,19} Contrary to what evidence suggests, CS is believed to be protective in some lay settings and clinicians are more likely to be sued for a complication during vaginal delivery; even without evidence of error, than for a CS; even when unnecessary. Being sued even when eventually found not guilty or liable does not

guarantee innocence in the court of public opinion; it generates negative publicity, damages reputations and destroys careers.¹⁹ A health system factor found in low resource settings is where referrals to tertiary hospitals from peripheral hospitals are delayed due to inadequate skill of referring personal in early detection of danger signs, or where women are mismanaged by unskilled birth attendants before verbal referrals. A CS is often the only logical option in such circumstances.¹⁹

In developing countries where there are high incidences of obstructed labour, beyond the unavailability of skill for destructive operations there is also a socio-cultural aversion towards destructive operations in many settings. CS is therefore carried out in many such situations even when there is already a foetal demise.

CS on maternal request is a CS done on patient's request without any medical or obstetric indication or a contraindication to vaginal delivery.¹² It is believed to be among the leading causes of rising CS rates in developed countries.^{12,13} It is commoner among the educated, above low social class and in private hospitals. Reasons why women request an elective Caesarean delivery include fear of labour pain (usually where epidural analgesia is not available or affordable), previous traumatic birth experience, previous unpleasant birth experience (disrespect and abuse in previous labour), fear of complication for the baby, psychosomatic/psychiatric reason, fear of urinary, faecal incontinence and genital prolapse after vaginal delivery, fear of sexual dysfunction after vaginal delivery, wrong perception of CS as safer than vaginal delivery for mother and baby, delivery planned for a particular date, planned tubal ligation after CS etc.^{12,19} Contrary to perceived opinion however, most women do not prefer a Caesarean delivery. A systematic review on world preferences for CS reported 15% in all women and 10% in women without a previous CS.¹⁸ Many times the opinions of pregnant women leading to the decision for a CS are influenced by the environment and the social

media.⁷ CS is sometimes presented as convenient, controllable, modern and fashionable.

SITUATION IN DEVELOPING COUNTRIES

According to WHO,^{7,8} CS rate below 10-15% at population level suggests underutilization of the benefit of CS in reducing maternal and neonatal morbidity and mortality. In 2014, CS rates were as low as 11.4% in Ghana, 2.0% in Nigeria, 7.1% in Rwanda, and 3.0% in Zambia.⁶ While concerns are centred on rising CS rates above threshold in developed countries, the concerns in developing countries are about adequate access to and safety of CS.³ In addition, despite the inadequate access to CS, overuse still exists in some settings in developing countries. Overuse and underuse of CS coexists in many developing countries, especially in urban settings.⁹

Underuse and Unsafe Use

Underuse of CS in developing countries is a factor of inadequate or lack of access. Many women who need a CS to save their lives and/or that of their babies do not get one, and when they do, many times it is too late. Lack of access to CS contributes to high maternal and perinatal morbidity and mortality indices. Ninety-nine percent (99%) of the 300,000 women that die during childbirth are from low and middle-income countries.⁴

Factors causing inadequate or lack of access to CS in developing countries are not different from those factors limiting access to healthcare generally.

These are both on the supply side and the demand side; having the dimensions of availability, accessibility, affordability, and acceptability.²⁰ On the supply side, there is poor funding for public health, unavailability of public health facilities where they are needed, and when they are available, they lack staff and equipment to work; especially in rural areas. Also, functional facilities are often times not easily accessible because of bad road networks or sometimes no connection by road at all, faced with challenges of ensuring quality of services rendered and occasional dysfunction and inability to render services.²⁰ On the demand side, available services are not

utilized by the beneficiaries. There are peculiar problems limiting demand in developing countries including a largely uneducated populace and cultural beliefs, which may affect judgement on the need to seek health care, and poverty, lack of universal health insurance which may make cost unaffordable and prevent utilization even if benefits are recognized.²⁰ Supply and demand side factors are interconnected in practice; a dysfunctional health service will arouse little interest from the public, and high purchasing power will increase demand and drive supply.²⁰

