Obstetric and Gynaecology Section

Caesarean Section: Mortality and Morbidity

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ABSTRACT

Caesarean Section (CS) is the most common obstetric surgery performed today. With advancement of anaesthesia and technique resulting in improved outcome and safety, its rate has been rising. Nevertheless, it carries risk of complications resulting in morbidity and sometimes mortality. Therefore, CSs done without medial indications, remains questionable.

Maternal mortality and morbidity after caesarean birth is nearly five times than vaginal births, especially the risks of haemorrhage, sepsis, thromboembolism and amniotic fluid embolism. In a subsequent pregnancy, CS increases the risks of placenta previa and adherent placenta which may further result in higher risk of haemorrhage and peripartum hysterectomy. Technical difficulties due to adhesions increase the risk of injury to bladder and bowel.

Though CS can be life saving for a foetus in jeopardy, yet in countries with high caesarean rate increased neonatal mortality and morbidity is seen i.e., iatrogenic pre-term births and respiratory morbidity. Risk of rupture uterus and stillbirths in women with previous CS also increase perinatal mortality. Neonatal adaptations is delayed in caesarean babies i.e., maintenance of body temperature, glycaemia and pulmonary respiration. Development of neonatal immune system is also affected in babies born by CS. Hence, CS should be done only if medically indicated.

INTRODUCTION

The indications for doing CS varied tremendously over last many decades. In the 18th century CSs were done to save foetus in the dead or dying mother. Nineteenth century saw caesarean being done to save life of mother. With use of safe anaesthesia, suturing techniques, antiseptics, asepsis, blood transfusion and antibiotics, CS has become an increasingly safe and common procedure. The continued improvement in safety has led to CS being done on demand today with no medical indications though the mortality related to caesarean birth is still 3-4 times higher than vaginal birth [1,2].

To address the question whether CS without medical indications on maternal request is justified or not, it is imperative to know the associated mortality and morbidity of CS.

MATERNAL MORTALITY

Maternal mortality has been defined by World Health Organization (WHO) as the death of a woman while pregnant or within 42 days of the termination of pregnancy irrespective of the duration and site of the pregnancy for any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes [3].

Maternal mortality related to CS had dropped to 5-10% by the end of year 1800 and to 0.1% by 1950 [4].

Maternal mortality after CS has been estimated to be between 5.81 and 6.1 per 100,000 procedures [5].

Maternal Mortality: Association With CS Compared to Vaginal delivery (Vd)

The risk of mortality associated with CS compared with Vd after exclusion of pre-existing morbidity was 4- 5 fold [1,6]. The main reasons for increased mortality after CS is post-partum haemorrhage (aOR 3, 95% CI), complications of anaesthesia, thromboembolism (aOR 3.5) and post-partum infections (aOR 1.2, 95% CI) [7].

Maternal Mortality: Association of Emergency and Planned CS with Vd

Liu S et al. showed that emergency caesarean delivery increases the risk of maternal deaths up to 5 times compared to vaginal delivery (9.7 versus 1.8/100,000 births respectively) [8]. The adjusted odds ratio (aOR) on maternal deaths for intra-partum CS compared to pre-partum CS was 1.4 (95% CI) [1].

It was found that planned caesarean delivery had the lowest maternal mortality rate compared with all other births after analysis of a CEMACH report in 2008 [9].

Maternal Mortality: Relationship with Rate of CSs

Access to caesarean delivery is an essential strategy for reducing child and maternal mortality. However, its overuse can be harmful to both mother and neonate. World Health Organization (WHO) has recommended that CS rates should not exceed 10 to 15 per 100 live births to optimise maternal and neonatal outcomes [10]. However, Molina G et al., in a study of WHO member states representing 97.6% of all live births in the world, has shown that the optimum caesarean rate should be below 19.1% [11].

Maternal Mortality: Causes

Most of the maternal mortalities (73%) are due to direct causes and rest 27% from indirect causes. The important direct causes are haemorrhage (27.1%), hypertensive disorders (14%), sepsis (10.7%), abortion (7.9%) and embolism (3.2%) [12].

Eclampsia and pre-eclampsia account for 88.3% of all hypertensive disorders. Most cases of infection are due to puerperal sepsis. The indirect causes of maternal mortality are cardiovascular disorders (9%), cerebrovascular accidents (7%), pulmonary system disorders (8%), gastrointestinal system disorders (4%), and other indirect

causes (9%) [13].

Maternal Morbidity

As maternal mortality is rare, maternal morbidity, or severe maternal morbidity: mortality ratio, reflects the quality of care more appropriately [14-16] and has become an important indicator of maternal health.

WHO has defined maternal morbidity as any health condition which is related to or aggravated by pregnancy and delivery which causes a negative effect on woman's well being. These morbidities can lead to short-term and long-term effects on mother and baby [17].

Maternal Morbidity: Causes

There are various risk factors for maternal morbidity. They vary in duration and severity; from the most severe form, the 'maternal near miss' to non life threatening morbidity, which is more common.

Morbidity for CS births is four times than for Vd [14]. Intraoperative or post-operative complications were reported during hospital stay in 27% women, who had CS; 10% women had severe complications and only 0.76% had life threatening complications. Maternal morbidity was least in Vd followed by instrumental Vd and planned CS. Morbidity was highest in emergency CS. Thus, even in the most high risk woman, Vd is the most safe option, including risks associated with emergency CS [18].

Maternal Morbidity And Complications

Deviation from the normal post-operative course has been defined as complications. Sometimes complications can be asymptomatic i.e., arrhythmias and atelectasis [19]. These complications can have a negative impact on women's well-being and cause maternal morbidity. The incidence of maternal complications reported in different studies vary according to how complications are defined, the method of collecting data and the period of follow-up after caesarean. The rate of complications related to CS was found to be 90.5% in a retrospective study, where data were collected from all sources including nurses diaries [20].

Severe Acute Maternal Morbidities (SAMM): Life threatening complications, in terms of organ failure and life saving surgery constitute SAMM. Woman with SAMM are unlikely to survive if they do not receive care in a hospital [21]. Incidence of severe maternal morbidity depends on the criteria used: organ system based or intervention criteria. It is 3-4 times more often related to CS than to Vd. The incidence of severe maternal morbidity was 4.77% compared to 1.41% for vaginal deliveries [22]. The OR for severe morbidity in elective CS compared to Vd was 1.7 (95% CI) [23]. SAMM has increased almost 200% over the years from 1993 to 2014. This increase has been mostly because of blood transfusions, which has increased 4-5 times. The rate of SMM has increased by about 20% over time when transfusion of blood is excluded (CDC) [24].

