

Incidence of Surgical Complications Following Cesarean Section: A longitudinal study

**Rubina Amjad¹, Farzana Khan², Summiya Ramzan³, Devi Kumari⁴, Salma khudaidad⁵,
Breera Sadaf⁶.**

¹Assistant Professor Gynaecology, Mekran Medical College Teaching Hospital Turbat Kech,
Pakistan. email: drrubinabaloch@gmail.com

²Consultant Gynaecology, Sandeman Provincial Hospital Quetta, Pakistan.
email: farzanakhan_99@hotmail.com

³Consultant Gynaecology, Sandeman Provincial Hospital Quetta, Pakistan. email:
Summiya_ramzan@yahoo.com

⁴Senior Registrar Gynaecology, Jinnah Medical and Dental College affiliated with SM Sohail
Trust Hospital Korangi Karachi, Pakistan. email: nkvalecha@yahoo.com

⁵Consultant Gynaecology, Bolan Medical Complex Hospital Quetta, Pakistan.
email: salmakhan955@ymail.com

⁶Consultant Gynaecology, Sheikh Zaid Hospital Quetta, Pakistan.
email: breerasadaff@gmail.com

ABSTRACT

Aim: To determine the incidence and risk factors of the surgical complications following the caesarian section.

Study design: A longitudinal study

Place and Duration: This study was conducted at Sheikh Zaid Hospital Quetta, Bolan Medical Complex Hospital Quetta, Jinnah Medical and Dental College karachi, Sandeman Provincial Hospital Quetta, Mekran Medical College Teaching Hospital Turbat Kech, Pakistan from the year June 2018 to June 2021.

Methodology: All the cases of the caesarian section conducted in different hospitals in three year were included in this study. In this study, we recruited 79052 cases of caesarian section delivering their first child while 402316 vaginal deliveries were also reported. Short-term

complications occurring within 42 days after delivery (puerperium) were also noted. The risk for placenta previa and uterine rupture was also studied. The secondary outcomes of surgical complications were that that occurred after the caesarian section. We divided our participants into subcategories to identify the risk factors.

Results: We observed comparatively high odd ratios of the case group for all surgical complications. Within 42 days we observed 0.17% cases of bleeding, 0.22% organ damage, 0.22% of wound dehiscence, and 0.66% cases of infection were also reported.

Conclusion: Our study concluded that the trend of the caesarian section is steadily increasing in past few years. However, the caesarian section has more complications when compared with vaginal deliveries. Obesity and smoking are independent risk factors for caesarian complications.

Keywords: Caesarian section, Life-threatening complications, Obesity

Introduction:

In many parts of the world rate of the caesarian section steadily increasing. In 1985, the world health organization reported a 10-15% caesarian ratio with the claim that no decrease in maternal or perinatal mortality was obtained with rates above that.¹ However, in recent years the validity of this claim is questioned and physicians suggested that caesarian should be only performed when needed.^{2, 3} In 2012, a total of 24.5% of mothers used caesarian as the mode of delivery. Furthermore, North America reported 32% while South America reported 41% cases of caesarian in 2018.^{4,5} There is a need to understand the risks and complications related to the caesarian section.⁴ A very limited number of comprehensive studies have been produced to highlight the surgical complications. Some studies reported bleeding as a major complication in 7% of cases⁶ while a small number of cases reported bowel destruction and damage to the urinary tract in very few studies.⁷ Abdominal pain is one of the major complications of caesarian reported in two systematic reviews with a 4% to 42% prevalence.^{8,9} Two large studies also reported 0.05 to 0.2% cases of bowel obstruction.¹⁰ After multiple caesarian sections, previous studies reported an increase in the incisional hernia repair rate.¹¹ Two studies also highlighted some rare cases of uterine rupture and placenta praevia due to caesarian section.^{12,13} With the help of this literature, we designed our study to evaluate the surgical complications of the caesarian section at the population level. We also aim to highlight the risk factors which may

contribute to caesarian complications.

