

## Risks of Caesarean Section - research papers

*The following are research papers related to the risks of caesarean sections. They may be used as a basis for further research on the subject.*

**Risks of caesarean section** - Caesarean sections are not without complications and consequences. Maternal risks in the short term include haemorrhage, infection, ileus, pulmonary embolism, and Mendelson's syndrome (the result of the mother inhaling her stomach contents due to incorrect anaesthesia). The prevalence of hysterectomy due to haemorrhage after caesarean section is 10 times that after vaginal delivery, and the risk of maternal death is increased up to 16-fold.

Long term morbidity including formation of adhesions, intestinal obstruction, bladder injury, and uterine rupture is often underestimated during subsequent pregnancy. There is evidence suggesting decreased fecundity, increased risk of ectopic pregnancy, placenta praevia, and worse infant outcome in subsequent pregnancies, although the effect on non-reproductive health is unclear and contradictory. Feelings of inadequacy, guilt, and failure in not completing a natural process may affect bonding between mother and infant, particularly if the operation was conducted under general anaesthetic."

**From a summary by Olumusola Amu, Sasha Rajendran and Ibrahim I Bolaji, BMJ 1998, Vol 317, p462-465.**

**Further surgery** - Researchers in Seattle, USA, checked re-admissions to hospital within 60 days of giving birth to their first child for over 200,000 women. Caesarean mothers had a significantly increased risk (almost twice as high) of being readmitted to hospital compared with those who had a vaginal delivery. There were increased risks for uterine infection, wound complications, cardiopulmonary problems and thromboses. Unexpected increases were also found in gall bladder disease and appendicitis, which had not previously been reported as risks of caesarean although gall bladder problems are known to happen after other abdominal surgery. The authors suggest that appendicitis might be increased because the abdomen is disturbed and an existing subclinical infection could be exacerbated. 17 per 1000 of caesarean mothers were re-hospitalised.

While only 1.2% of women needed readmission, there was an 80% increase in hospitalisation for those who had been sectioned, and a 30% increase after assisted deliveries.

**Lydon-Rochell M. Association between method of delivery and maternal rehospitalization, JAMA, 2000, 283, p2411-6. AIMS Journal, Vol 12, No 2, Summer 2000, p18.**

**Risk of Adult Asthma** - Adults with asthma are more likely to have been delivered by caesarean section compared with adults without asthma, according to researchers in Finland.

A team led by Dr. Baizhuang Xu, of the National Public Health Institute in Kuopio, obtained prospective data regarding asthma, allergic disorders, and obstetric history of 1953 individuals born in 1966 who survived to age 31. Atopy (hypersensitivity to certain substances) was diagnosed by skin prick tests for four common allergens.

Caesarean section, the means of birth for 5.3% of the subjects, was strongly associated with current physician-diagnosed asthma, with an adjusted odds ratio of 3.23. The investigators note that caesarean sections performed in the 1960s in Finland were almost always the result of emergency situations. The implications of the nearly five-fold higher rate of caesarean sections in Finland today are not yet known.

No strong relationships were observed between caesarean section and atopy, hay fever, or atopic eczema. Based on these findings, Dr. Xu's group concludes that the association between caesarean section and the prevalence of asthma is not due to the effect of caesarean section on microbial flora and the Th1/Th2 lymphocyte balance.

**J Allergy Clin Immunol 2001;107:732-733.**

**Cow milk allergy/intolerance** - The present study provides support for a positive association between cesarean delivery and persistent cow milk allergy/cow's milk intolerance. Correspondingly, a negative association was seen between cesarean delivery and early outgrown cow milk allergy/intolerance. A possible explanation is that cesarean delivery, rather than increasing the overall risk of food allergy, increases the risk of persistency of disease among food allergic children.

**Cesarean delivery and cow milk allergy/intolerance. Allergy. 60(9):1172-1173, September 2005. Eggesbo, M. 1; Botten, G. 2; Stigum, H. 1; Samuelsen, S. O. 1,3; Brunekreef, B. 4; Magnus, P. 1**

**HIV Positive women** - A hospital in Valencia compared the aftermath of caesarean section in 45 HIV positive mothers with outcomes in 90 control women who had sections for similar reasons. The commonest reasons were fetal distress, failure to progress, breech presentation, previous section, post term pregnancy and pre-eclampsia. All sections were done under general anaesthetic and everyone had routine antibiotics. Both major and minor complications were more common in the HIV positive group, their hospital stays were longer and they were more likely to need antibiotics. Fever, wound infections, pneumonia, sepsis, peritonitis and anaemia were all more common in the HIV group.

