

# Factors Affecting Trends of Cesarean Section: A Review

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## Abstract

Cesarean section rate is rising in both developing and developed countries. The reason for the increase is multifaceted. The clinical and non-clinical factors have explained the wide variation in cesarean delivery rates between and within countries. Changes in maternal characteristics and professional practice styles, increasing malpractice pressure, as well as economic organizational, social and cultural factors have been implicated in this trend. The higher rate of CS is a complex and multidimensional phenomenon. Therefore, programs and interventions should be introduced to decrease the rate of CS like painless vaginal delivery, emotional and educational interventions, improved quality of safe normal vaginal delivery in both private and public settings as well as the change in maternal and professional attitude towards the choice of mode of delivery.

**Keywords:** Cesarean section, cesarean delivery on maternal request, advanced maternal age, maternal socioeconomic status, education level, maternal obesity

## 1. Introduction

In modern era, the commonly performed surgery in obstetrics is a Cesarean section (CS). When adequately indicated, can prevent poor obstetric outcomes and be a life-saving procedure for both the mother and the baby (Cavallaro et al, 2013). In 1985, World Health Organization (WHO) published a guideline, which stated that cesarean birth rates should be less than 15 percent, which was, based on data from developed countries signifying that no extra benefit to the maternal-neonatal outcomes when the rate exceeds this level (Lancet et al, 1985). CS has become more prevalent in recent years without any medical rationalization and regardless of the risk; it may bring to mother and the children born by CS. In many studies, identified the socioeconomic factors like maternal education, residence, maternal age as well as medical indications like gestational hypertension, fetal weight, fetal mal-position which led to CS delivery (Tian et al, 2010; Zhong et al, 2014).

Scientific progress and the availability of modern health technology, increase in access to and use of antenatal care services, especially in private health institutions and in particular, legal changes have led to fundamental change in attitude towards CS among patients and doctors explains the rise in CS rate. Whereas, on the other hand, there is growing evidence of CS on demand for personal and cultural reasons, particularly in profit-motivated institutes (Hu et al, 2016; Hopkins et al, 2000; Wagner et al, 2000).

According to United Nations geographical grouping in 2014 CS rates in Africa 7.3% (Eastern Africa 3.9%, Middle Africa 5.8%, Northern Africa 27.8%, Western Africa 3.0%), Asia 19.2% (Eastern Asia 34.8%, South Central Asia 11.4%, South Eastern Asia 14.8%, Western Asia 26.8%), Europe 25.0% (Eastern 23.7%, Northern 22.4%, Southern 30.7%, Western 24.5%), Latin America and the Caribbean 40.5% (Caribbean 27.5%, Central America 38.2%, Southern America 42.9%), Northern America 32.3% and Australia/New Zealand 32.3% respectively (Betran et al, 2016).

The purpose of this article is to review the factors associated with the rise of CS rate and to determine the relation between indications, maternal age, maternal obesity, socioeconomic status and education level with the selection of CS delivery as well as reasons and prevalence rate of CS rate in private and public hospitals.

## 2. Factors associated with the rise in CS:

### 2.1. Major indications for CS

The rationale behind the decision for CS is entirely based on the question whether it is best for the mother and the children or may save lives of both (Mylonas et al, 2015). In the studies reviewed, the most frequently reported indications were; cephalo-pelvic disproportion (CPD), fetal distress, prior cesarean, dysfunctional labor and elective CS (Vega et al, 2015). Among these indications, the majorities are maternal indications and only a few are fetal indications (Liu et al, 2014). The indications are different among the countries and health sector, for example in a retrospective study done in India, increase in primary CS and repeat CS rates were reported and primary CS was done for fetal distress, arrest of decent and fetal indications whereas repeat CS was done for scar tenderness, arrest of labor both dilation and decent and CPD. Whereas, the study done in Chinese population by Liu et al found Cesarean Delivery on Maternal Request (CDMR) was the commonest indication for CS followed by CPD, fetal distress, previous CS delivery, mal-presentation, macrosomia and other indications (Mittal et al, 2014; Liu et al, 2014). In some reviewed literature dystocia, CPD, presumed fetal distress, high risk of uterine

rupture, mal-presentation, antepartum hemorrhage and maternal/fetal compromise were indications (Meda et al, 2016; Nelson et al, 2017) whereas previous CS was the commonest indication in a study done in Israel (Chu et al, 2012) and CPD was commonest in Cameroon (Lurie et al, 2016).