NEAR MISS: A woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy are near miss cases. These women survive a life threatening condition [25].

Maternal Morbidity: CS Versus Vd

Though CS prevents many maternal and neonatal deaths yet, severe morbidity rate was three times in planned CS compared to planned Vd [8]. Planned caesarean group had significant higher post-partum risk of cardiac arrest (OR 5.1), hysterectomy (OR 3.2), haemorrhage requiring hysterectomy (OR 2.1), wound haematoma (OR 5.1), major puerperal infection (OR 3.0), anaesthetic complication (OR 2.3), venous thromboembolism (OR 2.2) compared to planned vaginal delivery group [26].

Maternal CS Morbidity: In Women With Prior CS

Vaginal Birth After Caesarean (VBAC) result in lower morbidity (regards to maternal transfusion, ICU admissions, unplanned hysterectomy and rupture uterus) than planned repeat CS. Failed trial of labour followed by CS results in increased morbidity . Although rare, rates of ruptured uterus are seven times higher among women attempting a trial of labour after a previous caesarean than among women with elective repeat procedure. In an attempt to avoid such morbidities there is declining percentage of women with previous

Short Term Morbidities after CS

Haemorrhage	It is the most common cause of maternal morbidity. Incidence after CS is 8.6%-13% for haemorrhage ≥1000 mL or need of transfusion [28,29]. Visual estimation is often incorrect [30]. Severe haemorrhage is defined as: >1500 mL blood loss, transfusion of ≥ 4 units red cells, fall in the haemoglobin ≥ 40 gm/L., embolisation or hysterectomy or re-operation for haemorrhage [14,16,28]. The reported incidence is 0.8 % in Vd, 2.2 % in elective CS and 3.4% in emergency CS [14,31]. A 6-14 folds increase of most severe forms of haemorrhage leading to hysterectomy or other interventions, even for primary CS compared to Vd, and more after a prior CS is seen [32-34]. Risk factors are prior CS which predisposes for abnormal placentation and uterine rupture [34,35]. A prior CS is associated with a higher risk for haemorrhage in CS delivery and also in subsequent Vd compared to a women with a history of Vds [36,37]. Significant risk factors for PPH after adjusting for confounders are: age ≥35 years (OR 1.5), multiple pregnancy (OR 2.8), fibroids (OR 2.0), preeclampsia (OR 3.1), amnionitis (OR 2.9), placenta previa or abruption (OR 7.0), cervical laceration (OR 94.0), uterine rupture (OR 11.6), and CS (OR 1.4) [38].
Blood Tranfusion	Blood transfusion was the most common morbidity, as reported in National Vital StatistiCS, required in 280.4/100,000 live births [27].
Peripartum Hysterectomy	The incidence varies from 0.3 to 5.0 per 1000 deliveries. Incidence is more in CS than Vd. Women with prior CS compared to without a prior CS is a risk factor for peri-partum hysterectomy [33,34,39]. With increase in CS rates, an abnormal adherent placenta has become more common, and has become the most common cause for peripartum hysterectomy [40]. Obstetric hysterectomy has high risk of intraoperative and post-operative complications and include-fever, coagulopathy, ICU admissions, acute renal failure, DIC, UTI, ARDS, ureteric/bladder/bowel injury, re-operation, transfusion, cardiac arrest, thromboembolic events, sepsis, wound infections, VVF and maternal deaths [41-45]. No significant differences were observed in frequency of complications in women who underwent total or subtotal hysterectomy [41-43].
Other intraoperative complications	These include accidental incision of foetal skin, laceration of cervix, vagina, uterus and uterine arteries, injury to bowel, bladder and ureter. These injuries are higher in emergency CS and inexperienced surgeon. Bladder injury is more common with prior caesarean scar, emergency CS, prior pelvic surgery and head deep in pelvis. Intraoperative complications ie tissue damage that required extra suturing, bowel/bladder lesion, technical difficulties because of adhesions, and other events that were judged as a complication by the surgeon) amounted to 8.1% of the operations. The risk increased with increasing cervical dilation (19.1% at 9-10 cm of cervical dilation and 4.0% at 0 cm) [28].
Infections	Postpartum infection are five times higher after CS than after Vd [46]. Febrile morbidity was reported in approximately 30% of women undergoing CS. Prophylactic antibiotics reduced the incidence of febrile morbidity from 50% to 15% [47]. Serious infectious morbidity (defined as bacteremia, septic shock, septic thrombophlebitis, necrotising fasciitis or death attributed to infection) was reported following 1–2% of caesarean births [47]. Emergency CS is a risk factor (adjusted OR: 5.53; 95% CI) for infections [48]. Prohlylactic use of antibiotics [49] has decreased infection rate. Endometritis-There is ten times higher risk of endometritis after CS than after Vd [50]. Incidence of endometritis after CS in a US study was 6.9% (2.7% and 9.4% in elective and emergency CS, respectively) [51]. Wound infection-Surgial Site Infections (SSI) after CS was 8.9% during a 30 days follow-up, though at hospital discharge it was only 1.8% [52]. The risk factors for SSI are: emergency CS, premature rupture of membranes, anaemia, obesity, operating time > 38 minutes. Anaemia has been reported as an independent risk factor for SSI (risk ratio 2.39) [53]. Urinary Tract Infections -UTI occurred in 1.5% after Vd, 2.6% after elective CS and 3.0% after emergency CS in a study on infections related to CS [47]. Pneumonia-Pneumonia was more common in women delivering by CS than Vd. The incidence was 0.1% after Vd, 0.5% after elective CS and 0.7% after emergency CS. Smokers had a 2-fold risk for pneumonia compared to non-smokers [51]. Sepsis- Common cause of maternal deaths especially in low resource settings. This can progress to septic shock with signs of hypotension, low platelet count, hypoperfusion [13]. Postpartum sepsis is 3.2 times more common after CS deliveries compared to Vd [54]. UTI and chorio-amnionitis are common infections associated with septic shock. Risk factors for maternal sepsis - obesity, diabetes or IGT, impaired immunity, immunosuppressive medications, anaemia, prolonged rupture of membranes, amniocentesis, history of pelvic infection, group B streptococcal infection in women or close contacts. Most common organisms involved - group A beta-haemolytic *Streptococcus, E.coli.*