**AIMS Journal, Vol 11, No 3, Autumn 1999, p 15.**

Postpartum endometritis was significantly higher with caesarean delivery compared with vaginal delivery 17% vs 4%

Other complications - amnionitis, wound infection, pneumonia, platelet transfusion, urinary tract infection, pyelonephritis, septic pelvic thrombophlebitis, deep vein thrombosis or haematomas.

**Watts, Lambert J, Stiehm R et al. Complications according to mode of delivery among human immunodeficiency virus infected women with CD4 lymphocyte counts of <math></math>500/microliter. Am J Obs and Gynae, July 2000, Vol 183, No 1, p100-107.**

**Infections** - Post-operative infection occurred in 27% of women when the obstetrician put his hand in the cavity and took the placenta out, but only 15% when it spontaneously separated. The second method is less popular with doctors, because they have to wait around for a few minutes.

**Lasley D et al. The effect of placental removal method on the incidence of post caesarean infections, A J Ob Gyn, 1997, 176; p1250-54. AIMS Journal, Vol 9 No 4, Winter 1997/8, p15.**

**Maternal age** - A retrospective Canadian study showed that nulliparous women (those expecting their first baby) over 35 years of age are the ones most likely to experience the highest rates of intervention. This group had twice the rate of caesarean delivery as well as a higher induction and instrumental delivery rate. The authors conclude that high rates of intervention probably result from the traditionally held view that older mothers pose significantly greater risks, and that "good perinatal outcomes could be achieved with less intervention".

**Ezra Y et al, (1995), European Journal of Obstetrics and Gynecology, Vol 62, p203-207.**

**Maternal death** - Women are 5.1 times more likely to die from caesarean section, causes: infection, haemorrhage, embolism and anaesthetic complications. The death rates are 31 per 100,000 compared with 6 per 100,000 women who had normal births. *Br J Obs and Gynae*, 1990 Vol 97, p883-92.

An American study put the figure at 60 per 100,000  
**Am J Obs and Gynae**, 1981, vol 139 p 681-85.

Death rate for women aged 15-34 from automobile accidents is 20 per 100,000  
**Clinical Obs and Gynae**, 1985, 28, p 763-09.

An increase in maternal deaths from haemorrhage despite advice that peripartum hysterectomy be considered sooner rather than later in cases of life-threatening haemorrhage. Estimated incidence of 4.0 per 10,000 births. There was associated maternal mortality of 1% and prenatal mortality of 2%, 19% of women had associated major morbidity.

**Knight M et al, (2007). Peripartum hysterectomy in the UK: outcomes and management of associated haemorrhage.**

### **Maternal Postnatal Health**

A study of 971 women who responded to a detailed questionnaire seven weeks after giving birth revealed that caesarean mothers had significantly lower scores for physical functioning, mental health, pain, social functioning, and daily activity than women with 'normal' vaginal births. Women with unassisted vaginal deliveries did significantly better than caesarean mothers in areas like vigorous activity, sports, lifting or carrying things or climbing stairs. They were less likely to have felt downhearted and blue.

**Lydon-Rochelle M, et al. Delivery method and self-reported postpartum general health status among primiparous women. Paed Perinatal Epidemiol**, 2001; 15: p232-40.

**Obstetric hysterectomy** - A report from St George's Hospital, Tooting, shows that emergency hysterectomies at delivery have increased seven-fold in recent years. Between 1992 and 1998 the unit did 10 operations. Only two were done in the first four years, making it a rare occurrence of 1 in 7,000 deliveries. However in 1996-98 they did 8 - an increase to 1 in 1,000 deliveries. Since then the caesarean section rate at this hospital has increased from 23.4% in 1992 to over 30% in 2000. Women with a previous section are up to 27 times more likely to need obstetric hysterectomy than those who have had only vaginal deliveries.