Methodology:

This longitudinal population-based study was conducted in different hospitals and multicentric trial was done. All the cases of caesarian conducted from June 2018 to June 2021. We included all the registered data of discharged diagnosis and surgical interventions that were gathered and coded according to the International Classification of Diseases (ICD).^{14, 15} We included all the information related to BMI, smoking habits, and maternal factors except whether the delivery was elective or emergency. We initiated this study after obtaining ethical approval from the research institute of the hospital. Written consent from all participants was obtained from the patients after explaining the research objectives. We followed the protocol of the STROBE checklist developed for the observational studies. The study was divided into two major groups. The case group consisted of women delivering by cesarean section while the control group consisted of women experiencing vaginal deliveries during the study timeframe. We only included patients who had their first delivery to avoid the mixing of data. Complications were measured within 42 days of the caesarian section. Our primary outcomes of surgical complications included bowel obstruction; incisional hernia; abdominal pain. The risk for placenta praevia and uterine rupture was also studied. The secondary outcomes of surgical complications were that occurred after the caesarian section. We divided our participants into subcategories to identify the risk factors. The comparison was drawn based on infant birth weight and maternal age. Maternal age was divided into three sections; <30 years, between 30 to 34, and ≥ 35 years. World health classification was used to define the BMI of the patients.^{16, 17} For statistical analysis, SPSS software version 23.0 was used. Data was presented meanwhile comparison was drawn by using the Chi-square test. Multivariate regression models were used for measuring odd ratios for all possible risk factors while adjusted and unadjusted data. P-value was considered as significant if <0.05 .

Results:

In this study, we recruited 79052 cases of caesarian section delivering their first child while 402316 vaginal deliveries were also reported. We observed that women of the caesarian group were elder and delivered low birth weight babies when compared with the vaginal group. The

mean age of the control group was reported as 30.72 years while younger women with a mean age of 28.03 years delivered via the vagina. In the case of a group, the mean infant birth weight was reported as 3373 grams. Regarding the maternal weight caesarian group had more weight and had a high ratio of pre-eclampsia/eclampsia episodes than the control group. The mean body mass index of the case group was noted as 25.30kg while the case group reported a BMI of 23.97 with 3.1% cases of preeclampsia. We observed comparatively high odd ratios of the case group for all surgical complications. Within 42 days we observed 0.17% cases of bleeding, 0.22% organ damage, 0.22% of wound dehiscence, and 0.66% cases of infection were also reported.

Table 1: Characteristics of study participants

Variables	Vaginal deliveries N= 402316 (83.6%)	Caesarean deliveries N= 79052 (16.4%)	P-values
Maternal age (Years)			< 0.001
>35	29 131 (7.2%)	15644 (19.8%)	
<30	280242 (69.7%)	38964 (49.3%)	
30-35	92941 (23.1%)	24444 (30.9%)	
Mean age of the patient	28.03	30.72	
Pre-eclampsia/Eclampsia	12450 (3.1%)	8116 (10.3%)	< 0.001
Meanbirth weight (g)	3444	3373	< 0.001
Missing information about infant birth weight	513 (0.1%)	173 (0.2%)	
Deliveries during the study period	1.67	1.44	< 0.001
Emergency Section	-	21290 (26.9%)	N/A
Maternal BMI			
Missing	30199 (7.5%)	6715 (8.5%)	

underweight/normal weight	258191 (69.4%)	41603 (57.5%)	< 0.001
Pre-obesity	80432 (21.6%)	19363 (26.8%)	< 0.001
Obesity	33494 (9.0%)	11371 (15.7%)	< 0.001
Mean BMI in kg	23.97	25.30	< 0.001
Smoking during pregnancy	24230 (6.3%)	4707 (6.3%)	0.851
Missing	18322 (4.6%)	4240 (5.4%)	

Table 2: Multivariate and univariate analysis of primiparas

Complications	Total number		Adjusted Odd Ratio (CI 95%)		P-value	Unadjusted Odd Ratio (CI 95%)		p-value
	Vaginal group (Control)	caesarian group (Case)	Vaginal group (Control)	caesarian group (Case)		Vaginal Group (Control)	caesarian group (Case)	
All	73835 (18.4%)	17489 (22.1%)	1	1.44 (1.41–1.47)	<0.001	1	1.26 (1.24–1.29)	<0.001
Abdominal pain	72848 (18.1%)	16951 (21.4%)	1	1.41 (1.38–1.44)	<0.001	1	1.24 (1.21–1.26)	<0.001
Uterine rupture	75 (0%)	566 (0.70%)	1	55.10 (42.44–71.54)	<0.001	1	38.68 (30.40–49.22)	<0.001
Bowel obstruction	663 (0.2%)	436 (0.6%)	1	2.92 (2.55–3.34)	<0.001	1	3.36 (2.98–3.79)	<0.001