Thromboembolic events	The risk factor for a thromboembolic event during pregnancy is CS, and with other risk factors, the risk increases even more [55]. CS constituted a 3.8-fold risk for pulmonary embolism and a 5.8-fold risk for stroke compared to Vd [56]. Septic pelvic thrombophlebitis, diagnosed by computed tomographic imaging, has an incidence of 1:3000 deliveries. The incidence is 11-folds in CS compared to Vd [57].
Amniotic fuid embolism	A rare and life threatening condition which may occur during or immediately after delivery. The reported incidence is 2-8 per 100,000 deliveries and the mortality rate is 56% in the initial phase till 23 hours) [58]. Rupture of the membranes predisposes to inflow of amniotic fluid into maternal circulation which can occur easily in CS. Significant associations with AFE were observed with medical induction of labour (aOR 1.7; 95% CI), CS (aOR 15.0; 95% CI), instrumental vaginal delivery (aOR 6.6; 95%CI), and cervical/uterine trauma (aOR 7.4; 95% CI). AFE was associated with increase in risk of stillbirth, hysterectomy, maternal death and prolonged hospital stay [59].
Reoperation	In a study on 3380 CS, re-laparotomy was needed in 0.53% of the CS: 66% due to haemorrhage, 17% due to infection and rest due to other causes [60]. In a Norwegian study on 2752 CS, re-operation was needed in 1.7% after a CS performed after ≥30 weeks of pregnancy, and in 5.2% performed before 30 weeks of pregnancy [28].
Ileus	Ileus occurs from hypomotility of the gastrointestinal tract in the absence of mechanical bowel obstruction. Ileus was reported after 1.5% of CS in a Dutch study, and in 0.64% in a Scottish study [20,61]. It usually resolves spontaneously within 2-3 days. Sepsis, diabetes, hypothyroidism, anaemia, low potassium can be the predisposing factors.
Wound haematoma	Wound haematoma was recorded in 1.2% of women after CS in a study from Israel and in 3.7% of women after CS in a study from Norway [28,50]. It can get infected leading to wound dehiscence.
Post-partum urinary retention	An incidence of 3.38% was identified in a study [62]. Women at risk are: who had undergone emergency CS for lack of progress in labour. These women usually recover completely within 28 days [63]. With early diagnosis an overstreching of the bladder wall, causing detrusor damage can be avoided.
Breast feeding problems	Most common among women who undergo elective CS
Post surgical fatigue and pain	Post surgical fatigue and pain may affect woman from caring and breastfeeding of the newborn [64].
Anaesthetic complications	Neuraxial anaesthesia for CS is safe and preferred to general anaesthesia because it minimises the risk of failed intubation, ventilation and aspiration. A significant number of the women who died while undergoing CS may have required emergent delivery, requiring general anaesthesia rather than regional anaesthesia, and these factors contributed to the higher rate of mortality and morbidity associated with CS.

Long Term Complications/Morbidities After

Adherent placenta/ Placenta Accreta	Although rare, it has become more common during recent years, probably due to increased rate of CS [34]. The risk increases progressively with increasing number of prior CS [34,65]. The incidence of an abnormally adherent placenta was as high as 5.8% in a woman with one prior CS associated with placenta previa. The incidence of placenta accreta in woman with 6 or more CS increased to 28-folds and the risk of hysterectomy increased to 14-folds compared to the risk at first CS [65].
Placenta previa	Uterine scarring associated with CS results in endometrial and myometrial damage, defective implantation mechanisms, and failure of differential growth of the scarred lower uterine segment, all of these predispose to low implantation of the placenta. The incidence of placenta previa was 1.75% after previous Vd compared to 6% after one previous CS, an increased risk of 4 times. With 2 or 3 prior CS the risk is 7 times, with 4 or more CS the risk is 45 times higher. Presence of placenta previa increases feto-maternal morbidity and mortality [66].
Placental abruption	Placenta previa increases the risk of placental abruption. It can lead to maternal haemorrhage and decrease the oxygen and nutrient supply to the baby. There is an increased risk of abruption in next pregnancy, in women with previous CS; compared to women who had previous Vd (RR 1.3, 95% CI). Women with 2 previous CS have 30% higher risk of abruption in their next pregnancy [67].
Uterine Rupture	It is a serious complication and may lead to severe morbidity and occasionally to foetal and maternal death. An overall incidence of uterine rupture was reported to be 0.2 per 1000 deliveries. In woman with a prior CS having trial for vaginal delivery, the incidence was 2.1/1000 whereas, its incidence was only 0.3/1000 in an elective CS [68]. Risk factors for uterine rupture are: woman who had two or more prior CS, CS had been performed less than 12 months earlier or if the labour has been induced [68].
Hysterectomy	Women with prior CS are at increased risk of hysterectomy in subsequent pregnancy due to increased risk of placenta previa, placenta accreta and rupture uterus.
Still births	Unexplained still birth is more common after a CS than after Vd. In a meta-analysis it was concluded that the risk of stillbirth in later pregnancies increase by 23% in women with prior CS [69].
Preterm births	Women with pregnany after prior CS are at increased risk for placenta previa, therefore, the risk of pre-term births are increased. The pre-term babies are more likely to suffer from morbidities i.e., anaemia, jaundice, infection, apnea, heart failure, vision problems and RDS.
Ectopic pregnancy	Ectopic pregnancy is a life threatening condition and must be terminated. Ectopic pregnancy was reported with a RR of 1.3, in a cohort stydy [70]. The embryo can become attached to previous caesarean scar (caesarean scar pregnancy), the management of which is quite critical.
Infertility/ Subfertility	It is estimated that 10% women with prior CS have difficulty in becoming pregnant again. It is not clear whether it is due to surgery itself or due to other factors.
Chronic pain	Chronic pain after CS is reported in 12.3% of women, 10 months after a CS, and 5.9% of them experienced pain daily or almost daily [71]. Chronic pain may be the result of nerve entrapment, caesarean scar defect or pelvic adhesions [72].
Adhesions	Adhesions can cause difficulty during future intra-abdominal surgical procedures, and may increase the risk of bladder or bowel injury.

