


Original Research

Analysis of Factors Influencing Neonatal Outcomes in Emergency Cesarean Section: A Retrospective Study

Qiaona Dai^{1,†}, Sangsang Qi^{1,†}, Aner Chen¹, Xianhu Fu^{1,*}

¹Department of Obstetrics and Gynecology, Women and Children's Hospital of Ningbo University, 315012 Ningbo, Zhejiang, China

*Correspondence: fuxianhu2005@sina.com (Xianhu Fu)

†These authors contributed equally.

Academic Editor: Michael H. Dahan

Submitted: 6 March 2026 Revised: 27 May 2026 Accepted: 9 June 2026 Published: 7 July 2026

Abstract

Background: Emergency cesarean section is a critical intervention for maternal and fetal rescue, yet neonatal outcomes remain variable and are influenced by multiple perioperative factors. To identify and analyze factors influencing neonatal outcomes following emergency cesarean section. **Methods:** A retrospective analysis was conducted on 216 cases of emergency cesarean section performed at the Women and Children's Hospital of Ningbo University from January 2016 to December 2019. Data management and statistical analyses were performed using SPSS version 20.0. Variables reaching statistical significance in the univariate analysis were subsequently assessed using a multivariate logistic regression model. A $p < 0.05$ was considered statistically significant. **Results:** Of the 216 cases, 80 (37.03%) neonates had low Apgar scores. When emergency cesarean section was initiated from the outpatient setting, the incidence of low Apgar scores (54.43%, 43/79) was significantly higher than when it was initiated from the inpatient setting (27.01%, 37/137; $p < 0.001$). Univariate analysis identified the following risk factors for low Apgar scores: gestational age, hypertensive disorders of pregnancy, dexamethasone use, anesthesia method, birth weight, occurrence of risk factors of maternal or fetal to decision operation interval (ORDOI), occurrence of risk factors of maternal or fetal to delivery interval (ORDI), and surgical indications (all $p < 0.05$). Maternal age, gestational diabetes mellitus, decision-to-delivery interval (DDI), and histological chorioamnionitis were not associated with low Apgar scores ($p > 0.05$). Multivariate logistic regression analyses identified the following independent risk factors for low Apgar score: general anesthesia (odds ratio [OR] = 6.930, 95% confidence interval [CI]: 2.446–19.637), placental abruption with fetal distress (OR = 5.732, 95% CI: 1.893–17.354), umbilical cord prolapse with fetal distress (OR = 17.531, 95% CI: 3.091–99.429), severe maternal complications in obstetrics with fetal distress (OR = 14.615, 95% CI: 2.036–101.888), and ORDI. Using ORDI (0–60 min) as the reference, the OR values for ORDI (61–120 min), (121–180 min), and (>180 min) were (OR = 4.399, 95% CI: 1.555–12.444), (OR = 8.748, 95% CI: 2.515–30.433), and (OR = 6.899, 95% CI: 1.816–26.215), respectively. Gestational age was identified as an independent protective factor against low Apgar score (OR = 0.827, 95% CI: 0.723–0.946). **Conclusions:** Timely identification of maternal and fetal risk factors and reduction of the ORDI are key strategies for improving neonatal outcomes in the emergency cesarean section.

Keywords: emergency cesarean section; Apgar score; decision-to-delivery interval

1. Introduction

Emergency cesarean section is an urgent rescue surgery performed to save the lives of both mother and child. The timeliness of this rescue is closely related to the prognosis of both [1]. Currently, there is no consensus on the decision to delivery interval (DDI) for emergency cesarean sections, with some authors suggesting it should be less than 30 minutes [2,3]. In emergencies such as amniotic fluid embolism, umbilical cord prolapse, and uterine rupture, shorter DDI should in theory be associated with better outcomes. However, research to date has yielded mixed results regarding the impact of DDI on neonatal outcomes [4,5,6,7]. Recent studies have suggested that neonatal outcomes are associated with anesthesia methods, surgical indications, and the severity of the condition [7,8].

This study retrospectively analyzed cases of emergency cesarean section performed at Women and Children's Hospital of Ningbo University with the aim of identifying factors that affect neonatal outcomes.