### *2.2. Cesarean Delivery on Maternal Request (CDMR)*

CDMR, defined as a primary pre-labor cesarean delivery on maternal request without any maternal or fetal indication (Tanyi et al, 2016), one of the major cause of increasing CS rate. Based on the WHO global survey in 2010 on maternal and perinatal health in Asia, China had the highest rate of CS of 46.25, with an 11.7% rate performed without medical indications (ACOG 2013). In a study done in China, 24.7% requested for CS, women who choose CS were elderly, obese, women with sexually transmitted diseases, large fetus and those conceived with assisted conception (Liu et al, 2017; Liu et al 2015). In a cross-sectional survey done in Nigeria, 39.65% respondents were aware of CDMR (Okonkwo et al, 2012), and the reasons were fear of labor pain, fear of the poor fetal outcome, fear of urinary and fecal incontinence and emotional aspects which are similar to survey done by Lener-Geva et al and R Shaboiea et al (Lerner et al, 2015; Shahoei et al 2014). In the study by Bagheri et al in 2013, they stated that the prenatal anxiety is a risk factor for choosing CS without any medical indications (Bagheri et al, 2013). In some studies reviewed, women who conceived after fertility treatment always demand CS (Ghotbi et al, 2014). Widespread myths like baby delivered by CS is smarter, the head shape is better, women's body shape and pelvic floor will be better protected by CS and certain dates of birth are more auspicious are factors associated with increased demand CS (Okby et al, 2016).

### *2.3. Advanced maternal age and parity*

Maternal age at delivery has increased during recent decades, as has the rate of CS (Schantz et al 2016). In the articles reviewed, a clear relationship between the age and method of delivery was observed. Women with 35 years or older are considered to have a higher incidence of obstetric complications and adverse pregnancy outcomes than the younger pregnant women (Ngowa et al, 2013). Furthermore, maternal co-morbidities such as gestational diabetes, hypertension as well as have 30% chance of preterm delivery, decreased fetal birth weight and stillbirth which increases the rate of CS particularly in low and middle-income countries (Herstad et al, 2016; Bayrampour et al 2010). Padwe et al showed that advanced maternal age is associated with elevated risks of pregnancy complications like gestational diabetes, preeclampsia and antepartum hemorrhage and increased rate of assisted conception in India (Pawde et al, 2015), was supported by Rendtorff R et al study in which CS rate was increased to 59% in elderly women when compared to younger mothers (Rendtorff et al, 2017) and Lisonkova et al study in which primary and repeat CS were common in older age women (Lisonkova et al, 2017). Oakley L et al in a study found that maternal age between 35-39 years and nulliparous have CS relative risk (RR) 4.67, with multiparous RR 2.85 and maternal age >40 years with nulliparous, RR 8.23, with multiparous RR 3.75 respectively (Oakley et al, 2016).

### *2.4. Socio-economic status (SES) and maternal education*

Frequently, the differences in maternal health access are more pronounced in different socioeconomic groups within each country. This review is done for assessing whether SES is associated with the rising rate of CS. The CS is associated with higher familiar income per capita, higher education, lower residential crowding, pregnancy planning and advanced maternal age (Khan et al, 2017). A study carried out in Bangladesh, demonstrated that women from poorer and poorest households reported lower use of CS at around 30% and 54% respectively, whereas the use of CS was 1.32 times and 2.33 times higher among the richer and richest households who generally choose private hospitals where frequency of CS is higher which was similar to the study done in Finland [Cury et al, 2017; Raisanen et al, 2014]. In México, the pregnant women belonging to high socioeconomic level was associated with 44 % more chance of cesarean regarding low stratum (OR = 1.44, 95 % CI: 1.12-1.83) and women within the medium and high social classes were attended only in private hospitals and 85.07% of these women underwent to a CS (Lopez et al, 2013).