**Gould D et al. Emergency obstetric hysterectomy - an increasing incidence. Journal Obstet. Gynaecol.** 1999, 19, pp580-583.

In a review of 65,488 Dublin deliveries over 10 years the researchers found 11 cases of hysterectomy, done either for rupture of the uterus or for uncontrollable bleeding. 7 were associated with a previous caesarean. There were no hysterectomies in women having their first child. A history of caesarean section increased the risk of hysterectomy 18 fold.

**Green R, Gardeil and Turner M. Long term implications of caesarean section. Am J Obstet Gynaecol** 176(1), p254-5, 1997.

40% of hysterectomies were in women with antenatally diagnosed placenta praevia. 74% of cases of placenta praevia were reported as grade 3 or 4.

Prior delivery by caesarean section is associated with a six-fold increase in risk of peripartum hysterectomy in subsequent pregnancies. This suggests that the incidence of peripartum hysterectomy will rise as the caesarean section rate rises and women should be counselled accordingly.

**Knight M et al. (2007). Peripartum Hysterectomy: A national case-control study to investigate incidence and risk factors using the UK obstetric Surveillance System (UKOSS).**

There were 318 confirmed cases of peripartum hysterectomy in an estimated 779,955 total births, giving an incidence of 4.1 per 10,000 total births. Three hysterectomies were undertaken electively for management of malignancy (one ovarian, two cervical cancers) with the remaining 315 undertaken for management of haemorrhage. Most commonly reported causes of haemorrhage were uterine atony (53%), morbidly adherent placenta (39%), uterine rupture (8%) and extension of uterine incision at delivery (6%). Compared with controls, women who had a peripartum hysterectomy were over three times more likely to have had a previous caesarean section. The risk increased with the number of previous sections such that women with a peripartum hysterectomy were over eighteen times more likely to have had two or more previous sections than control women. Women received a median of ten units of blood. Two women died, a case fatality of 0.6%.

Peripartum hysterectomy is strongly associated with previous delivery by caesarean section and the risks rise with increasing number of previous caesarean section deliveries. The incidence of peripartum hysterectomy is likely to rise with increasing rates of caesarean section delivery.

**Knight M, Kurinczuk JJ, Spark P and Brocklehurst P. United Kingdom Obstetric Surveillance System 9UKOSS) Annual Report 2007, National Perinatal Epidemiology Unit, Oxford.**

**Misoprostol** - Women attempting a vaginal birth after caesarean (VBAC) who are given misoprostol have a rate of uterine rupture of 5.6% compared with a rupture rate of 0.2% of women who were not given the drug. Plaut MM, Schwartz ML, Lubarsku SL. Uterine rupture associated with the use of misoprostol in the gravid patient with a previous caesarean section. *Am J Obstet Gynecol*, 1999, 180, p1535-42.

Physician bias- The occurrence of obstetric complications does not explain why pregnant women older than 30 years of age are more likely than younger women to undergo caesarean section. Researchers from Aberdeen Maternity hospital evaluated the factors influencing the high caesarean section rate among older women by analysing data from 23,806 deliveries registered in the Aberdeen maternal and neonatal data bank. For women without previous caesarean section the caesarean rate increased with maternal age independent of obstetric complications and other confounding factors. Physician preference is a significant factor. **Bell JS et al. Do obstetric complications explain high CS rates among women over 30? A retrospective analysis, *BMJ*, 2001, Vol 322, p894-95.**

**Placenta praevia** -A study of over 18,000 deliveries from Jordan found that previous caesarean section increased the risk of placenta praevia from 0.25% to 1.87%. The greater the number of previous caesareans, the more the risk increased - 1.78% for one section, 2.4% for two and 2.8% for three or more. **Ziadeh S. Placental praevia and accreta: an analysis of two years' experience, *J Ob Gyn*, 1998, 19, p584-6.**

**Placenta accreta** - The incidence of placenta accreta (where the placenta has invaded the muscle of the uterus and there is no clear separation) is also increased by a caesarean scar. If a woman with placenta praevia had no previous sections, the risk of placenta accreta was 9%, but if she had a previous caesarean scar it was 46%. **Ziadeh S. Placental praevia and accreta: an analysis of two years' experience, *J Ob Gyn*, 1998, 19, p584-6.**