2. Materials and Methods

2.1 Data Source

The study cohort was 216 pregnant women who underwent emergency cesarean section at Ningbo University's Women and Children's Hospital from January 2016 to December 2019.

2.2 Methods

Procedure: Upon an emergency in the ward, emergency room, or delivery room, the doctor activated the obstetric emergency group by contacting obstetric nurses, anesthesia medical personnel, such as a new pediatrician in rescue. When the emergency cesarean section was initiated in the delivery room, the pregnant woman was immediately transferred to the operating suite within the delivery room. When the emergency cesarean section was started in the emergency department or ward, the doctors and nurses quickly transferred the pregnant woman to the



operating room, where she was attended to by other medical staff. The pregnant woman was transferred to the operating table, and the medical staff performed their respective duties. Disinfectant was sprayed onto the surgical site, and urine catheterization was carried out. The surgeon quickly applied surgical disinfectant and wore surgical clothes, double-layer gloves, and towels. The anesthesiologist prepared the patient for anesthesia, and the completion of anesthesia was announced by the anesthesiologist. The operation physician then immediately began the surgery. The fetus was delivered after the umbilical cord was severed and was promptly transferred to the neonatal rescue team.

Anesthesia method: Pregnant women who had received analgesia during labor were evaluated for the effectiveness of anesthesia upon entering the operating room. Those with poor anesthesia effectiveness received supplemental general anesthesia. For the remaining pregnant women, spinal-epidural anesthesia or general anesthesia was administered based on their specific condition [9].

2.3 Study Parameters

A retrospective analysis was conducted on the following parameters of these pregnant women: age, gestational age, use of dexamethasone, diabetes mellitus, hypertensive disorders of pregnancy, anesthesia method, indications for cesarean section, occurrence of risk factors of maternal or fetal to delivery interval (ORDI), DDI, occurrence of risk factors of maternal or fetal to decision operation interval (ORDOI), newborn birth weight, chorioamnionitis, and low Apgar score. Low Apgar score was defined according to the criteria of a score ≤ 7 at 1 minute, or ≤ 7 at 5 minutes [10]. Indications for cesarean section included fetal distress (abnormal NST or Category III fetal heart rate monitoring during labor), placental abruption, placental abruption with fetal distress, umbilical cord prolapse, umbilical cord prolapse with fetal distress, other obstetric emergencies (including placenta previa with major hemorrhage, impending uterine rupture, uterine rupture, amniotic fluid embolism, eclampsia, etc.), and other obstetric emergencies with fetal distress [9,10,11].

2.4 Statistical Analysis

SPSS 20.0 software (Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA)) was used for data sorting, screening, and statistical analysis. Measurement data were recorded in the form, and counting data were recorded in N (%) form. The independent sample *t*-test was used to compare measurement indexes between groups, and the Chi-square test to compare counting indexes between groups. Variables showing statistical significance in univariate analysis were further evaluated using multivariate logistic regression analysis. $p < 0.05$ was considered to indicate statistical significance. Prior to multivariate lo-

gistic regression analysis, multicollinearity among candidate variables was assessed using variance inflation factors (VIFs). Because gestational age and birth weight were highly correlated, only gestational age was retained in the final multivariate model based on clinical relevance and lower collinearity.

3. Results

3.1 General Characteristics

A total of 216 cases of emergency cesarean section were included in this study, of which 80 (37.03%) had low Apgar scores (Table 1). A low Apgar score was found in 54.43% (43/79) of cases when the emergency cesarean section was initiated in the outpatient department, and in 27.01% (37/137) of cases when it was initiated in the inpatient department. This difference was statistically significant ($p < 0.001$).

3.2 Univariate Analysis

Univariate analysis identified the following risk factors associated with low Apgar scores: gestational age, hypertensive disorders of pregnancy, use of dexamethasone, anesthesia method, newborn birth weight, occurrence of risk factors of maternal or fetal to decision operation interval (ORDOI), ORDI, and indications for surgery (all $p < 0.05$). However, maternal age, gestational diabetes mellitus, DDI, and histological chorioamnionitis were not associated with low Apgar scores ($p > 0.05$) (Table 2).