CS RISK FACTORS FOR MATERNAL MORBIDITY IN CS

Emergency/ elective CS	The risk of complications in emergency CS is more compared to elective CS (RR 1.1 - 2.5) in many studies [28,61]. For severe maternal morbidity the aOR was 2.3 for elective CS and 2.0 for intrapartum CS versus Vd, when adjusted for parity, any comorbidity prior to pregnancy or during pregnancy, hypertensive disorders, bleeding in second half of pregnancy, IUGR and other medical conditions in a large study from eight Latin American countries [48]. The degree of cervical dilatation was linearly related to the rate of maternal complications, with a total complication rate of 4% at 0 cm and of 19.1% at 9-10 cm [28].
Obesity	In obese women, the risk of emergency CS is increased to 2-3 folds compared to normal weight women [73-75]. The risk of CS is increased by 7% for every one unit increase in maternal BMI [76]. Obese women have more intraoperative complications because of technical difficulties [77]. Obesity increases the risk for postpartum haemorrhage. Obesity is also a risk factor for both minor and major infections [52,77,78]. Obese women with BMI>30 had an OR of 2.2 for wound infection [73]. Endometritis occurs 30% more often in obese women than in normal weight women [51]. Pneumonia is also more common in obese women than in normal weight women, possibly due to later mobilisation and weaker lung function [73,77]. Obese women had twice the odds of uncomplicated sepsis [79]. Severe morbidity in a woman with BMI >30 has an OR of 1.4 and a woman with BMI > 40 has an OR of 2.1 [80]. Obesity is also a known risk factor for thromboembolism throughout pregnancy and puerperium with adjusted OR in women with BMI>30 of 5.3 compared to normal weight women [81].
Smoking	Smoking is a risk factor for maternal complications. Risk of placental abruption with maternal smoking has been reported in various studies (RR 1.4-2.5) [82]. It has been studied as an independent risk factor for SSI [83].
Pre-eclampsia (PE)	PE is a severe obstetric complication in itself, but also increases the risk for complications, risk of severe haemorrhage increases by 2 to 3 folds [31,38,51]. Because of changes in coagulation system in women with PE, the risk for thromboembolic events is increased with an OR of 3.8 [55].
Diabetes Mellitus (DM)	Risk of associated maternal complications with diabetes mellitus i.e., pregnancy induced hypertension, pre-eclampsia, HELLP syndrome, CS, hypoglycaemia and the worsening of any degree of a pre-existing renal insufficiency and retinopathy increase the risk of maternal morbidity. Obesity increased the risk of infection for diabetic women during the hospital stay more than two-fold (OR 2.7 (95%CI) [84].

Age	An increased risk for any haemorrhage (OR 1.1-1.3) and severe haemorrhage (OR 1.1-1.5) in older women has been reported [31,36,38]. For every 5-year increase in maternal age, the risk of CS increased by 50% [85]. A higher rate of thromboembolic events related to deliveries in women aged >35 has been reported in several studies (OR 1.3-1.5) compared to younger women [86]. The rate of severe complications increased linearly with increasing maternal age [87]. In a Belgian study, maternal age over 35 years increased the MMR 7-folds, and in a British study the adjusted OR for maternal death was 2.4 for women aged more than 35 years, compared to younger women [81,87]. For teenaged mother, rates of transfusion (316.3 per 100,000 live births) and ICU admission (156.4) by maternal age were higher than for mothers aged 20–34 (262.4 and 135.5, respectively), and highest for mothers aged 35–54 (355.5 and 252.8, respectively) [27]. Rate of ruptured uterus and unplanned hysterectomy generally increased with maternal age, with a greater increase for unplanned hysterectomy. The rate, for women aged 35–54 was more than 10 times the rate for women under age 20 [26].
Race and ethinicity	Non-Hispanic black women had the highest rates of transfusion (332.3 per 100,000 live births) and ICU admission (239.5) among all racial and ethnic groups. Non-Hispanic black (39.2) and non-Hispanic Asian (32.1) women had the highest rates of ruptured uterus [27].
Surgeon's experience	The surgeon experience affects the risk of CS-related complications [88]. In a study, comparing CS complications in women operated on by general practitioners and women operated on by specialists, it was observed that major surgical morbidity occurred in 2.5% vs. 1.6%, transfusions need in 5.9% vs. 7.0% and severe morbidity in 3.1% vs.1.9% of the women [88]. An operating time ≥38 min increased the risk for SSI 2.5-folds [52]. Surgeon's s experience decreased the risk for infections related to CS. The OR was 2.4 for a CS performed by a resident compared to a CS performed by a senior surgeon [50].

caesarean deliveries attempting a trial of labour over the last two decades [27].

Neonatal Morbidity in CS versus Vd

Cerebral palsy: It is a common belief that CS protects the neonate from cerebral palsy, but only a small proportion. About 8-28%, of the cases of CP are associated with birth asphyxia [89]. Most neonates who develop CP had damaging events already antenatally (infection, hypoxia, intracranial haemorrhage) or are low-weight or pre-term at birth [89].

Foetal injuries: Foetal lacerations occur in 0.1-3.1% of CS. The risk factors are: emergency operations, abnormal presentations and ruptured membranes [90-92]. Sometimes severe lacerations occur, needing operative repair later [91]. Foetal injuries are more common in Vd especially after instrumental deliveries.

Delayed maternal adaptation: Neonatal adaptation to extrauterine life is delayed in babies born by elective CS related to glucose balance, body temperature and neurologic adaptation. This might be due to catecholamine surge that occurs in neonates born vaginally. Also, during vaginal delivery, the mechanical pressure on the foetus during the passage through the birth canal together with activation of sodium channels that transport liquids from the lungs, help the neonate to start breathing [93]. A study on feto-maternal outcome after CS without medical indications, showed increased respiratory distress with OR of 2.7 in elective CS compared to emergency CS, also the risk of hypoglycaemia doubled for infants born by CS [94].

Respiratory morbidity: Respiratory morbidity risk is two to four times higher in term pregnancies which are uncomplicated, after elective CS compared to VD [95-97]. The risk is reduced by increasing pregnancy duration, and is significantly lower after 39 weeks of pregnancy. The most common form of respiratory morbidity is transitory tachypnoea, but even more severe forms of respiratory morbidity can occur, such as respiratory distress syndrome, pneumothorax and persistent pulmonary hypertension of the newborn [98-100].