A study from Saudi Arabia of 23,000 deliveries 100 women had placenta praevia and 12 of them had placenta praevia accreta. The percentage of placenta praevias which were embedded increased from 4.1% in women with no previous section, to 60% in women who had three or more caesareans. **Zaki M et al. Risk factors and morbidity in patients with placenta praevia accreta compared to placenta praevia non-accreta, *Acta Ob Gyn Scand*, 1998, 77; p391-4.**

**Operative complications** - A retrospective study found an intra-operative complication rate of nearly 15% (lacerations to the body of the uterus and blood loss >1000ml) and an overall post-operative morbidity rate of 36%. Fever, blood loss >1000ml, haematoma and urinary tract infection were the most frequent complications.

**van Ham M, van Dongen P, Mulder J. Maternal consequences of caesarean section. A retrospective study of intra-operative and post-operative maternal complications of caesarean section during a 10 year period. Eur J Obstet Gynaecol Reprod Biol, 74(1), p1-6, 1997.**

Significant levels of postnatal morbidity which included wound infections, chest infections, interuterine infections, urinary tract infections, urinary catheterisation and postnatal blood transfusion. Only 9% of women had no recorded morbidity in the postnatal period. It stressed that these complications are most marked with emergency caesarean sections.

**Hillan E. Postoperative morbidity following caesarean section. J Adv Nursing, 22(6), p800-806, 1995.**

**Formation of adhesions.** Thirty-three qualified studies including 4423 women were analysed. There were 406 adhesions among 571 women and 238 adhesions among 596 women in the Stark's caesarean section (also known as Misgav-Ladach method) group and modified Stark's caesarean section group, respectively, with pooled OR 4.69 (95% CI 3.32–6.62;  $P < 0.01$ , 12 studies); 1173 adhesions among 1555 women and 1179 adhesions among 1625 women in Stark's caesarean section group and classic lower-segment caesarean section group, respectively, with pooled odds ratio 1.28 (95% CI 0.97–1.68;  $P = 0.08$ , 21 studies); and 29 adhesions from 102 women and 115 adhesions from 193 women in modified Stark's caesarean section group and classic lower-segment caesarean section group, respectively, with pooled odds ratio 0.28 (95% CI 0.10–0.82;  $P = 0.02$ , two studies). The authors concluded that 'the closure of the peritoneum in modified Stark's caesarean section resulted in less adhesion formation and should be recommended'.

**Shi Z, Ma L, Yang Y, Wang H, Schreiber A, Li X, Tai S, Zhao X, Teng J, Zhang L, Lu W, An Y, Alla N, Cui T. Adhesion formation after previous caesarean section—a meta-analysis and systematic review. BJOG 2011;118:410–422.**

**Permanent vegetative state** - In July 2000 the UK High Court granted an order permitting a London NHS Trust to discontinue all life-sustaining treatment, including nutrition and artificial hydration. The 54-year old woman had never woken up from the anaesthetic for a caesarean section, having suffered severe oxygen deprivation during it, and 21 years later was in a permanent vegetative state.

**Bulletin of Medical Ethics, October 2000, p7.**

**Post Traumatic Stress Disorder** - Nearly 600 pregnant women in Brisbane, Australia, were contacted in pregnancy and filled in forms to measure how anxious they were. They were interviewed by telephone 4-6 weeks after giving birth and a Perception of Care Questionnaire was used. A third of the women reported a stressful experience and having three or more trauma symptoms. 5.6% met the criteria for acute post-traumatic stress disorder, as they had all six symptoms - and there was no difference between those having a first or later baby.

Risk was not affected by whether they had had childbirth preparation, support from their partner or how anxious they were. What did predict symptoms was the level of intervention (e.g. an emergency section, forceps delivery or quality of postnatal analgesia). These were highly statistically significant. Vacuum deliveries and fearing for the baby's life were also related, but less consistently. Dissatisfaction with care

was a significant contributor. Women who had both a high level of intervention and saw their care as poor were more likely to get PTSD than those who also had a lot of intervention but thought care was OK.