3.3 Multivariate Logistic Regression

Multivariate regression analysis revealed the anesthesia method was an independent risk factor for low Apgar score (OR = 6.930, 95% CI: 2.446–19.637), with an almost 7-fold higher risk compared to the epidural anesthesia group. Using fetal distress as the reference group, the risk of low Apgar score was higher in the placental abruption with fetal distress group (OR = 5.732, 95% CI: 1.893–17.354), the umbilical cord prolapse with fetal distress group (OR = 17.531, 95% CI: 3.091–99.429), and the severe obstetric complications with fetal distress group (OR = 14.615, 95% CI: 2.036–101.888). Because ORDI represents the overall interval from the occurrence of maternal or fetal risk factors to delivery and includes both ORDOI and DDI, only ORDI was entered into the final multivariate model to avoid overlap and collinearity among time-related variables. Using ORDI (0–60 min) as the reference group, the risk of low Apgar score was higher in the ORDI (61–120 min) group (OR = 4.399, 95% CI: 1.555–12.444), ORDI (121–180 min) group (OR = 8.748, 95% CI: 2.515–30.433), and ORDI (>180 min) group (OR = 6.899, 95% CI: 1.816–26.215). Gestational age was an independent protective factor for low Apgar score (OR = 0.827, 95% CI: 0.723–0.946). Longer gestational age was associated with a decreased risk of low Apgar score (Table 3). The multivariate logistic regression model demonstrated good predictive

Table 1. Incidence of low Apgar score according to the site of initiation of emergency cesarean section.

Location	Normal	low Apgar score	χ^2	<i>p</i>
Outpatient department	36 (45.57)	43 (54.43)	16.159	<0.001
Inpatient department	100 (72.99)	37 (27.01)		

Table 2. Univariate analysis of risk factors for low Apgar score.

Factor	Normal group	Low Apgar score	<i>t</i> / χ^2	<i>p</i>
Maternal age (years)	29.12 ± 5.00	30.48 ± 5.87	-1.805	0.072
Gestational age (weeks)	36.85 ± 3.30	34.74 ± 4.06	3.942	<0.001
Newborn birth weight (g)	2799.30 ± 726.24	2316.2 ± 848.50	4.257	<0.001
Use of dexamethasone			14.689	0.002
Full-term use	12 (57.14)	9 (42.86)		
Partial use	9 (56.25)	7 (43.75)		
No use	14 (37.84)	23 (62.16)		
No need to use	101 (71.13)	41 (28.87)		
Gestational diabetes mellitus			0.094	0.760
No	117 (62.57)	70 (37.43)		
Yes	19 (65.52)	10 (34.48)		
Hypertensive disorders of pregnancy			7.393	0.007
No	130 (65.66)	68 (34.34)		
Yes	6 (33.33)	12 (66.67)		
Anesthesia method			14.068	<0.001
Epidural anesthesia	42 (85.71)	7 (14.29)		
General anesthesia	94 (56.29)	73 (43.71)		
Indications for cesarean section			49.148	<0.001
Fetal distress	48 (73.85)	17 (26.15)		
Placental abruption	45 (73.77)	16 (26.23)		
Placental abruption with fetal distress	11 (28.95)	27 (71.05)		
Umbilical cord prolapse	15 (100)	0 (0)		
Umbilical cord prolapse with fetal distress	3 (30)	7 (70)		
Severe obstetric complications	12 (75)	4 (25)		
Severe obstetric complications with fetal distress	2 (18.18)	9 (81.82)		
ORDOI (min)			15.622	0.001
0–30	71 (76.34)	22 (23.66)		
31–60	27 (60)	18 (40)		
61–120	25 (54.35)	21 (45.65)		
>120	13 (40.63)	19 (59.38)		
DDI (min)			0.766	0.682
0–15	66 (64.08)	37 (35.92)		
16–30	46 (64.79)	25 (35.21)		
>30	24 (57.14)	18 (42.86)		
ORDI (min)			16.814	0.001
0–60	75 (77.32)	22 (22.68)		
61–120	30 (56.6)	23 (43.4)		
121–180	17 (48.57)	18 (51.43)		
>180	14 (45.16)	17 (54.84)		
Histological chorioamnionitis			0.095	0.758
No	126 (62.69)	75 (37.31)		
Yes	10 (66.67)	5 (33.33)		

ORDOI, occurrence of risk factors of maternal or fetal to decision operation interval; DDI, decision-to-delivery interval; ORDI, occurrence of risk factors of maternal or fetal to delivery interval.