Immune system: Recently, there have been numerous studies on the impact of the mode of delivery on the immune system of the neonate. There is strong evidence suggesting that the early composition of the microbiota of neonates plays an important role for the postnatal development of the immune system [101]. There is growing evidence showing that altered microbial colonisation after CS may affect postnatal maturation of T-cells and predispose to illnesses in later life [92].

Risk of asthma, allergic rhinitis and atopy in children born by CS is increased compared to children born vaginally [102]. In children born by CS, the risk of asthma increased by 20% [103]. CS may also predispose children to food allergy [104]. This association only for emergency CS has been reported by some, therefore, exposure to vaginal microflora alone cannot explain the association between CS and increased childhood asthma seen in many studies [105,106].

Neonatal mortality: MacDorman MF et al., have examined neonatal mortality risk with no medical or obstetric risk factors in "CS without labour complications" and "planned vaginal delivery" [107]. After adjusting for several confounding factors the OR for neonatal mortality was 1.7 in CS babies compared to babies born after planned Vd.

Complications/Morbidity Related to Vaginal Delivery

Perineal lacerations are more common in Vd. Anal sphincter injury occurs 0.6%-7.8% in Vd, more in instrumental deliveries [51,108]. Reported rate of flatus incontinence was 8-61% and of fecal incontinence 0-20% [109]. Problem of anal incontinence occurs less frequently after CS birth; 4% after elective CS and 6% after emergency CS [110,111].

Urinary incontinence occurred in 4.5% and 7.3% in planned CS and planned Vd [110]. Vd is also a risk factor for Pelvic Organ Prolapse (POP). Some protection of caesarean birth against symptomatic POP in later life occurs, ranging from a 50 to 80% reduction, with an OR of symptomatic POP being 0.5 (95% CI: 0.3-0.9) for one or more CS compared with women who had experienced only vaginal births, when adjusted for both age and parity [112].

CONCLUSION

Caesarean sections can cause complications resulting in death or morbidity. The morbidities associated with CS can be short term or long term. The risk of morbidity and mortality was high in women undergoing emergency CS and in women who previously had a CSs. Neonatal and perinatal mortality and morbidity was also increased in CS babies. Caesarean section more than 19% does not improve maternal and neonatal outcomes. CS are effective in saving maternal and infant lives, if they are done for medical indications. Therefore, CSs should ideally be undertaken only when medically indicated.

REFERENCES

[1] Deneux-Tharaux C, Carmona E, Marie-Hélene BC, Gérard B. Postpartum maternal mortality and cesarean delivery. Obstetrics & Gynecology. 2006;108(3):541-48.

[2] Callaghan WM. Overview of maternal mortality in the United States. Semin Perinatol. 2012;36(1):02-06.

[3] WHO. Health statistics and information systems Maternal mortality ratio (per 100,000 live births) Available at http://www.who.int/healthinfo/statistics/indmaternalmortality/en/

[4] O'Sullivan JF. Cesarean birth. Ulster Med J. 1990;59(1):01-10.

[5] Lanneau GS, Muffley P, Magann EF. Chapter 74. Cesarean births. Surgical techniques in vol. 2. Gynecology and Obstetrics. 2004 edition. Publisher Lippincott Williams Wilkins. Available at https://www.glowm.com/resources/glowm/cd/pages/v2/v2c074.html

[6] Schutte JM, Steegers EA, Santema JG, Schuitemaker NEW, van Roosmalen J. Maternal deaths after elective cesarean section for breech presentation in the Netherlands. Acta Obstet Gynecol Scand. 2007;86:240-43.

[7] Esteves-Pereira AP, Deneux-Tharaux C, Nakamura-Pereira M, Saucedo M, Bouvier-Colle MH, Leal MdC. Caesarean Delivery and Postpartum Maternal Mortality: A Population-Based Case Control Study in Brazil. PLOS ONE. 2016;11(4):e0153396.

[8] Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS, et al. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. CMAJ. 2007;176(4):455-60.

[9] Maternal and neonatal individual risks and benefits associated with caesarean

delivery: multicentre prospective study BMJ. 2007;335:1025.

[10] WHO Statement on Caesarean Section Rates. Available at: http://apps.who.int/iris/bitstream/10665/161442/1/WHO_RHR_15.02_eng.pdf

[11] Molina G, Weiser TG, Lipsitz SR, Esquivel MM, Uribe-Leitz T, Azad T, et al. Relationship Between cesarean delivery rate and maternal and neonatal mortality. JAMA. 2015;314(21):2263-70.

[12] Say L, Chou D, Gemmill A, Tunçalp O, Moller, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet. 2014;2(6):e323-33.

[13] Uzuncakmak C, Ozcam H. Association between maternal mortality and cesarean section: Turkey experience. PLOS ONE. 2016;11(11):e0166622.

[14] Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: case control study. BMJ. 2001;322:1089-94.

[15] Zhang WH, Alexander S, Bouvier-Colle M-H, Macfarlane A. Incidence of severe pre-eclampsia, postpartum haemorrhage and sepsis as surrogate marker for severe maternal morbidity in a European population-based study: the MOMS-B survey. BJOG. 2005;112:89-96.

[16] Zwart JJ, Richters JM, Öry F, de Vries JIP, Bloemenkamp KWM, van Roosmalen J. Severe maternal morbidity during pregnancy, delivery and puerperium in the Netherlands: a nationwide population-based study of 371,000 pregnancies. BJOG. 2008;115(7):842-50.

[17] Monitoring >WHO Maternal Morbidity Working Group available at https://pre-empt.bcchr.ca/who-maternal-morbidity-working-group

[18] Nanneli Pallasmaa. Cesarean Section-Short Term Maternal Complications Related To The Mode Of Delivery. 2014. University of Turku, Finland.

[19] Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004;240(2):205-13.

[20] Hillan EM. Postoperative morbidity following cesarean delivery. J Adv Nurs. 1995;22(6):1035-42.

[21] Ronsmans C. Severe acute maternal morbidity in low-income countries. Best Pract Res Clin Obstet Gynaecol. 2009;23:305-16.

[22] Lazariu V, Nguyen T, McNutt L-A, Jeffrey J, Kacica M. Severe maternal morbidity: A population-based study of an expanded measure and associated factors. PLOS ONE. 2017;12(8):e0182343.

[23] van Dillen J, Zwart JJ, Schutte J, Bloemenkamp KWM, van Roosmalen J. Severe acute maternal morbidity and mode of delivery in the Netherlands. Acta Obstet Gynecol Scand. 2010;89:1460-65.