**Creedy D et al. Childbirth and the development of acute trauma symptoms incidence and contributing factors, Birth, 2000, 27, p104-111.**

**Psychological outcomes** - Caesarean mothers compared with mothers who delivered vaginally:

- Expressed less immediate and long-term satisfaction with the birth
- Were less likely to breast-feed
- Experienced a much longer time before first interactions with their babies
- Have less positive interactions with their babies
- Have less positive interactions with their babies after the birth
- Interacted less with their babies at home.

**DiMatteo M, Morton S, et al. Caesarean childbirth and psychosocial outcomes: a meta-analysis, Health Psychol, 15(4), p305-14, 1996**

**Repeat Caesareans - Hemminki E. Impact of caesarean section on future pregnancy - a review of cohort studies. paediatr Perinat Epidemiol, 10(4), p366-79, 1996.**

**Ruptured uterus** - See obstetric hysterectomy.

**Serious complications** - a study in three London hospitals revealed that women who have caesarean sections run a 4-fold risk of suffering serious complications, including haemorrhage, infection and rupture of the uterus. The study involved 49,000 women who had their babies in South East England between 1st March 1997 and 28th February 1998. The researchers comment that the low number of maternal deaths encourages women to believe this type of birth is safe, because of this they felt that severe complications gave a better indication of the risks of caesareans. In this study for every death there were 118 near misses where women suffered a life-threatening event.

**Waterstone M et al. Incidence and predictors of severe obstetric morbidity: case control study, BMJ, 2001, Vo322, p1089-94.**

**Sex of the obstetrician** - a study in America revealed that male doctors are 40% more likely to perform caesarean sections and hysterectomies than female doctors. **Journal of Clinical Epidemiology, 1999.**

**Thromboembolism - Corosu R, Vizzaccaro F and Moretti S. Incidence of thromboembolic complications in caesarean sections and heparin prophylaxis. Minerva Ginecol 51(5), p173-6, 1999.**

**Vaginal Birth After Caesarean (VBACs)** - Uterine rupture rate was 2.3% for those who had labour induced:

- 0.7% for those who had spontaneous labours
- 4.5% for those who had prostaglandin gel inductions(1).
- 0.8% in women with a previous caesarean scar
- 3.7% in women with two caesarean scars(2).
- 8% in women with a bicornate or septate uterus who had been induced with prostaglandin gel (one had oxytocin as well).

**1. Zelop C et al. Uterine rupture during induced or augmented labor in gravid women with one prior cesarean delivery. Am J. Obs. Gyn., 1999, 181, 882-6.**

**2. Caughey A et al. Rate of uterine rupture during a trial of labor in women with one or two prior cesarean deliveries. Am. J. Obs. Gyn., 1999, 181, pp872-6.**

**3. Ravasia D et al. Incidence of uterine rupture among women with mullerian duct anomalies who attempt vaginal birth after cesarean delivery. Am. J. Obs. Gyn., 1999, pp877-81.**

**Choosing a Caesarean** The striking increase in caesarean section rates in middle- and high-income countries has been partly attributed to maternal request. We conducted a systematic review and meta-analysis of women's preferences for caesarean section. A systematic search of MEDLINE, EMBASE, LILACS and PsychINFO was performed. References of all included articles were examined.

This included studies that quantitatively evaluated women's preferences for caesarean section in any country, and excluded articles assessing health providers' preferences and qualitative studies. The researchers concluded that 'Only a minority of women in a wide variety of countries expressed a preference for caesarean delivery'.

**Mazzoni A, Althabe F, Liu N, Bonotti A, Gibbons L, Sánchez A, Belizán J. Women's preference for caesarean section: a systematic review and meta-analysis of observational studies. BJOG 2011;118:391–399.**

**Risks of multiple caesarean sections** Serious maternal morbidity progressively increased as the number of previous caesarean deliveries increased. The rate of hysterectomy, blood transfusions, adhesions, and surgical injury all increased with increasing number of caesarean deliveries. The incidence of placenta previa increased from 10/1000 deliveries with 1 previous caesarean delivery to 28/1000 with 3 caesarean deliveries. Compared with women with praevia and no previous caesarean delivery, women with praevia and 3 caesarean deliveries had a statistically significant increased risk of accretia (3.3-4% vs 50-67%), hysterectomy (0.7-4% vs 50-67%), and composite maternal morbidity (15% vs 83%; odds ratio, 33.6; 95% confidence interval, 14.6 –77.4).