Table 3. Multivariate logistic regression analysis of low Apgar score.

Intercept and variable	B	S.E.	Wald	<i>p</i>	OR	95% CI
Gestational age	-0.190	0.069	7.663	0.006	0.827	0.723–0.946
General anesthesia	1.936	0.531	13.272	<0.001	6.930	2.446–19.637
Indications for cesarean section			36.526	<0.001		
Placental abruption	-1.609	0.575	7.821	0.005	0.200	0.065–0.618
Placental abruption with fetal distress	1.746	0.565	9.545	0.002	5.732	1.893–17.354
Umbilical cord prolapse	-19.763	9659.744	<0.001	0.998	<0.001	<0.001
Umbilical cord prolapse with fetal distress	2.864	0.885	10.462	0.001	17.531	3.091–99.429
Severe obstetric complications	-1.047	0.851	1.513	0.219	0.351	0.066–1.861
Severe obstetric complications with fetal distress	2.682	1.006	7.114	0.008	14.615	2.036–101.888
ORDI (min)			13.908	0.003		
61–120	1.481	0.531	7.798	0.005	4.399	1.555–12.444
121–180	2.169	0.636	11.627	0.001	8.748	2.515–30.433
>180	1.931	0.681	8.042	0.005	6.899	1.816–26.215
constant	1.738	2.870	0.366	0.545	5.683	

Abbreviations: OR, odds ratio; CI, confidence interval; ORDI, occurrence of risk factors of maternal or fetal to delivery interval.

performance, with an Area Under the Curve (AUC) of 0.885 (Fig. 1).

4. Discussion

DDI was not an independent risk factor for low Apgar score in this study. There is currently some controversy regarding whether the length of DDI affects neonatal outcome [4]. Our study found that gestational age, general anesthesia, ORDI, placental abruption with fetal distress, umbilical cord prolapse with fetal distress, and other severe obstetric complications with fetal distress were independent risk factors for low Apgar scores. These factors are not directly related to DDI. ORDI was found to be an independent risk factor affecting neonatal outcomes. ORDI is the sum of the times for the ORDOI and DDI. Although birth weight was significant in the univariate analysis, it was not included in the final multivariate model because of its strong correlation with gestational age. Gestational age was retained as it is a more clinically fundamental indicator reflecting fetal maturity. Shortening the ORDI time requires early identification and timely management of obstetric risk factors by pregnant women and healthcare providers. Although DDI was not directly related to neonatal outcomes in the present study, it could affect ORDI, thereby indirectly affecting neonatal outcomes [5,6]. In addition, maternal metabolic conditions such as gestational diabetes mellitus may also contribute to adverse perinatal outcomes in emergency cesarean deliveries [12].

Obstetric emergencies with fetal distress were found to be independent risk factors for low Apgar scores. The cases included in this study were all pregnant women requiring emergency cesarean section, equivalent to the Class I patients in emergency cesarean sections abroad [13]. The indications for surgery included fetal distress, placental abruption, placental abruption with fetal distress, umbili-

cal cord prolapse, umbilical cord prolapse with fetal distress, other severe obstetric complications (including placenta previa with massive hemorrhage, impending uterine rupture, uterine rupture, amniotic fluid embolism, eclampsia, etc.), and other severe obstetric complications with fetal distress. To study the impact of different surgical indications on neonatal outcomes, we used fetal distress as the control group. Compared to the control group, we found that isolated placental abruption, umbilical cord prolapse, and other severe obstetric complications did not increase the rate of neonatal asphyxia. However, the rate of neonatal asphyxia was significantly higher if these conditions were present in combination with fetal distress. Therefore, in pregnant women with complications, fetal heart monitoring should be performed to determine whether to initiate DDI.