Incision hernia	1469 (0.4%)	727 (1.0%)	1	2.71 (2.46– 3.00)	<0.0 01	1	2.53 (2.32– 2.77)	<0.0 01
Placenta praevia	98 (0.02%)	1353 (0.28%)	1	67.72 (54.68– 83.89)	<0.0 01	1	68.15 (55.78– 83.28)	<0.0 01
Surgery for Bowel obstruction	292 (0.1%)	141 (0.2%)	1	2.12 (1.70– 2.65)	<0.0 01	1	2.46 (2.01– 3.01)	<0.0 01
Surgery for incision hernia	218 (0.1%)	183 (0.2%)	1	3.35 (2.68– 4.18)	<0.0 01	1	4.28 (3.52– 5.21)	<0.0 01

Table 3: Complications reported in Case and control group

Complications	Total N= 118057	Cases N (%)	Controls N (%)
Other	64 (0.05%)	63 (0.05%)	1 (0.00%)
Bleeding	213 (0.18%)	203 (0.17%)	10 (0.01%)
Bowel obstruction	109 (0.09%)	100 (0.08%)	9 (0.01%)
Infection	813 (0.69%)	785 (0.66%)	28 (0.02%)
Wound dehiscence	272 (0.23%)	259 (0.22%)	13 (0.01%)
Organ damage	257 (0.22%)	252 (0.21%)	5 (0%)

Discussion:

In our study, we found that the caesarian section is highly associated with a high risk of complications than the control group. We observed three times higher complications of bowel obstruction and hernia in the caesarian group and many patients needing surgery. However, obesity and smoking are the major risk factors for these complications. The emergency caesarian section also reported high complications of incision hernia when compared with the elective caesarian section. Caesarian section enhances the risk of complications related to bowel

obstruction, incision hernia, and abdominal pain so before selecting the delivery procedure these complications should take into consideration. The probability of incision hernia increased after abdominal surgery. Recent systematic reviews reported a 0.0–5.6% risk of incision hernia after caesarian section. Midline incisions are highly reported in developing countries¹¹ whereas developed countries used transverse incisions to avoid the incision hernia.¹⁸ In developed countries, the rate of incision hernia is only 0.16% and 0.5%.^{19, 20} Comparing the results, our results are somehow parallel to these studies, we reported a 1% rate of incision hernia. However, our study reported 0.6% cases of bowel obstruction after caesarian section which are comparatively high from the previous study of Andhoff et al.¹⁰ in which he only observed a 0.2% ratio. Our study reported a lower risk of complications due to the young population of the cohort. The study reported that young health patients had fewer chances of complications after the caesarian section.²¹ Some complications were under-reporting however even minor complications of the caesarian section should be addressed. Repeated caesarian sections also enhanced the risk of complications however, we only included patients having their first delivery. Recent studies show that smoking is one of the major risk factors which enhances the risk of complications after many surgical procedures.^{22, 23} Obesity is another major independent factor for complications all around the world.^{24, 25} In past studies observed damage to the bladder in 0.03–1% cases while they also observed ureters damage in 0.02–0.05% after the caesarian section.^{7, 26} In our study, we only reported 0.1% cases of bowel damage and 0.22% cases of organ damage. Regarding wound dehiscence very limited cases of 0.23% have been observed.

These results are similar to the previous study of Otkjaer et al.²⁶ reported 0.19–0.25% incidence. We reported 21.4% incidents of abdominal pain after caesarian in young participants. These results are much higher than the previous study of Liu et al.²⁷ reporting 7.8% cases of abdominal pain within 2 months. Very rare cases of placenta previa and uterine rupture were reported in this study and barely classified as surgical complications. Both of them are highly observed in vaginal deliveries and often required surgery. The risk of placenta previa and uterine rupture increased after two or more than three caesarian sections.^{28, 29} In the past large number of studies had been produced regarding long-term consequences of vaginal delivery including pelvic organ prolapse, fecal incontinence, and pain.³⁰⁻³² Our study is unique in the sense that we try to explore the surgical complications after the first caesarian section.