**Marshall E, Fu R, Guise J-M (2011). Impact of multiple caesarean deliveries on maternal mortality: a systematic review, Am J Obstet Gynecol, 2011, 205:262.e1-8.**

## RISKS TO THE BABY

**Increased risk of infant and neonatal death.** This study compared primary caesarean section with vaginal delivery for singleton full-term women with no indicated medical risks or complications and found that the risks for babies delivered by caesarean section were three times higher than those delivered vaginally (1.77 per 1,000 live births compared with 0.62 per 1,000 live births). **Marian F. MacDorman, PhD, Eugene Declercq, PhD, Fay Menacker, DrPH, CPNP, and Michael H. Malloy, MD, MS, Infant and Neonatal Mortality for Primary Cesarean and Vaginal Births to Women with "No Indicated Risk," United States, 1998–2001 Birth Cohorts, BIRTH 33:3 September 2006, p175-182.**

**Increase risk of diabetes after caesarean section delivery –** This study investigated the evidence of an increased risk of childhood-onset type 1 diabetes in children born by Caesarean section by systematically reviewing the published literature and performing a meta-analysis with adjustment for recognised confounders. This analysis demonstrated a 20% increase in the risk of childhood-onset type 1 diabetes after Caesarean section delivery that cannot be explained by known confounders. [Cardwell CR, et al. Diabetologia. 2008 May; 51\(5\):726-35. Epub 2008 Feb 22. Department of Epidemiology and Public Health, School of Medicine and Dentistry, Queen's University Belfast, Grosvenor Road, Belfast, BT12 6BJ, UK. \[c.cardwell@qub.ac.uk\]\(mailto:c.cardwell@qub.ac.uk\)](#)

**Increased risk of breathing problems** - Researchers at Aarhus University Hospital in Denmark compared infants intended for vaginal delivery with 2,687 infants delivered by elective caesarean section. They found that babies delivered by elective caesarean section around term carry up to a fourfold increased risk of breathing problems. This risk increased the earlier the caesarean was performed. A nearly fourfold increased risk was found at 37 weeks gestation, a threefold increase in risk at 38 weeks gestation, and a doubling of risk in infants delivered at 39 weeks gestation. Adjusting for maternal factors had little effect.

At 37 weeks, 2.8% of infants delivered by intended vaginal delivery had general respiratory problems compared to 10% of infants delivered by elective caesarean section. At 38 weeks, the proportion was 1.7% compared to 5.1% and at 39 weeks, 1.1% compared to 2.1%.

Analyses after restriction to low risk pregnancies revealed slightly smaller risk estimates at 37 weeks gestation but essentially unchanged estimates at 38 and 39 weeks gestation for serious respiratory problems, whereas the estimates remained unchanged at all gestational ages for general respiratory problems.

**Anne Kirkeby Hansen, Kirsten Wisborg and Niels Ulbjerg. And Tine Brink Henriksen. Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study, British Medical Journal, December 2007**

Researchers at the Rosie Maternity Hospital, Cambridge reviewed 33,289 deliveries that occurred at or after 37 weeks of gestation. The incidence of respiratory distress syndrome at term was 2.2/1000 deliveries (95% CI; 1.7-2.7). The incidence of transient tachypnoea was 5.7/1000 deliveries (95% CI; 4.9-6.5). The incidence of respiratory morbidity was significantly higher for the group delivered by caesarean section before the onset of labour (35.5/1000) compared with caesarean section during labour (12.2/1000), and compared with vaginal delivery (5.3/1000).

The relative risk of neonatal respiratory morbidity for delivery by caesarean section before the onset of labour during the week 37+0 to 37+6 compared with the week 38+0 to 38+6 was 1.74 and during the week 38+0 to 38+6 compared with the week 39+0 to 39+6 was 2.4. They concluded that there would be a significant reduction in neonatal respiratory morbidity would be obtained if elective caesarean section was performed in the week 39+0 to 39+6 of pregnancy.