Our study found that general anesthesia was an independent risk factor for low Apgar scores. Compared to spinal anesthesia, general anesthesia was more likely to result in low Apgar scores in newborns (OR = 6.930, 95% CI: 2.446–19.637). These findings are consistent with those of Bidon et al. [14,15] and Beckmann et al. [15,16]. Bidon C et al. [16] conducted a study on 194 cases of emergency cesarean sections, including 127 cases with spinal anesthesia and 67 cases with general anesthesia. They concluded that general anesthesia was an independent risk factor for low Apgar scores at 5 minutes in newborns [16,17,18,19]. Beckmann et al. [15] conducted a retrospective study on 533 cases of emergency cesarean sections performed due to fetal distress, including 81 cases with general anesthesia and 452 cases with spinal anesthesia. The DDI during general anesthesia was 8 minutes less than during spinal anesthesia (24.7 vs. 32.6 min; $p < 0.001$). Newborns with Apgar scores of <7 at 5 minutes were more common in mothers who received general anesthesia than in those who received spinal anesthesia (aOR: 6.89; 95% CI: 1.79–26.55; p

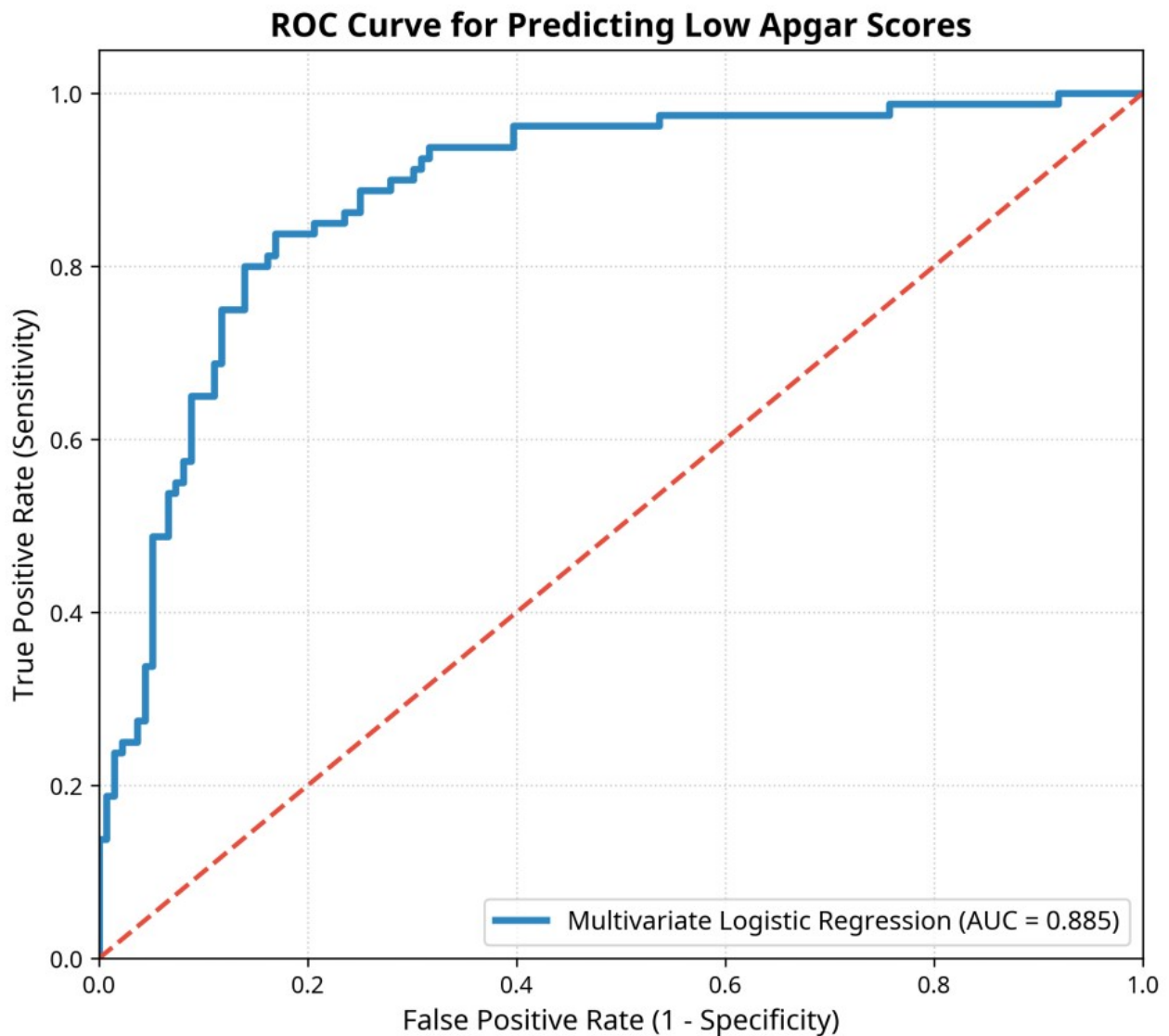


Fig. 1. ROC curve of the multivariate logistic regression model for predicting low Apgar score. The blue line represents the performance of the model, with an Area Under the Curve (AUC) of 0.885. The red dashed line represents the reference line (AUC = 0.5).

= 0.005). Moreover, they were more likely to be transferred to the NICU (aOR: 2.24; 95% CI: 1.16–4.31; $p = 0.016$).

Limitations

A limitation of this study was that the umbilical cord blood pH values were not measured in all newborns. The outcome of newborns was assessed solely by Apgar score, which may have introduced some subjectivity [20,21,22,23].

The retrospective nature of this study may have introduced inherent selection bias. The data was collected from January 2016 to December 2019. Given the long study period, the impact of data timeliness is relevant. Clinical practice, including obstetric guidelines, anesthesia techniques, and neonatal resuscitation protocols, may have changed since the study period, and hence our results may not fully reflect the latest progress in emergency ob-

stetric care. However, the core factors identified in this study—such as the impact of general anesthesia and the key role of ORDI—remain fundamental principles in obstetric management. Future prospective studies that include more up-to-date data are needed to validate these findings within the context of current clinical standards. In addition, ORDI was analyzed as a categorical variable rather than a continuous variable in this study. The non-monotonic trend in OR values across ORDI categories may reflect residual confounding and the relatively limited sample size within subgroups. Future studies with larger sample sizes should consider modeling ORDI as a continuous variable using approaches such as restricted cubic splines.