Conclusion:

Our study concluded that the trend of the caesarian section is steadily increasing in past few years. However, the caesarian section has more complications when compared with vaginal deliveries. Obesity and smoking are independent risk factors for caesarian complications. Caesarian complications may affect the lives of women in the future so there is a need to spread awareness about complications and reduced the risk of upcoming caesarian sections.

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Conflict of interest:

None

Permission:

It was taken from the ethical review committee of the institute

References:

1. Ye J, Betran AP, Guerrero Vela M, Souza JP, Zhang J. Searching for the optimal rate of medically necessary cesarean delivery. *Birth* 2014; 41(3): 237–44. doi: 10.1111/birt.12104
2. Betran AP, Torloni MR, Zhang JJ, Gulmezoglu AM, Section WHOWGoC. WHO Statement on Caesarean Section Rates. *BJOG: an international journal of obstetrics and gynaecology* 2016; 123(5): 667–70. doi: 10.1111/1471-0528.13526
3. Vogel JP, Betran AP, Vindevoghel N, et al. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. *Lancet Glob Health* 2015; 3(5): e260–70. doi: 10.1016/S2214-109X(15)70094-X
4. Lavender T, Hofmeyr GJ, Neilson JP, Kingdon C, Gyte GM. Caesarean section for non-medical reasons at term. *The Cochrane database of systematic reviews* 2012; (3): CD004660. doi: 10.1002/14651858.CD004660.pub3
5. Keag OE, Norman JE, Stock SJ. Long-term risks and benefits associated with cesarean delivery for mother, baby, and subsequent pregnancies: Systematic review and meta- analysis. *PLoS Med* 2018; 15(1): e1002494. doi: 10.1371/journal.pmed.1002494
6. Holm C, Langhoff-Roos J, Petersen KB, Norgaard A, Diness BR. Severe postpartum haemorrhage and mode of delivery: a retrospective cohort study. *BJOG: an international*

- journal of obstetrics and gynaecology 2012; 119(5): 596–604. doi: 10.1111/j.1471-0528.2011.03267.x
7. Oliphant SS, Bochenska K, Tolge ME, Catov JM, Zyczynski HM. Maternal lower urinary tract injury at the time of Cesarean delivery. *Int Urogynecol J* 2014; 25(12): 1709–14. doi: 10.1007/s00192-014-2446-2
8. Weibel S, Neubert K, Jelting Y, et al. Incidence and severity of chronic pain after caesarean section: A systematic review with meta-analysis. *Eur J Anaesthesiol* 2016; 33(11): 853–65. doi: 10.1097/EJA.0000000000000535
9. Yimer H, Woldie H. Incidence and Associated Factors of Chronic Pain after Caesarean Section: A Systematic Review. *J Obstet Gynaecol Can* 2019; 41(6): 840–54. doi: 10.1016/j.jogc.2018.04.006
10. Andolf E, Thorsell M, Kallen K. Cesarean delivery and risk for postoperative adhesions and intestinal obstruction: a nested case-control study of the Swedish Medical Birth Registry. *American journal of obstetrics and gynecology* 2010; 203(4): 406 e1–6. doi: 10.1016/j.ajog.2010.07.013
11. Paulsen CB, Zetner D, Rosenberg J. Incisional hernia after cesarean section: A systematic review. *Eur J Obstet Gynecol Reprod Biol* 2020; 244: 128–33. doi: 10.1016/j.ejogrb.2019.11.010
12. Al-Zirqi I, Stray-Pedersen B, Forsen L, Daltveit AK, Vangen S. Uterine rupture: trends over 40 years. *BJOG: an international journal of obstetrics and gynaecology* 2016; 123(5): 780–7.
13. Fitzpatrick KE, Kurinczuk JJ, Bhattacharya S, Quigley MA. Planned mode of delivery after previous cesarean section and short-term maternal and perinatal outcomes: A population-based record linkage cohort study in Scotland. *PLoS Med* 2019; 16(9): e1002913. doi: 10.1371/journal.pmed.1002913
14. Socialstyrelsen. Hälsodataregister. Patientregistret. 2021.
15. Ludvigsson JF, Andersson E, Ekbom A, et al. External review and validation of the Swedish national inpatient register. *BMC public health* 2011; 11: 450. doi: 10.1186/1471-2458-11-450
16. WHO. Body mass index- BMI. 2020. <https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi> (accessed October 13 2020)
17. Larsson C, Djuvfelt E, Lindam A, Tunón K, Nordin P. Surgical complications after cesarean