On the quality side of access to health, access to safe CS is another challenge being faced in developing countries. From the African Surgical Outcomes Study (ASOS) of 2016,²¹ over 3/4th of women that had Caesarean delivery presented as an emergency; with a high baseline preoperative risk from pregnancy-related complications including pre-eclampsia or eclampsia, placenta previa, abruptio placentae, and uterine rupture. Emergency CS especially in the second stage of labour is a major risk factor for severe acute maternal morbidity (SAMM), and maternal and perinatal deaths.⁴ The risk of intraoperative complications during such emergency CS are increased 17-fold in developing countries compared to 3-fold in developed countries.⁴ Preoperative major bleeding risk, perioperative haemorrhage and anaesthesia related complications (from failed intubation, aspiration, hypoxia and cardiac arrest) were independently associated with mortality.²¹

One in six women who had CS developed a perioperative complication.²¹ Postpartum haemorrhage was the most severe complication²¹ and is the main cause of death from systematic reviews of complications associated with CS in developing countries.⁴ A woman has a 1 in 100 chance of dying following a CS in developing countries especially in Sub-Saharan Africa; 100 times more than women in the UK.^{4,11} One in ten babies delivered by CS in developing countries is stillborn largely because of delayed referral by inadequately skilled health professionals or unskilled birth attendants, and CS done despite a

diagnosis of still birth or with undiagnosed still birth.⁴ Overall neonatal mortality after CS was 4.4%, and up to 18% for neonates delivered at 35 weeks' gestation or less. These outcomes of CS in developing countries are attributable to too little access offered too late.

Caesarean section performed in settings that lack minimum standards for clinical decision making, surgical safety, counselling and consent due to significant gaps in resources are a challenge in developing countries. This is a consequence of inadequate clinician training, workforce, infrastructure, quality assurance systems and also task shifting. These settings include clinicians carrying out a CS alone; without nursing or anaesthesia support (usually seen in private hospital settings), obstetrician-gynaecologists providing an average of six CS a day at overwhelmed referral hospitals, and operating theatres facing such high volume that staff can not adhere to basic infection control practices between procedures.⁹

While understandably focus has been on providing access to CS as a lifesaving measure and to prevent maternal and neonatal complications, it is pertinent to also note that unsafe use of CS will contribute to poor maternal and neonatal outcomes by increasing risk of preventable iatrogenic morbidity. CS has been ranked among the most common causal procedures of iatrogenic fistula in developing countries.⁹

Overuse

Beyond the obvious disparity in access to health between developed and developing countries, there exist disparities in access also within the developing countries.²² Where there is access to and utilization of CS, inappropriate use is not uncommon. Inequality in access to CS does exist in developing countries such that while some parts of the population have no access or inadequate access to CS, same is being overused in some settings within the same population.³ Access and utilization appear to be directly proportional to socio-economic status.³

Urban/rural settlement, wealth inequalities and education of the mother²² are determinants of access to CS where overuse and underuse coexists, and overuse possibly limits resources that could be used to address underuse since developing countries are resource-constrained.

Within Sub-Saharan African countries, prevalence of CS was higher in private hospitals than public hospitals. In Rwanda, Namibia, Comoros and Ethiopia, private hospital prevalence was 64.2%, 60.3%, 33.3% and 30.1% respectively compared to 14.6%, 14.6%, 12.9% and 7.3% respectively in public hospitals. In Ghana, Nigeria, Cameroon, Benin, Zimbabwe, and Uganda, private hospital prevalence was 17.6%, 7.8%, 7.4%, 9.1%, 16.6% and 11.8% respectively compared to 15.6%, 6.0%, 6.0%, 6.2%, 6.9% and 8.0% respectively in public hospitals. Exceptions are found in Congo where prevalence of CS was lower in private hospitals and Sao Tome and Principe where none was recorded in private hospitals.²³

In Pakistan, there is a 33% population-level CS rate in Islamabad while in Balochistan, it is just 3%.⁹ In India, the state of Telangana recorded 57.7% CS rate,⁹ whereas the state of Mizoram recorded about 5.8%.²⁴ In Ethiopia, the province of Addis-Ababa recorded 21.4% CS rate, while the province of Somalia recorded as low as 0.4%.²⁴ In Cambodia, 14.3% was recorded in Khulna while 2.2% was recorded in Kampong Speu & Pursat.²⁴

In Bangladesh, over half of the births among the richest quintile of women were Caesarean deliveries, compared with 7% among the poorest.⁹ Similarly, in Nigeria, utilization of CS is within the WHO 10-15% recommended level among women from the richest households, conversely, women from the poorest households fall significantly lower than the recommended rate.²²