Maternal scholar degree was considered as a factor associated with the election of the delivery method in this review. The trend among some studies reviewed shows directly proportional relationship between cesarean section and a higher educational level. In Brazil women with higher maternal educational level ( $\pm 12$  years), showed a cesarean prevalence of 77.2% (Barros et al, 2012). Whereas, in a study done in Germany, 41.5% of women with the tertiary degree have low health access compared to 56% vocationally educated women and 52% least educated women. But, only 24.4% tertiary degree women have CS compared to 30% vocationally educated and 39.15 least educated women (Kottwitz et al, 2014).

### *2.5. Maternal Obesity*

Al-Kubaisy et al. in 2014 in a study stated maternal obesity is defined as women who have body mass index (BMI) >30kg/m<sup>2</sup> at first antenatal visit. It is calculated by dividing pre-pregnancy weight in kilograms (kg) by

height in meter-square ( $m^2$ ). In their study, they concluded that the significant number of obese primigravida or multigravida with no history of CS in current pregnancy had CS thus significant (ALkubaisy et al, 2014). A study done in Ghana demonstrated that women with obesity had six-fold increased the risk for pregnancy-induced hypertension (RR 6.17), chronic hypertension (RR 6.00) and fetal macrosomia (RR 2.32) leading to two-fold increased the risk of CS (RR 2.20) (linden et al, 2016). An article in Spain studied that the risk of obstructed/ non-progressive labor, failed induction for labor, fetal distress and CS due to previous CS are greater in overweight and obese women than in normal-weight pregnant women leading to increased rate CS. The main reason for failed induction is the lower contractile response in obese women (Fernandez et al2016). Tetsuya Kawakita et al in a study found that the rate of primary CS in normal weight women is 15.8% compared to obese women whose is 50.8% and the indications are failure to progress, CPD, fetal macrosomia were indications for primary CS that increase with increasing obesity but the percentage of non-reassuring fetal heart did not increase with increased obesity (Kawakita et al, 2016).

#### 2.6. CS prevalence in public and private hospitals

Practically, the worldwide health system is divided into public and private hospitals with specific characteristics according to the country (Vega et al, 2015). The difference in CS rates at public and private maternity hospitals are either due to differences in preference of patient mode of delivery or the difference in prenatal and delivery care between these two settings that could influence the delivery outcome (karlstrom et al, 2011). In a study done by L Benova et al, the rate of CS in private facilities in Asia, Middle East Europe, Sub Saharan Africa and Latin America were 66%, 49%, 23% and 13% respectively, which is higher than that in public hospitals (Benova et al, 2015). F. Ghotbi et al in a study showed that rates of CS in private and public hospitals were 91.9% and 78.5% respectively and the most common reason was non-reassuring fetal heart rate pattern (Ghotbi et al, 2014). Mazzoni et al found rates of CS 43.7% in private sectors and 34.7% in public hospitals and the frequent indication were labor arrest in both sectors (Mazzoni et al, 2016). A. Arrieta et al. in which they explained that rise in CS rates in private hospital may be due to doctors in public hospitals have the fixed salary, whereas, physicians in private settings work under fee for service scheme. Because CS pays more and requires less time per birth than vaginal birth, the fee for scheme creates incentives, to over utilize CS (Arrieta et al, 2011)). The study done by Sepehri et al was consistent with previous research articles the risk of having CS in private facility was greater than in public hospital by 36-38% in India and Indonesia and by as much as 130% in Bangladesh (Sepehri et al, 2017).

### 3. Conclusion

As discussed above, the high rate of CS is a complex phenomenon associated with maternal, neonatal and social factors. Therefore, the programs and interventions should be introduced to modify both patient preference and professional attitude towards the mode of delivery. Emotional and educational interventions, improved quality of normal vaginal delivery and painless labor should be introduced in both private and public hospitals to lower CS rate. Maternal awareness regarding social beliefs like elective CS is safer than vaginal delivery for mother and baby as well as prenatal education to make them aware regarding complications of CS and their consequences in the future pregnancy such as ectopic scar pregnancy, placenta previa, cicatricial diverticulum. Additionally, obese women should be considered as high risk and educational programs on weight control, medical and psychological counseling to pregnant women should be done in primary care sectors to reduce their weight.