[24] Center for disease control and prevention. Severe Maternal Morbidity Indicators and Corresponding ICD Codes during Delivery Hospitalizations. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm

[25] Evaluating the quality of care for severe pregnancy complications. The WHO near-miss approach for maternal health. WHO 2011. Available at http://apps.who.int/iris/bitstream/10665/44692/1/9789241502221_eng.pdf

[26] C-section morbidity. Open anaesthesia. Available at https://www.open anaesthesia.org./c-section morbidity/

[27] Curtin SC, Gregory KD, Korst LM, and Uddin SFG. Maternal Morbidity for Vaginal and Cesarean Deliveries, According to Previous Cesarean History: New Data From the Birth Certificate, 2013. National Vital Statistics Reports. 2015; Volume 64, Number 4. https://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_04.pdf

[28] Häger RM, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Øian P, et al. Complications of cesarean deliveries: Rates and risk factors. Am J Obstet Gynecol. 2004;190(2):428-34.

[29] Källen K, Rydström H, Olausson PO. Sverige K. 1990-2001. Rapport. (A report on Cesarean Delivery in Sweden in 1990-2001). Epidemiologist centrum, 2005; Socialstyrelsen.

[30] Kabel KT, Weeber TA. Measuring and communicating blood loss during obstetric haemorrhage. J Obstet Gynecol Neonatal Nurs. 2012;41(4):551-58.

[31] Al-Zirqi I, Vangen S, Forsen L, Stray-Pedersen B. Prevalence and risk factors of severe obstetric haemorrhage. BJOG. 2008;115:1265-72.

[32] Simoes E, Kunz S, Bosing-Schwenkglenks M, Schmahl F. Association between method of delivery and puerperal infectious complications in the perinatal database of Baden- Wurttemberg 1998-2001. Gynecol Obstet Invest. 2005;60:213-17.

[33] Stivanello E, Knight M, Dallolio L, Frammartino B, Rizzo N, Fantini MP. Peripartum hysterectomy and cesarean delivery: a population-based study. Acta Obstet Gynecol Scand. 2010;89:321-27.

[34] Knight M, Kurinczuk J, Spark P, Brocklehurst P. Cesarean delivery and peripartum hysterectomy; United Kingdom Obstetric Surveillance System Steering Committee. Obstet Gynecol. 2008;111(1):97-105.

[35] Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol. 2005;107:1226-32.

[36] Jakobsson M, Gissler M, Tapper AM. Risk factors for blood transfusion at delivery in Finland. Acta Obstet Gynecol Scand. 2013;92(4):414-20.

[37] Holm C, Langhoff-Roos J, Petersen KB, Norgaard A, Diness BR. Severe postpartum haemorrhage and mode of delivery: a retrospective cohort study. BJOG. 2012;119(5):596-604.

[38] Kramer MS, Berg C, Abenheim H, Dahhou M, Rouleau J, Mehrabadi A, et al. Incidence, risk factors, and temporal trends in severe postpartum hemorrhage. Am J Obstet Gynecol. 2013;209(5):449.e01-07.

[39] O Brien D, Babiker E, O'Sullivan O, Conroy R, McAuliffe F, Geary M, et al. Prediction of peripartum hysterectomy and end organ dysfunction in major obstetric haemorrhage. Eur J Obstet Reprod Biol. 2010;153(2):165-69.

[40] Roethlisberger M, Womastek I, Posch M, Husslein P, Pateisky N, Lehner R. Early postpartum hysterectomy: incidence and risk factors. Acta Obst Gyn Scand. 2010;89:1040-44.

[41] Chawla J, Arora D, Paul M, Ajmani SN. Emergency obstetric hysterectomy: a retrospective study from a teaching hospital in North India over eight years. Oman Med J. 2015;30(3):181-86.

[42] Juneja SK, MTandon P, Mohan B, Kaushal S. A change in the management of intractable obstetrical hemorrhage over 15 years in a tertiary care center. Int J Appl Basic Med Res. 2014;4(Suppl 1):S17-19.

[43] Korejo R, Nasir A, Yasmin H, Bhutta S. Emergency obstetric hysterectomy. J Pak Med Assoc. 2012;62(12):1322-25.

[44] Shellhaas CS, Gilbert S, Landon MB, Varner MW, Leveno KJ, Hauth JC, et al. The frequency and complication rates of hysterectomy accompanying cesarean delivery. Obstet Gynecol. 2009;114(2 Pt 1):224-29.

[45] Forna F, Miles AM, Jamieson DJ. Emergency peripartum hysterectomy: A comparison of cesarean and postpartum hysterectomy. Am J Obstet Gynecol. 2004;190(5):1440-44.

[46] Leth RA, Møller JK, Thomsen RW, Uldbjerg N, Nørgaard M. Risk of selected postpartum infections after cesarean section compared with vaginal birth: A five-year cohort study of 32,468 women. Acta Obstet Gynecol Scand. 2009;88(9):976-83.

[47] Smaill F, Hofmeyr GJ. Antibiotic prophylaxis for cesarean section. Cochrane Database Syst Rev. 2002;3:CD000933.

[48] Villar J, Carroli G, Zavaleta N, Donner A, Wojdyla D, Faunders A, et al. Maternal and neonatal individual risks and benefits associated with cesarean delivery: multicentre prospective study. BMJ. 2007;335:1025-29.

[49] Hofmeyr GJ, Mathai M, Shah AN, Novikova N. Techniques for cesarean section (Review). Cochrane Database Syst Rev. 2008;23(1):CD004662.

[50] Hadar E, Melamed N, Tzadikevitch_geffen K, Yogev Y. Timing and risk factors of maternal complications of cesarean section. Arch Gynecol Obstet. 2011;283(4):735-41.

[51] Burrows LJ, Meyn LA, Weber AM. Maternal morbidity associated with vaginal versus cesarean delivery. Obstet Gynecol. 2004;103(5 Pt1):907-12.

[52] Opøien HK, Valbø A, Grinde-Andersen A, Walberg M. Post-cesarean surgical site infections according to CDC standards: rates and risk factors. A prospective cohort study. Acta Obstet Gynecol Scand. 2007;86:1097-102.