Population-level CS rates above threshold raises concern about the health impact on the population. In 2015, while addressing population-level CS rate, WHO^{7,8} stated that "as Caesarean

section rates increased above 10% and up to 30% no effect on mortality rates was observed". Instead, overuse of CS can directly affect the safety^{9,13} of the procedure and increase the chances of occurrence of associated immediate and short term operative morbidities including anaesthetic complications, haemorrhage, iatrogenic injuries to organs, venous thromboembolism, and perioperative infection.¹² A woman who delivers by CS is more likely to have another Caesarean delivery as the risks associated with subsequent pregnancies are higher including risks of uterine scar rupture, placenta previa, accreta, increta, percreta, still birth, preterm birth.^{2,12} With increasing number of CS, there is a risk of pelvic adhesions, a higher risk of intraoperative haemorrhage, need for blood transfusion, intraoperative surgical injury, and hysterectomy.² Other possible long-term complications include small bowel obstruction, ectopic pregnancy, dysmenorrhoea, chronic pelvic pain, sexual dysfunction, subfertility, urinary/faecal incontinence, and pelvic organ prolapse.²

The overall unadjusted frequency of SAMM is greater following CS than vaginal birth.² Thus if a CS was unnecessary *ab initio*, there is no evidence of substantial benefit to the mother or the baby^{7,8} and its associated risk can easily outweigh any intended benefit. The consequences of an unnecessary CS are usually higher in developing countries, because apart from possibility of poorer outcome due to inadequate operative infrastructure and challenges with optimum perioperative management, there are limited resources for managing complications if it arises.^{4,5,10}

Moreover, there is emerging evidence that babies born through CS have different hormonal, bacterial, medical and physical exposures that may subtly alter neonatal physiology. There is an association between CS birth, aberrant infant skin and gut microbial composition, and altered immune development, increased possibility of allergy, atopy, asthma and in later life obesity, and metabolic syndrome.^{2,12}

PROVIDING ACCESS TO SAFE CAESAREAN SECTION

Access to comprehensive emergency obstetric and newborn care (EmONC) including CS is a priority in reducing maternal mortality.²⁵ Beyond access the safety of the CS procedure is key to improving outcome in developing countries. Lack of access to CS is a reflection of the significant gap between the health care need and the level of access to health care in developing countries especially among the poorest groups.

From the work of Bright T, et al²⁶ in a systematic review of strategies to increase access to health services in low- and middle-income countries, howbeit with reference to under five children, the categories of interventions to improve health care access can be identified. The supply and demand components of health care access as described by Peters DH, et al,²⁷ in the dimensions of accessibility, availability, affordability and acceptability must be in view. That is, is the service geographically reachable? Will the user receive the right service, and timely? Can the user afford the direct and indirect costs of the service? Does the service meet the needs and expectations of the user? Types of interventions to tackle different dimensions of access as highlighted by Bright T, et al²⁶ include delivery of services at or closer to home, service level improvements, health promotion/education programmes, financial or other incentives, and a combination of all four types.

On the supply side, as stated by the Secretary-General, United Nations in the forward written for the MDGs report 2015²⁸ that "further progress will require an unswerving political will, and collective long-term effort", a strong and consistent political will by the governments of developing countries is required to increase access to health. An improvement in funding for public health is essential to provide health infrastructures and personnel for emergency obstetric care (EmOC) services²⁹ especially in the rural areas, sited and replicated within reasonable distances from the users. Bringing such services closer to the rural communities²⁶ thereby

overcoming geographical and financial accessibility barriers, plus ensuring the right services are provided promptly by increasing number of qualified providers and promotion of task shifting within the appropriate cadres⁴ will likely scale up utilization. This is in keeping with the World Health Assembly's resolution to include emergency and essential surgical care as a component of universal health coverage.³⁰ Nyamtema A, et al³¹ in a before-after intervention study in Tanzania concluded that increasing the availability and quality of CS by improving infrastructure and training of personnel with supportive supervision is feasible, acceptable and required in low resource settings.