### 4. Conflict of Interest

All contributing authors declare that they have no conflict of interest.

### Reference

- Cavallaro FL, Cresswell JA, França GV, Victora CG, Barros AJ, Ronsmans C (2013). Trends in cesarean delivery by country and wealth quintile: cross-sectional surveys in southern Asia and sub-Saharan Africa. *Bulletin of the World Health Organization*. 2013 Dec;91(12):914-22D.
- World Health Organization (1985). Appropriate technology for birth. *Lancet*. 1985;2.
- Tian X, Wu J, Li B, Qin M, Qi J (2010). Occurrence of cesarean section and related factors in 40 counties of China from 1978 to 2010.
- Zhong Hua (2014) [Chinese journal of preventive medicine]. 2014 May;48(5):391-5.
- Hu Y, Tao H, Cheng Z (2016). Cesarean Sections in Beijing, China—Results from a Descriptive Study. *Das Gesundheitswesen*. 2016 Mar;17(01):e1-5.
- Mylonas I, Friese K (2015). Indications for and risks of elective Cesarean section. *Deutsches Ärzteblatt International*. 2015 Jul;112(29-30):489.
- Wagner M (2000). Choosing Cesarean section. *The Lancet*. 2000 Nov 11;356(9242):1677-80.
- Hopkins K (2000). Are Brazilian women really choosing to deliver by cesarean? *Social science and medicine*.