[53] Bhartiya N, Gupta M, Jain S, Saini V. Anaemia: A risk factor for surgical site infection following caesarean section. Accepted for publication in Indian Obst Gynae. 2018;8(1).

[54] Kankuri E, Kurki T, Carlson P, Hiilesmaa V. Incidence, treatment and outcome of peripartum sepsis. Acta Obstet Gynecol Scand. 2003;82:730-35.

[55] Jakobsen AF, Skjeldestad FE, Sandset PM. Incidence and risk patterns of venous thromboembolism in pregnancy and puerperium – a register-based case-control study. Am J Obstet Gynecol. 2008;198(2):233.e01-07.

[56] Ros HS, Lichtenstein P, Bellocco P, Petersson G, Cnattingius S. Pulmonary embolism and stroke in relation to pregnancy: How can high-risk women be identified? Am J Obstet Gynecol. 2002;186(2):198-203.

[57] Brown CE, Stettler RW, Twickler D, Cunningham FG. Puerperal septic pelvic thrombophlebitis: incidence and response to heparin therapy. Am J Obstet Gynecol. 1999;181(1):143-48.

[58] Piva I,Scutiero G, Greco P. Amniotic fluid embolism: an update of the evidence. Med Toxicol Clin Forens Med. 2016;2:02.

[59] Kramer MS, Haim A, Mourad D, Jocelyn R; Cynthia B. Incidence, risk factors, and consequences of amniotic fluid embolism. Source: Paediatric and perinatal epidemiology. 2013;27(5):436-41.

[60] Lurie S, Sadan O, Golan A. Re-laparotomy after cesarean section. Eur J Obstet Gynecol and Reprod Biol. 2007;134:184-87.

[61] van Ham MAPC, van Dongen PWJ, Mulder J. Maternal consequences of cesarean section. A retrospective study of intraoperative and post-operative maternal complications of cesarean section during a 10-year period. Eur J Obstet Gynecol and Reprod Biol. 1997;74:01-06.

[62] Chai AH, Wong T, Mak HJ, Cheon C, Yip SK, Wong AS. Prevalence and associated risk factors of retention of urine after caesarean section. Int Urogynecol J. 2008;19:537-42.

[63] Groutz A, Levin I, Gold R, Pauzner D, Lessing JB, Gordon D. Protracted postpartum urinary retention: the importance of early diagnosis and timely intervention. Neurourol Urodyn. 2011;30:83-86.

[64] Lobel M, DeLuca RS. Psychosocial sequelae of cesarean delivery: Review and analysis of their causes and implications. Soc Sci Med. 2007;64(11):2272-81.

[65] Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Obstet Gynecol. 2006;107:1226-32.

[66] Bellala Swetha Study on Association of Placenta Previa with Previous Cesarean Section Pregnancy. IOSR Journal of Dental and Medical Sciences 2016. e-ISSN: 2279-0853, p-ISSN: 2279-0861. 15 (5) Ver. IV: PP 60-63.

[67] Getahun D, Oyelese Y, Salihu HM, Ananth C. Previous Cesarean Delivery and Risks of Placenta Previa and Placental Abruption. Obstetrics and Gynecology. 2006;107(4):771-78.

[68] Fitzpatrick KE, Sellers S, Spark P, Kurinczuk JJ, Brocklehurst P, Knight M. Incidence and risk factors for placenta accrete/increta/percreta in the UK: A national case-control study. PLOS One. 2012;7(12):e52893.

[69] O'Neill SM, Kearney PM, Kenny LC, Khashan AS, Henriksen TB, Lutomski JE, et al. Cesarean delivery and subsequent stillbirth or miscarriage: Systematic review and meta-analysis. PLOS One. 2013;8(1):e54588.

[70] Hemminki E, Meriläinen J. Long-term effects of cesarean sections: ectopic pregnancies and placental problems. Am J Obstet Gynecol. 1996;174(5):1569-74.

[71] Nikolajsen L, Sørensen HC, Jensen TS, Kehlet H. Chronic pain following Cesarean section. Acta Anaesthaesiol Scand. 2004;48(1):111-16.

[72] Silver RM. Delivery after previous cesarean: Long term maternal outcome. Semin Perinatol. 2010;34(4):258-66.

[73] Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW, et al. Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. Int J Obes Relat Metab Disord. 2001;25(8):1175-82.

[74] Weiss JL, Malone FD, Emig D, Ball R, Nyberg DA, Comstock CH, et al. Obesity, obstetric complications and cesarean delivery rate – A population-based screening study. Am J Obstet Gynecol. 2004;190:1091-97.

[75] Fyfe EM, Thompson JM, Anderson NH, Groom KM, McCowan LM. Maternal obesity and postpartum haemorrhage after vaginal and cesarean delivery among nulliparous women at term: a retrospective cohort study. BMC Pregnancy Childbirth. 2012;12(1):112.

[76] Galtier-Dereure F, Boegner C, Bringer J. Obesity and pregnancy: complications and cost. Am J Clin Nutr. 2000;71(Suppl. 5):S1242-S1248.

[77] Dinatale A, Ermito S, Fonti I, Giordano R, Cacciatore A, Romano M, et al. Obesity and fetal maternal outcomes. Review. Journal of Prenatal Medicine. 2010;4(1):05-08.

[78] Jarvie E, Ramsay JE. Obstetric management of obesity in pregnancy. Seminars in Fetal and Neonatal Medicine. 2010;15:83-88.

[79] Acosta CD, Knight M, Lee HC, Kurinczuk JJ, Gould JB, Lyndon A. The continuum of maternal sepsis severity: incidence and risk factors in a population-based cohort study. PLOS One. 2013;8(7):e67175.

[80] Witteveen T, Zwart JJ, Gast KB, Bloemenkamp KW, van Roosmalen J. Overweight and severe acute maternal morbidity in a low-risk pregnant population in the Netherlands. PLOS One. 2013;8(9):e74494.

[81] Larsen TB, Sørensen HT, Gislum M, Johnsen SP. Maternal smoking, obesity, and risk of venous thromboembolism during pregnancy and the puerperium: A population-based nested case-control study. Thrombosis Research. 2007;120:505-09.

[82] Kaminsky LM, Ananth CV, Prasad V, Nath C, Vintzileos AM. The influence of maternal cigarette smoking on placental pathology in pregnancies complicated by abruption. Am J Obstet Gynecol. 2007;197(3):275.e01-05.