On the demand side, educational programmes to improve health seeking behaviour²⁶ of especially the rural populace are required; to disabuse their minds on erroneous cultural beliefs, preferences, norms and stigma that militate against utilization of available health services. Financial incentives or reliefs²⁶ for uptakers of emergency obstetric care services including CS from governments of developing countries will likely help take care of financial accessibility barriers. The work of Ravit M, et al³² provides evidence for the role of financial incentives in the uptake of CS. The study compared two West African countries; Mali and Benin with national user fee exemption policies with another two countries; Nigeria and Cameroon without such national policy and found that the user fee exemption policy had a positive impact on CS rates among non-educated women, women living in rural areas, and women in the middle-class wealth index.

However, Edu CB, et al³³ in a similar study on the effect of free maternal health care program on health seeking behaviour in Cross River State of Nigeria, found only a weak evidence of change in maternal health care service utilization. Urban/rural dwelling and closeness to health facilities were factors. Other barriers to health care service utilization included direct cost, poor information dissemination especially in rural areas, perceived poor quality of care at facilities including drug and consumables stock-outs, geographical

barriers, inadequate health work force, poor attitude of skilled health workers and lack of trust in the health system. The study concluded that reasons for maternal health care utilization even under a cost-removal policy are multifactorial; in addition to fee removal the government must be committed to addressing other deterrents in order to significantly increase maternal health care service utilization. This is in keeping with the combined intervention highlighted by Bright T, et al.²⁶ From exploring the experiences of women participating in a safe motherhood (Abiye) project in Ondo State, Nigeria,³⁴ which offered free healthcare to pregnant women; including Caesarean section, and to under five children, factors that determined utilization included attitude of staff, awareness and cost of services, health worker- patient communication, unmet expectations, and cultural beliefs and gender inequality.

Safety of CS can be related to timing of the surgery and the quality of care around CS.^{4,21} The limited access to CS available in developing countries often come too late. The birthing women are many times mismanaged by unskilled birth attendants^{4,19} mostly in rural areas before eventually being referred, and it may take further referrals before getting access to CS. As reported under goal 5 of the MDGs report 2015,²⁸ there is a 31 percent-point gap between urban and rural areas in the births supervised by skilled attendants in developing countries. By sub-regions, the gap is 39% in Sub-Saharan Africa (77% urban, 38% rural), 33% in Southern Asia (75% urban, 42% rural), 27% in Western Asia (94% urban, 67% rural), while it is lower at 18%, and 17% in Latin America and the Caribbean (96% urban, 78% rural) and South-Eastern Asia (91%urban, 74% rural) respectively. Caesarean section is performed as an emergency and in advanced labour in many of such scenario with a high risk of morbidity. Therefore, access to skilled birth attendants (SBAs) is also a priority in reducing maternal mortality,²⁵ especially in rural areas. SBAs need to be adequately trained and supervised to ensure optimum labour management, appropriate and timely decision

making for CS, and timely referral to improve safety of CS.⁴

From the ASOS findings,²¹ two areas of promising interventions were identified in making CS safe. One is providing safe obstetric anaesthesia through consistent use of surgical safety checklists, availability of pulse oximetry, dedicated training in anaesthesia, appropriate supervision and support especially in emergencies for non-physician anaesthesia providers. Second is management of bleeding risk and postpartum haemorrhage through early identification of patients at risk of bleeding and their active management, availability of blood and blood products, and early administration of tranexamic acid. Implementation and adaption of WHO safer surgery checklist especially for second-stage CS will likely help to avoid complications from difficult delivery of the head, trauma to adjacent organs, postpartum haemorrhage.^{4,35} Training of qualified providers in the use of interventions like balloon tamponade, and B-lynch suture for management of postpartum haemorrhage is required, plus ensuring supplies of uterotonics, tranexamic acid, blood, facilities for maternal and neonatal resuscitation, and effective antibiotics.^{4,36}

In 2017, Fistula Care Plus (FC+) at Engender Health and the Maternal Health Task Force, part of the Women and Health Initiative at the Harvard T.H Chan School of Public Health co-convened a technical consultation to examine issues affecting the safety and quality of CS services in low-resource settings.⁹ Participants developed a consensus action agenda to improve safety of CS. Key actions in the agenda include 1. Build bridges between maternal health and safe surgery communities, 2. Establish criteria and accreditation processes for facilities providing CS, 3. Invest in expanding the surgical, anaesthesia, and obstetric (SAO) workforce, 4. Support supervision and training for SAO quality improvement (QI), 5. Promote quality assurance (QA) in emergency obstetric and newborn care (EmONC), especially task shifting, 6. Strengthen facilitated EmONC referral including via information/communication technology, 7.