- 2000 Sep 1;51(5):725-40.
- Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR (2016). The increasing trend in cesarean section rates: global, regional and national estimates: 1990-2014. *PloS one*. 2016 Feb 5;11(2):e0148343.
- Mittal S, Pardeshi S, Mayadeo N, Mane J (2014). Trends in cesarean delivery: rate and indications. *The Journal of Obstetrics and Gynecology of India*. 2014 Aug 1;64(4):251-4.
- Liu Y, Li G, Chen Y, Wang X, Ruan Y, Zou L, Zhang W (2014). A descriptive analysis of the indications for cesarean section in mainland China. *BMC pregnancy and childbirth*. 2014 Dec 12;14(1):410.
- Meda IB, Millogo T, Baguiya A, Coulibaly A, Kouanda S (2016). Rate of and factors associated with indications for cesarean deliveries: Results of a national review in Burkina Faso. *International Journal of Gynecology & Obstetrics*. 2016 Nov 1;135(S1).
- Nelson JP (2017). Indications and appropriateness of cesarean sections performed in a tertiary referral centre in Uganda: a retrospective descriptive study. *The Pan African medical journal*. 2017;26.
- Chu K, Cortier H, Maldonado F, Mashant T, Ford N, Trelles M (2012). Cesarean section rates and indications in sub-Saharan Africa: a multi-country study from *Medecins sans Frontieres*. *PloS one*. 2012 Sep 4;7(9):e44484.
- Lurie S, Shalev A, Sadan O, Golan A (2016). The changing indications and rates of cesarean section in one academic center over a 16-year period (1997–2012). *Taiwanese Journal of Obstetrics and Gynecology*. 2016 Aug 31;55(4):499-502.
- Tanyi TJ, Atashili J, Fon PN, Robert T, Paul KN (2016). Cesarean delivery in the Limbé and the Buea regional hospitals, Cameroon: frequency, indications and outcomes. *Pan African Medical Journal*. 2016;24(1).
- American College of Obstetricians and Gynecologists (2013). Cesarean delivery on maternal request. Committee opinion no. 559. *Obstet Gynecol*. 2013;121(4):904-7.
- Liu Y, Wang X, Zou L, Ruan Y, Zhang W (2017). An analysis of variations of indications and maternal-fetal prognosis for cesarean section in a tertiary hospital of Beijing: A population-based retrospective cohort study. *Medicine*. 2017 Feb;96(7).
- Liu X, Landon MB, Cheng W, Chen Y (2015). Cesarean delivery on maternal request in China: what are the risks and benefits?. *American journal of obstetrics and gynecology*. 2015 Jun 30;212(6):817-e1.
- Okonkwo NS, Ojengbede OA, Morhason-Bello IO, Adedokun BO (2012). Maternal demand for cesarean section: perception and willingness to request by Nigerian antenatal clients. *International journal of women's health*. 2012;4:141.
- Lerner-Geva et al (2015). A case–control study of cesarean delivery on maternal request: who and why? *J Maternal Fetal Neonatal Med, Early Online*: 1–6 DOI: 10.3109/14767058.2015.1103727
- Shahoei R, Rezaei M, Ranaei F, Khosravy F, Zaheri F (2014). Kurdish women's preference for mode of birth: A qualitative study. *International journal of nursing practice*. 2014 Jun 1;20(3):302-9.
- Bagheri A, Alavi NM, Abbaszadeh F (2013). Iranian obstetricians' views about the factors that influence pregnant women's choice of delivery method: A qualitative study. *Women and Birth*. 2013 Mar 31;26(1):e45-9.
- Ghotbi F, Akbari Sene A, Azargashb E, Shiva F, Mohtadi M, Zadehmodares S, Farzaneh F (2014). Women's knowledge and attitude towards mode of delivery and frequency of cesarean section on mother's request in six public and private hospitals in Tehran, Iran, 2012. *Journal of Obstetrics and Gynaecology Research*. 2014 May 1;40(5):1257-66.
- Okby R, Druyan Y, Sonenklar M, Aricha-Tamir B, Sacks KN, Sheiner E (2016). Fertility treatment as a risk factor for maternal request of cesarean delivery in twin pregnancies. *Archives of gynecology and obstetrics*. 2016 Nov 1;294(6):1183-7.
- Clémence Schantz, Kruey Leang Sim, Véronique Petit, Heng Rany & Sophie Goyet (2016). Factors associated with cesarean sections in Phnom Penh, Cambodia, *Reproductive Health Matters*, 24:48, 111-121,
- Ngowa JD, Ngassam AN, Dohbit JS, Nzedjom C, Kasia JM (2013). Pregnancy outcome at advanced maternal age in a group of African women in two teaching Hospitals in Yaounde, Cameroon. *The Pan African Medical Journal*. 2013;14.
- Herstad L, Klungsøyr K, Skjærven R, Tanbo T, Forsén L, Åbyholm T, Vangen S (2016). Elective cesarean section or not? Maternal age and risk of adverse outcomes at term: a population-based registry study of low-risk primiparous women. *BMC pregnancy and childbirth*. 2016 Aug 17;16(1):230.
- Bayrampour H, Heaman M (2010). Advanced maternal age and the risk of cesarean birth: a systematic review. *Birth*. 2010 Sep 1;37(3):219-26.
- Pawde AA, Kulkarni MP, Unni J (2015). Pregnancy in women aged 35 years and above: a prospective observational study. *The Journal of Obstetrics and Gynecology of India*. 2015 Apr 1;65(2):93-6.30.
- Rendtorff R, Hinkson L, Kiver V, Dröge LA, Henrich W (2017). Pregnancies in Women Aged 45 Years and Older—a 10-Year Retrospective Analysis in Berlin. *Geburtshilfe und Frauenheilkunde*. 2017 Mar;77(03):268-75.