**Morrison JJ, Rennie JM, Milton PJ (1995). Neonatal respiratory morbidity and mode of delivery at term: influence of timing of elective caesarean section. Br J Obstet Gynaecol. 1995 Feb;102(2):101-6**

**Increased rate of transfer to neonatal intensive care unit** – Researchers in Norway examined neonatal outcomes among women with a planned caesarean and a planned vaginal delivery at term. The risk of pulmonary disorders (transient tachypnea of the newborn infant and respiratory distress syndrome) rose from 0.8% to 1.6% (P = .01). A planned caesarean delivery doubled both the rate of transfer to the neonatal intensive care unit and the risk of pulmonary disorders, compared with a planned vaginal delivery.

**Kolås T, Saugstad OD, Deltveit AK et al. Planned cesarean versus planned vaginal delivery at term: comparison of newborn infant outcomes, American Journal of Obstetrics and Gynecology, Vol 195, Dec 2006, pp1538-1543**

**Birth Injury** - A study of over half a million babies in California reveals the risk of brain injury (intracranial haemorrhage) by method of delivery for first babies:

Forceps	1 in 664
Vacuum extraction	1 in 860
Caesar - in labour	1 in 907

no labour	1 in 2750
Spontaneous labour	1 in 1900

As compared with normal vaginal delivery, the risk of the baby having a recorded subdural or cerebral haemorrhage goes up 3.4 times for forceps delivery, 2.7 times for vacuum. For babies who have both vacuum and forceps it is 7.3 times. There are also higher risks for facial nerve injuries (particularly with forceps), other injuries, and convulsions. Although the overall risk is higher for caesareans done during labour than before labour, the highest risk of all was for caesarean done AFTER a failed attempt at vaginal delivery.

**Iatrogenic injury** - Cutting the baby - The risk of the surgeon's knife accidentally lacerating the baby is in a non-vertex position. However, many cases are not reported. Only one case in 17 fetal lacerations baby is 1.9%. The risk increases to 6% if the was reported by the obstetrician.

**Smith W, Hernandez C, Wax JR. Fetal laceration injury of cesarean delivery. Obstet. Gynecol, 1997, 90, p344-46.**

Report of iatrogenic brain injury during emergency caesarean section. When the baby was delivered it was found to be bleeding from an incised scalp wound with convoluted tissue exuding from the site. **DurhamJH, Sekula-Perlman A and Callery RT. Iatrogenic brain injury during emergency caesarean section, Acta Obstet Gynecol Scand, `998, 77, p238-248.**

A prospective study of caesarean operations (876 women) during 2000 revealed that 1.5 percent of the babies had skin lacerations (13 babies), seven lacerated during emergency operations and six during elective ones. Only 7 of the 13 injuries were noted by the surgeon and four of the injuries were caused by one particular doctor, suggesting a fault in technique.

**Weiner J and Westwood J. Fetal lacerations at caesarean section, J Ob Gynae, 2002, 22, p23-4.**

**Prematurity** - Research shows that one extra week in the womb makes a huge difference to risk of respiratory distress syndrome - and death.

At 34 weeks	1 baby in 34 needed ventilation
35	1 73
36	1 140
37	1 557
38	1 16,692
39-41	1 133,227

Some of the babies had been delivered by elective caesareans at 37-38 weeks instead of 39 weeks onwards, when their risk would be so much lower. Some had elective caesareans simply because the mother had had a previous section, or because the baby was breech. One was done for 'fetal growth retardation' though in fact obstetricians had misdiagnosed the gestation - the baby was 34 instead of 38 weeks. The authors conclude that elective section should be avoided before 39 weeks, unless labour starts spontaneously. **Madar J, Richmond S and Hey E. Surfactant deficient respiratory distress at 'term'. Acta Paed, 1999, 88, p1244-8.**

**Maintaining body temperature** - Babies delivered by caesarean section have difficulties maintaining normal body temperature during the first hours after birth. Axillary and skin temperatures were significantly higher in the vaginally delivered group than in infants delivered by caesarean section. Infants born by non-elective caesarean section were slightly warmer during the first 90 minutes after birth compared to infants born by elective caesarean section. There were no significant differences in temperatures between infants cared for in a cot as compared to those cared for in an incubator.

**Christensson K et al. Lower body temperatures in infants delivered by caesarean section than in vaginally delivered infants, Acta Paediatr, 1993, 82(2), p128-131.**

**Lung function** - Lung function tests were carried out in the first 6 hours of life on 26 babies born by vaginal delivery and 10 born by caesarean section. The babies born by caesarean section had a mean thoracic gas volume of only 19.7ml/kg body weight compared with 32.7 ml/kg for the babies born vaginally. The study concluded that this is owing to an excess of lung fluid in the babies born by caesarean section.