Campaign against CS overuse, where appropriate, and 8. Strengthen health management information systems to support QA/QI for CS.

Though it is a challenging task to improve access to CS in the populations in need without exacerbating overuse in other populations in developing countries,^{4,9} working to improve access to and safety of CS must occur simultaneously with striving to avoid overuse of the procedure.

STRATEGIES TO AVOID OVERUSE OF CAESAREAN SECTION

There is reduction in maternal and perinatal morbidity and mortality when a medically necessary CS is performed,^{7,8} but when CS is performed for nonmedical reasons or is medically unnecessary, its benefits are easily eroded and risks supervene. To avoid overuse of CS and the possible risks that may follow especially with repeat CS, both clinical interventions targeted at certain indications for CS that are safely modifiable, and nonclinical interventions that address the role of patients, health care providers and health systems are required.

Clinical Interventions to Reduce Unnecessary Caesarean Sections

To avoid overuse of CS both primary and repeat CS need to be looked into. Judicious promotion of vaginal birth after Caesarean section (VBAC) is useful for avoiding unnecessary CS. Currently, the rate of successful VBAC is as high as 72-75% in developed countries.³⁷ A rate of 52.8 -70.1% was reported out of Sub-Saharan Africa, showing that a good VBAC rate is obtainable even in a low resource setting.³⁸ Despite the safety of VBAC in carefully selected women,³⁹ attitude to TOLAC differ among obstetricians, and so is how far obstetricians are willing to go when monitoring such labour.

Appropriate augmentation of labour during TOLAC is not associated with an increase in uterine scar rupture (no increase in foeto-maternal morbidity or mortality), however the need for augmentation is associated with a decrease in

successful VBAC and a low threshold for CS remains necessary.⁴⁰ The higher risk of uterine scar rupture/dehiscence in carefully selected women planned for VBAC than in women planned for elective repeat Caesarean section (ERCS) is counterbalanced by reduction in maternal morbidity, uterine scar rupture/dehiscence, and hysterectomy when VBAC is successful.⁴¹ In women planned for VBAC, induction of labour (IOL) with prostaglandins is associated with a 15.6-fold increase in risk of uterine scar rupture compared with women undergoing ERCS without labour.⁴⁰ Prostaglandins appear to have a direct weakening effect on the scar while oxytocin is more associated with defects away from the old scar.⁴⁰ However observation of Macones GA, et al⁴² was that sequential use of prostaglandin and oxytocin is what increased the risk of uterine rupture.

A suitable alternative to prostaglandin IOL is use of Foley catheter which although not associated with increased risk of uterine rupture, is less successful in effecting vaginal delivery.⁴⁰ In VBAC for twin pregnancy, vaginal delivery in up to 70% of the women have been documented, however there is a 3 to 5-fold increase in scar dehiscence.⁴⁰ A Study showed that TOLAC is more likely to fail in women ≥ 35 years of age,⁴³ and another study reported that risk of uterine rupture is higher in women ≥ 30 years of age.⁴⁴ Labour progress during TOLAC should be monitored meticulously with partograph as 1 hour after crossing the alert line with a poor progress in labour, the risk of uterine rupture increases by a factor of 10.⁴⁰ Successful VBAC can save cost and achieve greater patient satisfaction. To avoid one symptomatic uterine rupture from VBAC, 370 ERCS would be performed.⁴⁰

Despite the role of TOLAC, repeat CS still contribute to the overall number of CS in many settings either in women considered not suitable for a TOLAC e.g., women with two or more previous CS, one previous CS where IOL even with Foley catheter is contraindicated, or after a failed trial of labour. Thus, a repeat CS is still unavoidable in many cases and with the risk of

immediate, short term and long-term operative morbidity increasing significantly with each repeat CS, it becomes of great necessity to consider safe prevention of the primary CS. Spong CY, et al¹⁴ highlighted clinical interventions for reducing the primary CS according to emerging clinical and scientific evidences and advances, from the consensus reached following the National Institute of Child Health and Human Development (NICHD), the American College of Obstetricians and Gynaecologists (ACOG), and the Society for Maternal Foetal Medicine (SMFM) workshop in 2012. Based on pattern of common indications for the primary CS, areas identified for possible interventions include primary CS done for the following: labour dystocia, suspected foetal distress, failed induction of labour, breech presentation, suspected foetal macrosomia, twin pregnancy, and maternal request.