- Lisonkova S, Potts J, Muraca GM, Razaz N, Sabr Y, Chan WS, Kramer MS (2017). Maternal age and severe maternal morbidity: A population-based retrospective cohort study. *PLoS Medicine*. 2017 May 30;14(5):e1002307.
- Oakley L, Penn N, Pipi M, Oteng-Ntim E, Doyle P (2016). Risk of Adverse Obstetric and Neonatal Outcomes by Maternal Age: Quantifying Individual and Population Level Risk Using Routine UK Maternity Data. *PLoS one*. 2016 Oct 7;11(10):e0164462.
- Khan MN, Islam MM, Shariff AA, Alam MM, Rahman MM (2017). Socio-demographic predictors and average annual rates of cesarean section in Bangladesh between 2004 and 2014. *PLoS one*. 2017 May 11;12(5):e0177579.
- Faisal-Cury A, Menezes PR, Quayle J, Santiago K, Matijasevich A (2017). The relationship between indicators of socioeconomic status and cesarean section in public hospitals. *Revista de saude publica*. 2017;51.
- Räisänen S, Gissler M, Kramer MR, Heinonen S (2014). Influence of delivery characteristics and socioeconomic status on giving birth by cesarean section—a cross sectional study during 2000–2010 in Finland. *BMC pregnancy and childbirth*. 2014 Mar 31;14(1):120.
- Suárez-López L, Campero L, Vara-Salazar ED, Rivera-Rivera L, Hernández-Serrato MI, Walker D, Lazcano-Ponce E (2015). Sociodemographic and reproductive characteristics associated with the increase of cesarean section practice in Mexico. *Salud publica de Mexico*. 2013;55:S225-34.
- Barros FC, Matijasevich A, Hallal PC, Horta BL, Barros AJ, Menezes AB, Santos IS, Gigante DP, Victora CG (2012). Cesarean section and risk of obesity in childhood, adolescence, and early adulthood: evidence from 3 Brazilian birth cohorts. *The American journal of clinical nutrition*. 2012 Feb 1;95(2):465-70.
- Kottwitz A (2014). Mode of birth and social inequalities in health: the effect of maternal education and access to hospital care on cesarean delivery. *Health & place*. 2014 May 31;27:9-21.
- Al-Kubaisy W, Al-Rubaey M, Al-Naggar RA, Karim B, Noor NA (2014). Maternal obesity and its relation with the cesarean section: A hospital based cross sectional study in Iraq. *BMC pregnancy and childbirth*. 2014 Jul 17;14(1):235.
- Van Der Linden EL, Browne JL, Vissers KM, Antwi E, Agyepong IA, Grobbee DE, Klipstein - Grobusch K (2016). Maternal body mass index and adverse pregnancy outcomes: a Ghanaian cohort study. *Obesity*. 2016 Jan 1;24(1):215-22.
- Fernández Alba JJ, Paublete Herrera C, Vilar Sanchez A, Gonzalez-Macias C, Castillo Lara M, Torrejón R, Moreno Corral LJ (2017). Indications of cesarean section in overweight and obese versus normal-weight pregnant women: a retrospective cohort study. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2017 Feb 10:1-7.
- Kawakita T, Reddy UM, Landy HJ, Iqbal SN, Huang CC, Grantz KL (2016). Indications for primary cesarean delivery relative to body mass index. *American journal of obstetrics and gynecology*. 2016 Oct 31;215(4):515-e1.
- Soto-Vega E, Casco S, Chamizo K, Flores-Hernández D, Landini V, Guillén-Florez A (2015) Rising Trends of Cesarean Section Worldwide: A Systematic Review. *Obstet Gynecol Int J* 3(2): 00073.
- Karlström A, Nystedt A, Johansson M, Hildingsson I (2011). Behind the myth—few women prefer cesarean section in the absence of medical or obstetrical factors. *Midwifery*. 2011 Oct 31;27(5):620-7.
- Benova L, Macleod D, Footman K, Cavallaro F, Lynch CA, Campbell OM (2015). Role of the private sector in childbirth care: cross - sectional survey evidence from 57 low and middle income countries using Demographic and Health Surveys. *Tropical medicine & international health*. 2015 Dec 1;20(12):1657-73.
- Ghotbi F, Akbari Sene A, Azargashb E, Shiva F, Mohtadi M, Zadehmodares S, Farzaneh F (2012). Women's knowledge and attitude towards mode of delivery and frequency of cesarean section on mother's request in six public and private hospitals in Tehran, Iran, 2012. *Journal of Obstetrics and Gynaecology Research*. 2014 May 1;40(5):1257-66.
- Mazzoni A, Althabe F, Gutierrez L, Gibbons L, Liu NH, Bonotti AM, Izbizky GH, Ferrary M, Viergue N, Vigil SI, Denett GZ (2016). Women's preferences and mode of delivery in public and private hospitals: a prospective cohort study. *BMC pregnancy and childbirth*. 2016 Feb 8;16(1):34.
- Arrieta A. Health reform and cesarean sections in the private sector: the experience of Peru. *Health Policy*. 2011 Feb 28;99(2):124-30.
- Sepehri A, Guliani H (2017). Regional Gradients in Institutional Cesarean Delivery Rates: Evidence from Five Countries in Asia. *Birth*. 2017 Mar 1;44(1):11-20.