**Milner AD et al. Effects of delivery by caesarean section on lung mechanics and lung volume in the human neonate, Arch Dis Child, 1978, 53(7), p545-548.**

Clinically normal babies born at term by elective caesarean section had a smaller mean crying vital capacity (CVC - a means of assessing the baby's lung capacity) in the first two weeks of life compared with clinically normal babies born vaginally. In contrast, no significant difference was shown between the mean CVC in term babies born vaginally and those born by emergency caesarean section.

**Chiswick ML et al. Crying vital capacity. Measurement of neonatal lung function, Arch Dis Child, 1976, 51(1), p22-27.**

**Schizophrenia.** Increased risk of schizophrenia in babies delivered by caesarean section. Postulated by researchers who studied the effects of caesarean sections on rats.

**New Scientist 21 Nov 1998**

**Stillbirth** - Many babies are induced or delivered early on the grounds that prolonging the pregnancy will put the baby at increased risk. However, the risks of unexplained stillbirths in singleton pregnancies are as follows and do not justify routine induction or caesarean section at 38 weeks as the risks are reduced until 42 weeks when they are almost the same as the risks at 38 weeks.

Gestation		Prospective risk of unexplained stillbirths antepartum in singleton pregnancies	
35	1:500	36	1:556
37	1:645	38	1:730
39	1:840	40	1:926
41	1:826	42	1:769
43	1:633		

To prevent one neonatal death 500 women have to be induced.

**Cotzias C S et al (1999). Prospective risk of unexplained stillbirth in singleton pregnancies at term: population based analysis, British Medical Journal, Vol 319, p287-288.**

**Neonatal mortality** A recent study of nearly six million births has found that the risk of death to newborns delivered by voluntary Caesarean section is much higher than previously believed.

Researchers have found that the neonatal mortality rate for Caesarean delivery among low-risk women is 1.77 deaths per 1,000 live births, while the rate for vaginal delivery is 0.62 deaths per 1,000. Their findings were published in **August, 2006 issue of Birth: Issues in Perinatal Care.**

**Stillbirth of the next baby** – Women whose first baby was born by caesarean are twice as likely as other women to have an unexplained stillbirth around 39 weeks in their second pregnancy. The risk is small, 1.1 per 1,000 in women who have had a previous caesarean but 0.5 in those who had not.

**Smith G et al. Caesarean section and risk of unexplained stillbirth in pregnancy. The Lancet, 2003, 362, p 1779-1784. Commentary: Unexplained antepartum stillbirth in pregnancies after caesarean section, Lancet 2003; 362, p1774.**

**Neonatal mortality** - This paper compared outcome for health women with term babies born vaginally and by elective CS. The summary results say:

Neonatal mortality rates were higher among infants delivered by caesarean section (1.77 per 1,000 live births) than for those delivered vaginally (0.62). The magnitude of this difference was reduced only moderately on statistical adjustment for demographic and medical factors, and when deaths due to congenital malformations and events with Apgar scores less than 4 were excluded. The caesarean/vaginal mortality differential was widespread, and not confined to a few causes of death.

**Infant and Neonatal Mortality for Primary Caesarean and Vaginal Births to Women with “No Indicated Risk,” United States, 1998–2001 Birth Cohorts**

**Diabetes** – There is an increased risk of diabetes in babies delivered by caesarean section – Research paper to be identified and analysed.

#### **Further reading**

Walsh D. Part four: Fetal monitoring should be controlled, *British Journal of Midwifery*, Vol 8, No 8, P511-516, 2000.

Wagner M (2000). Choosing caesarean section, *The Lancet*, Vol 356, p1677-1680.

"A person who sought unnecessary medical intervention without just cause in any other area than childbirth would have Munchausen's Syndrome".

Paul Lewis, Professor of Midwifery, RCM Conference, Jersey, May 2000

There is no health improvement for either mother or baby when caesarean sections exceed 10%. WHO Interregional Conference, Joint Interregional conference on Appropriate Technology for Birth, 22-26 April, 1985

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