Labour management protocols have been based on the work of Friedman in the 1950s and beyond, which was translated into the popular Friedman Curve and CS done for labour progress that does not follow the curve. However more recent evidence from the Consortium on Safe Labour;^{4,5} a retrospective multicentre study conducted at 19 United States hospitals and consisted 62,415 parturient women each of whom delivered a singleton vertex foetus vaginally and had a normal perinatal outcome, as emerged. It is now known from the Consortium on Safe Labour data^{16,45} that in contemporary labour progress: 1. From 4-6cm nulliparous and multiparous women dilate at essentially the same rate and not as fast as previously thought, 2. The active phase (maximum slope in the rate of change of cervical dilation over time) does not start until at least 6 cm (rather than previously thought 4 cm), and 3. Beyond 6 cm, multiparous women dilate more rapidly at 0.5-1.3 cm/h (slower than the Friedman curve standard of ≥ 1.5 cm/h), and nulliparous women dilate less rapidly at 0.5-0.7 cm/h (slower than the Friedman curve standard of ≥ 1.2 cm/h). It is believed that since the evidence from the Consortium on Safe Labour data are cotemporary and robust, it should rather inform evidence-based

labour management than standards from Friedman's work.¹⁶ New labour management strategies predicated on this recent evidence are capable of reducing the number of CS done.

Recommendations from the recent WHO guideline on intrapartum care⁴⁶ and the ACOG/SMFM consensus¹⁶ concerning management of the first and second stages of labour are as follows: 1. Active phase of labour should be considered as a cervical os dilation of 6 cm in most women, and standards of active phase progress should not be applied before 6 cm dilatation, 2. Interventions to accelerate labour and birth (oxytocin augmentation or CS) before 6 cm cervical os dilatation are not recommended provided foeto-maternal conditions are reassuring, 3. Slow but progressive labour in the first stage of labour e.g. a slower than 1 cm/h cervical os dilatation alone, should not be an indication for CS, 4. Diagnosis of arrest of labour in the active phase and decision for a CS should only be made in women with ≥ 6 cm cervical os dilatation, with membrane ruptured, and no further progress despite 4 hours of adequate uterine contraction or 6 hours with inadequate contractions and oxytocin augmentation, and 5. Provided foeto-maternal conditions are reassuring, at least 2 hours and 3 hours of pushing in the multiparous and nulliparous woman respectively should be allowed before arrest of labour in the second stage is diagnosed; however as long as there is progress, longer duration may be allowed on individualized basis e.g., with epidural or foetal malposition.⁶

Operative vaginal delivery in second stage of labour by an experienced hand should be considered a safe and acceptable alternative to CS; training and maintenance of skills in operative vaginal delivery should be encouraged.⁷ Assessment of foetal position in the second stage of labour in the setting of abnormal foetal descent is recommended, and manual rotation of foetal occiput in the presence of foetal malposition is a reasonable intervention to consider before moving to operative vaginal delivery or CS.

Still on management of labour in the second stage, in developing countries where foetal demise is already diagnosed before CS is carried out, there could be a role for destructive operations where culturally acceptable.^{4,47}

Concerning CS for non-reassuring foetal heart rate patterns, foetal heart rate abnormalities detected by intermittent auscultation is an indication for continuous foetal heart rate monitoring.¹⁴ Non-reassuring/category II foetal heart rate patterns require intrauterine resuscitation, discontinuation of oxytocin infusion, monitoring and re-evaluation.^{14,16} Amnioinfusion with normal saline has been demonstrated to resolve variable foetal heart rate decelerations and reduce the number of CS done for non-reassuring foetal heart rate patterns.¹⁶

Foetal scalp stimulation to elicit foetal heart rate acceleration can be used if cervix is dilated to access foetal acid-base status.^{14,16} Elicited foetal heart rate accelerations are associated with a normal umbilical cord arterial PH (≥ 7.20) and can avoid unnecessary CS.¹⁶

