



Re-laparotomy following caesarean section in Italy

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ItOSS Near-Miss prospective population-based case-control study

- **Study Period:** 1 March 2024 – 31 March 2026
- **Case definition:** any woman who underwent re-laparotomy within 42 days of a cesarean section



Incidence of re-laparotomy

0.28% 95CI%(0.25-0.30)

1 in 363 caesarean section

0.35% 95CI% (0.31-0.39)

0.24% 95CI% (0.19-0.29)

0.22% 95CI% (0.19-0.25)



- **Control definition:** any woman who underwent caesarean section without requiring re-laparotomy within 42 days, enrolled from all participating units during the same study period

Complete record forms analysed:

- **cases** n=554
- **controls** n=1220





Characteristics of cases and controls undergoing caesarean section

	Cases (n=554)	Controls (n=1220)	
Variable	N. (%)	N. (%)	<i>crudeOR</i> (95%CI)
Age, years; mean (SD)	35.0 (6.0)	34.4 (5.6)	
Age ≥40	127 (22.9)	203 (16.6)	1.49 (1.16-1.91)
Born outside Italy	159 (28.7)	268 (22.0)	1.43 (1.13-1.79)
Education, years			
high(>8)	364 (65.7)	834 (68.4)	Reference
low (≤8)	110 (19.9)	218 (17.9)	1.16 (0.89-1.50)
unkown	78 (14.1)	165 (13.7)	1.08 (0.81-1.46)
BMI, kg/m²; mean (SD)	24.9 (5.4)	25.0 (5.1)	
BMI≥30 kg/m²	81 (14.6)	166 (13.6)	1.08 (0.81-1.45)
Previous uterine surgery	108 (19.5)	186 (15.2)	1.32 (1.01-1.71)
Previous CS	221 (39.9)	472 (38.7)	1.05 (0.86-1.29)
1	137 (24.7)	370 (30.3)	0.83 (0.66-1.05)
2	61 (11.0)	90 (7.4)	1.52 (1.07-2.16)
≥3	23 (4.2)	12 (1.0)	4.30 (2.11-8.74)

Abbreviation: OR, odds ratio; CI, confidence intervals; SD, Standard Deviation; BMI, Body Mass Index; CS, caesarean section





Characteristics of cases and controls undergoing caesarean section

	Cases (n=554)	Controls (n=1220)	
Variable	N. (%)	N. (%)	<i>crudeOR</i> (95%CI)
Multiple pregnancy	47 (8.5)	57 (4.7)	1.89 (1.27-2.82)
Pregnancy obtained through ART	99 (17.9)	113 (9.3)	2.14 (1.60-2.86)
Complications during pregnancy	293 (52.9)	490 (40.2)	1.68 (1.37-2.06)
gestational diabetes	86 (15.5)	175 (14.3)	1.10 (0.83-1.45)
gestational hypertension	25 (4.5)	47 (3.9)	1.18 (0.72-1.94)
pre-eclampsia	42 (7.6)	36 (3.0)	2.70 (1.71-4.27)
placenta praevia	28 (5.1)	20 (1.6)	3.20 (1.79-5.73)
fetal growth restriction	39 (7.0)	70(5.7)	1.25 (0.83-1.87)
pPROM/PROM	28 (5.1)	50 (4.1)	1.25 (0.78-2.00)
fibroids in pregnancy	11 (2.0)	10 (0.8)	2.43 (1.03-5.76)
Anticoagulant/antiplatelet drug use in pregnancy	103 (18.6)	155 (12.7)	1.56 (1.19-2.05)

Abbreviation: OR, odds ratio; CI, confidence intervals; SD, Standard Deviation; ART, Assisted Reproductive Technology; preterm premature rupture of membranes; pPROM/PROM, preterm/premature rupture of membranes; PROM, premature rupture of membranes