- section: A population-based cohort study. PLoS One. 2021 Oct 5; 16(10):e0258222. doi: 10.1371/journal.pone.0258222.
18. Mathai M, Hofmeyr GJ, Mathai NE. Abdominal surgical incisions for caesarean section. The Cochrane database of systematic reviews 2013; (5): CD004453. doi: 10.1002/14651858.CD004453.
 19. Aabakke AJ, Krebs L, Ladelund S, Secher NJ. Incidence of incisional hernia after cesarean delivery: a register-based cohort study. PLoS One 2014; 9(9): e108829. doi: 10.1371/journal.pone.0108829
 20. Shand AW, Chen JS, Schnitzler M, Roberts CL. Incisional hernia repair after caesarean section: a population-based study. Aust N Z J Obstet Gynaecol 2015; 55(2): 170–5. doi: 10.1111/ajo.12270
 21. Visser A, Geboers B, Gouma DJ, Goslings JC, Ubbink DT. Predictors of surgical complications: A systematic review. Surgery 2015; 158(1): 58–65. doi: 10.1016/j.surg.2015.01.012
 22. Gronkjaer M, Eliassen M, Skov-Ettrup LS, et al. Preoperative smoking status and postoperative complications: a systematic review and meta-analysis. Ann Surg 2014; 259(1): 52–71. doi: 10.1097/SLA.0b013e3182911913
 23. Sorensen LT. Wound healing and infection in surgery. The clinical impact of smoking and smoking cessation: a systematic review and meta-analysis. Arch Surg 2012; 147(4): 373–83. doi: 10.1001/archsurg.2012.5
 24. Collaboration NCDRF. Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. Lancet 2016; 387(10026): 1377–96. doi: 10.1016/S0140-6736(16)30054-X
 25. Chamberlain C, O'Mara-Eves A, Porter J, et al. Psychosocial interventions for supporting women to stop smoking in pregnancy. The Cochrane database of systematic reviews 2017; 2: CD001055. doi: 10.1002/14651858.CD001055.pub5 [PMC free article]
 26. Otkjaer AM, Jorgensen HL, Clausen TD, Krebs L. Maternal short-term complications after planned cesarean delivery without medical indication: A registry-based study. Acta obstetricia et gynecologica Scandinavica 2019; 98(7): 905–12. doi: 10.1111/aogs.13549 Liu TT, Raju A, Boesel T, Cyna AM, Tan SG. Chronic pain after caesarean delivery: an Australian cohort. Anaesth Intensive Care 2013; 41(4): 496–500. doi:

10.1177/0310057X1304100410

27. Tanos V, Toney ZA. Uterine scar rupture—Prediction, prevention, diagnosis, and management. *Best Pract Res Clin Obstet Gynaecol* 2019; 59: 115–31. doi: 10.1016/j.bpobgyn.2019.01.009
28. Fogelberg M, Baranov A, Herbst A, Vikhareva O. Underreporting of complete uterine rupture and uterine dehiscence in women with previous cesarean section. *J Matern Fetal Neonatal Med* 2017; 30(17): 2058–61. doi: 10.1080/14767058.2016.1236249
29. Foldspang A, Hvidman L, Mommsen S, Nielsen JB. Risk of postpartum urinary incontinence associated with pregnancy and mode of delivery. *Acta obstetricia et gynecologica Scandinavica* 2004; 83(10): 923–7. doi: 10.1111/j.0001-6349.2004.00353.x
30. Larsson C, Hedberg CL, Lundgren E, Soderstrom L, TunOn K, Nordin P. Anal incontinence after cesarean and vaginal delivery in Sweden: a national population-based study. *Lancet* 2019; 393(10177): 1233–9. doi: 10.1016/S0140-6736(18)32002-6
31. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S, Norwegian ES. Urinary incontinence after vaginal delivery or cesarean section. *N Engl J Med* 2003; 348(10): 900–7. doi: 10.1056/NEJMoa021788
32. Evans E, Falivene C, Briffa K, Thompson J, Henry A. What is the total impact of an obstetric anal sphincter injury? An Australian retrospective study. *Int Urogynecol J* 2020; 31(3): 557–66. doi: 10.1007/s00192-019-04108-3