[83] Avila C, Bhangoo R, Figueroa R, Santorelli J, Ogburn P, Desan PH. Association of smoking with wound complications after cesarean delivery. J Matern Fetal Neonatal Med. 2012;25(8):1250-53.

[84] Leth RA, Uldberg N, Nørgaard M, Møller JK, Thomsen RW. Obesity, diabetes, and the risk of infections diagnosed in hospital and post-discharge infections after cesarean section: a prospective cohort study. Acta Obstet Gynecol Scand. 2011;90(5):501-09.

[85] Smith GCS, Cordeaux Y, White IR, Pasupathy D, Missfelder-Lobos H, Pell JP, et al. The effect of delaying childbirth on primary cesarean section rates. PLOS Med. 2008;5(7):e144.

[86] James AH. Prevention and treatment of venous thromboembolism in pregnancy. Clin Obstet Gynecol. 2012;55(3):774-87.

[87] Temmerman M, Verstraelen H, Martens G, Bekaert A. Delayed childbearing and maternal mortality. Eur J Obstet Gynecol Reprod Biol. 2004;114(1):19-22.

[88] Aubrey-Bassier K, Newbery S, Kelly L, Weaver B, Wilson S. Maternal outcomes of cesarean sections: do eneralists' patients have different outcomes than specialists' patients? Can Fam Physician. 2007;53(12):2132-38.

[89] Clark SM, Ghulmiyyah LM, Hankins GDV. Antenatal antecedents and the impact of obstetric care in the etiology of cerebral palsy. Clin Obstet Gynecol. 2008;51(4):775-86.

[90] Haas DM, Ayres AW. Laceration injury at cesarean section. J Matern Fetal Neonatal Med. 2002;11(3):196-98.

[91] Dessole S, Cosmi E, Balata A, Uras L, Caserta D, Capobianco G, et al. Accidental fetal lacerations during cesarean delivery: experience in an Italian level III university hospital. Am J Obstet Gynecol. 2004;191(3 Pt 1):897-98.

[92] Signore C, Klebanoff M. Neonatal morbidity and mortality after elective cesarean delivery. Clin Perinatol. 2008;35:361-71.

[93] Jain L, Eaton DC. Physiology of fetal lung fluid clearance and the effect of labour. Semin Perinatol. 2006;30(1):34-43.

[94] Karlström A, Lindgren H, Hildingsson I. Maternal and infant outcome after cesarean section without recorded medical indication: findings from a Swedish case-control study. BJOG. 2013;120(4):479-86.

[95] Fogelson N, Menard K, Hulsey T, Ebeling M. Neonatal impact of elective repeat cesarean delivery at term: a comment on patient choice cesarean delivery. Am J Obstet Gynecol. 2005;192:1433-36.

[96] Hansen AK, Wisborg K, Uldberg N, Henriksen TB. Elective cesarean section and respiratory morbidity in the term and near-term neonate. Acta Obstet Gynecol Scand. 2007;86(4):389-94.

[97] Hansen AK, Wisborg K, Uldberg N, Henriksen TB. Risk of respiratory morbidity in term infants delivered by elective cesarean section: cohort study. BMJ. 2008;336(7635):85-87.

[98] Kolås T, Saugstad OD, Daltveit AK, Nilsen ST, Øian P. Planned cesarean versus planned vaginal delivery at term: Comparison of newborn infant outcomes. Am J Obstet Gynecol. 2006;195:1538-43.

[99] Zanardo V, Padovani E, Pittini C, Doglioni N, Ferrante A, Trevisanuto D. The influence of elective cesarean section on risk of neonatal pneumothorax. J Pediatr. 2007;150(3):252-55.

[100] Benterud T, Sandvik L, Lindeman R. Cesarean section is associated with more frequent pneumothorax and respiratory problems in the neonate. Acta Obstet Gynecol Scand. 2009;88:359-61.

[101] Biasucci G, Benennati B, Morelli L, Bessi E, Boehm G. Cesarean delivery may affect the early biodiversity of intestinal bacteria. J Nutr. 2008;138(9):1796S-800S.

[102] Roduit C, Scholtens S, de Jongste JC, Wijga AH, Gerritsen J, Postma DS, et al. Asthma at 8 years of age in children born by cesarean section. Thorax. 2009;64(9):824-25.

[103] Thavagnanam S, Fleming J, Bromley A, Shields MD, Cardwell CR. A meta-analysis of the association between cesarean section and childhood asthma. Clin Exp Allergy. 2008;38(4):554-56.

[104] Eggesbo M, Botten G, Stigum H, Nafstad P, Magnus P. Is delivery by cesarean section a risk factor for food allergy? J Allergy Clin Immunol. 2003;112(2):420-26.

[105] Almqvist C, Cnattingius S, Lichtenstein P, Lundholm C. The impact of birth mode of delivery on childhood asthma and allergic diseases – a sibling study. Clin Exp Allergy. 2012;42(9):1369-76.

[106] Tollånes MC, Moster D, Daltveit AK, Irgens LM. Cesarean section and risk of severe childhood asthma a population-based cohort study. J Pediatr. 2008;153(1):112-16.

[107] MacDorman MF, Menacker F, Declercq E. Cesarean Birth in the United States: Epidemiology, Trends, and Outcomes. Clin Perinatol. 2008;35:293-307.

[108] Laine K, Gissler M, Pirhonen J. Changing incidence of anal sphincter tears in four Nordic countries through the last decades. Eur J Obstet Gynecol Reprod Biol. 2009;146(1):71-75.

[109] Pinta TM, Kylänpää ML, Salmi TK, Teramo KA, Luukkonen PS. Primary sphincter repair: are the results of the operation good enough? Dis Colon Rectum. 2004;47(1):18-23.

[110] Hannah ME, Hannah WJ, Hodnett ED, Chalmers S, Kung R, Willan A, et al. Outcomes at 3 months after planned cesarean vs. planned vaginal delivery for breech presentation at term: the international randomized Term Breech Trial. JAMA. 2002;287(14):1822-31.

[111] Lal M, Mann CH, Callender R, Radley S. Does cesarean delivery prevent anal incontinence? Obstet Gynecol. 2003;101:305-12.

[112] Tegerstedt G, Miedel A, Maehle-Schmidt M, Nyren O, Hammarstrom M. Obstetric risk factors for symptomatic prolapse: a population-based approach. Am J Obstet Gynecol. 2006;194(1):75-81.

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