Caesarean section characteristics

	Cases (n=554)	Controls (n=1220)	
Variable	N. (%)	N. (%)	crudeOR (95%CI)
Labour before CS	202 (36.5)	362 (29.7)	1.36 (1.10-1.69)
Indications			
maternal	446 (80.5)	1003 (82.2)	Reference
fetal	106 (19.1)	208 (17.1)	1.15 (0.88-1.49)
not documented	2 (0.4)	9 (0.7)	0.50 (0.11-2.32)
CS			
elective	282 (50.9)	615 (50.4)	Reference
urgent/emergency	272 (49.1)	605 (49.6)	0.98 (0.80-1.20)
General anaesthesia during CS	63 (11.4)	37 (3.0)	4.14 (2.72-6.30)
Conditions identified at CS	242 (43.7)	87 (7.1)	10.2 (7.74-13.4)
adhesions	99 (17.9)	20 (1.6)	13.1 (8.02-21.5)
uterine atony	57 (10.3)	17 (1.4)	8.15 (4.69-14.2)
placenta praevia major	24 (4.3)	5 (0.4)	11.0 (4.19-29.1)
placental abruption	20 (3.6)	10 (0.8)	4.55 (2.11-9.78)
PAS	16 (2.9)	1 (0.1)	36.4 (4.81-275.0)
PPH≥1000ml	145 (26.2)	19 (1.6)	22.4 (13.7-36.6)
mean (SD)	2143.7 (1178.5)	1394.7 (356.6)	
median (IQR [range])	1961 (1200-2600 [1000-8000])	1300 (1100-1500 [1000-2000])	

Abbreviation: OR, odds ratio; CI, confidence intervals; CS, caesarean section; SD, Standard Deviation; IQR, Interquartile Range





Association between maternal, CS characteristics and re-laparotomy: multivariable logistic regression model

Variable	<i>adj</i> Odds Ratio (95%CI)
Previous CS ≥ 3	2.56 (1.03-6.33)
Multiple pregnancy	1.77 (1.09-2.86)
Pregnancy obtained through ART	1.64 (1.15-2.35)
● Pre-eclampsia	2.46 (1.44-4.21)
Labour before CS	1.64 (1.27-2.11)
● General anaesthesia during CS	1.98 (1.17-3.34)
<i>Conditions identified at CS</i>	
adhesions	15.6 (9.25-26.2)
uterine atony	2.63 (1.29-5.34)
placenta praevia major	3.70 (1.09-12.6)
PAS	28.7 (3.49-236.8)
● PPH $\geq 1000\text{ml}$	14.4 (8.56-24.2)

OR adjusted for all items in table

Abbreviation: OR, odds ratio; CI, confidence intervals; SD, Standard Deviation; CS, caesarean section; PAS, placenta accreta spectrum





Re-laparotomy - characteristics



Timing of re-laparotomy following CS

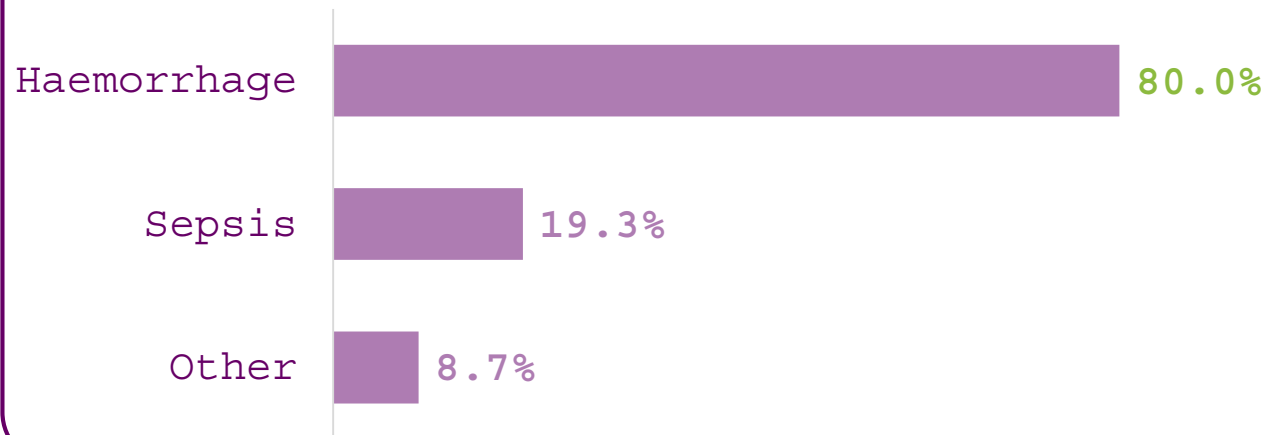
median (IQR [range]): **1 (0-7 [0-37])** days