On induction of labour (IOL), overall likelihood of vaginal delivery is lower after IOL than after spontaneous labour.¹⁴ IOL with an unfavourable cervix increases the potential for CS¹⁴ and should only be undertaken when continuation of the pregnancy is associated with risk of morbidity or mortality to the mother and/or the foetus. IOL without a medical indication should be limited to ≥ 39 weeks gestational age, is contraindicated with an unfavourable cervix especially in nulliparous women, and cervical ripening is not an option.¹⁴ A bishop score of >8 confers the same likelihood of vaginal delivery after IOL as that after spontaneous labour, and this must be considered when defining a favourable cervix.¹⁴ Conversely, studies have shown that a bishop score of 6 or less denotes an unfavourable and is associated with a higher risk of CS after IOL compared with spontaneous labour.¹⁴ Because vaginal delivery is the goal, adequate time should be allowed for labour to establish and to progress in labour.¹⁴ During IOL, intervention with CS for failed IOL

in the latent phase of labour (<6 cm cervical os dilatation) can be avoided by allowing up to 24 hours to reach active phase labour (dilatation of ≥ 6 cm) provided membrane is intact and foeto-maternal conditions are reassuring.¹⁶ Oxytocin should be administered after rupture of membrane for at least 12-18 hours without progress before diagnosing failed IOL.¹⁶

External cephalic version (ECV) is recommended to reduce the number of CS done for breech presentation.¹⁶ CS for suspected foetal macrosomia should be limited to estimated foetal weight of ≥ 5 kg in non-diabetic women and ≥ 4.5 kg in women with diabetes.¹⁶ Perinatal outcomes of cephalic/cephalic or cephalic/non-cephalic twin foetuses are not improved by CS and women should be counselled for vaginal delivery.¹⁶ Caesarean delivery on maternal request is not recommended for women desiring several children.⁴⁸ Age was noted as an important risk factor and the benefits of Caesarean delivery on maternal request may outweigh the risks in older women.⁴⁸

Non- Clinical Interventions to Reduce Unnecessary Caesarean Sections

Kingdom C, et al⁴⁹ conducted a qualitative evidence synthesis to assess the views of health-care professionals on interventions targeted at them and included papers from six middle-income and two low-income countries, the rest of the 17 papers being from high-income countries. Three key determinants of change were identified including prior physician beliefs about birth; what constitutes necessary and unnecessary CS and importance attached to reducing overuse, willingness or not to accept a change in practice especially when loss of income or status or medicolegal barriers are involved, and social and cultural context of practice and capacity and preparedness to engage health-care service norms to reduce unnecessary CS. Qualitative evidence synthesis and systematic reviews of qualitative studies were also done for interventions targeted at women and communities, and organizations, facilities and systems.^{50,51} A Cochrane review by Chen I, et al⁵² also presented results of a

systematic review of studies done to evaluate the effectiveness and safety of non-clinical interventions to reduce unnecessary CS.

Based on these studies, the WHO made three-pronged context-specific recommendations on non-clinical interventions to reduce unnecessary CS.⁵³ Interventions targeted at women include childbirth training workshops, nurse-led relaxation trainings, psychosocial couple-based prevention programmes and psychoeducation which are essentially geared towards allaying fear of pain in labour, anxiety and stress-related issues in pregnancy and emotional self-management. Interventions targeted at health-care professionals include implementation of evidence-based clinical guidelines combined with structured mandatory second opinion for CS indications, CS audits and timely feedback to health-care professionals. Interventions targeted at health organizations, facilities or systems include collaborative midwifery-obstetrician model of care, and reforms equalizing physician fees for vaginal births and CS.

CONCLUSION

Concurrent underuse, unsafe use and over use of caesarean section worsen the relatively higher maternal and perinatal morbidity and mortality associated with caesarean section in developing countries. Unwavering and consistent political will, increased government funding for health, provision of infrastructure for EmOC services especially in rural areas, women and community education to address negative cultural beliefs against health-care service utilization, and user fee exemption policies are key to addressing underuse of CS. To ensure safe CS, SBAs trained and well supervised on labour management, identification of need for CS and prompt referral are required especially in rural areas. Bridges between maternal health and safe surgery communities, accreditation for facilities providing CS, adequate SAO workforce, QA and QI systems are required. To address overuse, current recommendations on clinical and non-clinical interventions to reduce unnecessary CS needs to be adopted in developing countries.

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Author Contributions

MOI conceptualized the paper, reviewed literatures and wrote the first draft of the manuscript. OPC and ON contributed to revisions. All authors reviewed and approved the final manuscript.

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