<24 h	233 (42.1%)
1 to 7 days	184 (33.2%)
8–28 days	131 (23.6%)
≥29 days	6 (1.1%)



Setting: **95.1%** same-facility as CS

Main indications for re-laparotomy





Re-laparotomy - management

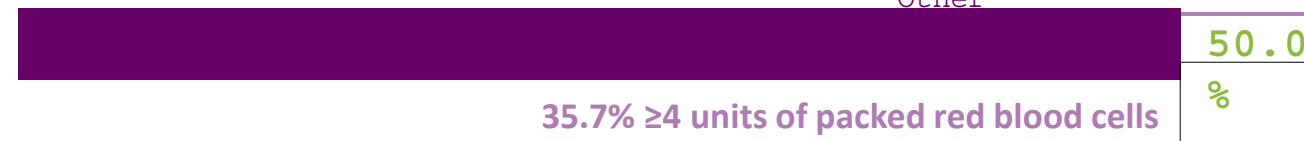


Antibiotics commenced before re-laparotomy 35.2%

Involvement of additional specialists 32.5%

	N
Infectious disease specialist	77
General surgeon	61
Interventional radiologist	20
Urologist	18
Microbiologist	15
Anaesthetist and Intensivist	17
Haematologist	14
Other	11

Blood transfusions





Maternal outcomes

	Cases (n=554)	Controls (n=1220)
Variable	N. (%)	N. (%)
Additional re-laparotomy	20 (3.6%)	-
Hysterectomy	115 (20.8%)	-
ICU admission	188 (33.9%)	8 (0.7%)
Severe maternal morbidity	41 (7.4%)	7 (0.6%)
Severe sepsis	14	2
DIC	12	-
Mechanical ventilation	9	-
Renal failure	9	-
Thromboembolic event	6	-
Respiratory distress syndrome	5	-
Pulmonary oedema	4	-
Cardiac arrest	2	-
Other	4	5
Maternal death	2	0





Neonatal outcomes

	Cases (n=554)	Controls (n=1220)
Variable	N. (%)	N. (%)
Gestational age at CS <37	130 (23.5)	174 (14.3)
32-36	102 (18.4)	143 (11.7)
28-31	21 (3.8)	23 (1.9)
<28	7 (1.3)	8 (0.7)

	Cases (n=602)	Controls (n=1279)
	N. (%)	N. (%)
Apgar<7	26 (4.3%)	18 (1.4%)
Stillborn	6	4
NICU admission	116 (19.3%)	124 (9.7%)
Neonatal morbidity	51 (8.5%)	59 (4.6%)
respiratory distress syndrome	26	23
Neonatal death	5	2





Conclusion

- Re-laparotomy is a recognised surgical complication that cannot be entirely prevented. The focus should be on addressing its underlying cause, rather than using its rates as a performance metric for maternity units.
- In Italy • **1 in 363** women undergoing caesarean section will return to the operating room for re-laparotomy, with haemorrhage as the main indication

UK¹: **1 in 1,282** CS • meta-analysis (Shan et al.)²: **1 in 588** CS • meta-analysis (Iskander et al.)³: **1 in 250** CS
- Independent risk factor identified in our study are consistent with previous evidence, particularly pre-eclampsia, multiple pregnancy, ART, general anaesthesia during CS and PPH ¹⁻⁴
- Our study identified additional factors associated with an increased risk of re-laparotomy, including ≥3 previous CS, adhesions, uterine atony, placenta praevia major and PAS
- Re-laparotomy following CS is a multifactorial complication. Early identification of women at increased risk may allow closer postoperative surveillance, earlier recognition of complications, and timely escalation of care

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