In summary, the active identification of maternal and fetal risk factors and the shortening of ORDI could improve the outcome of newborns.

5. Conclusions

This retrospective study identified several key factors that influence the prognosis of newborns in emergency cesarean section surgeries. Independent risk factors for low Apgar scores included general anesthesia, specific surgical indications (particularly placental separation, umbilical cord prolapse, and severe obstetric complications combined with fetal distress), and the occurrence of risk factors of maternal or fetal to delivery interval (ORDI). Importantly, the decision-to-delivery interval (DDI) showed no direct correlation with neonatal asphyxia in this cohort, but it is an important component of the overall ORDI. Therefore, in order to optimize the prognosis of newborns, clinicians in the obstetric field should focus on early identification of maternal and fetal risk signals and work to strategically shorten the ORDI. Moreover, the choice of anesthesia should be more carefully weighed, as general anesthesia significantly increases the risk of low Apgar scores compared to spinal-epidural anesthesia. These results highlight the importance of multidisciplinary coordination and rapid response plans in emergency obstetric work, thereby reducing the occurrence of adverse neonatal events and ensuring the safety of both mothers and infants.

Availability of Data and Materials

Deidentified datasets produced in this investigation are accessible contingent upon formal request to the corresponding author, subject to ethical approvals.

Author Contributions

QD, and XF designed the research study. QD and SQ performed the research. XF and AC analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

All research procedures conformed to the Helsinki Declaration (2013 revision). Institutional approval was granted by the Ethics Committee of Ningbo University's Women and Children's Hospital. The ethics approval number for this study is 2023KYSL-095. Due to the retrospective nature of the study and the use of de-identified data, the requirement for informed consent was waived by the Ethics Committee.

Acknowledgment

We would like to express our gratitude to all those who helped us during the writing of this manuscript.

Funding

This study was supported by Ningbo Key Medical Discipline (No. 2022-B16), Zhejiang Health Science and

Technology Program (2022KY1155) and Ningbo key research and development program (2023Z183) and Zhejiang TCM Science and Technology Project (No.: 2024ZL955).

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Darnal N, Dangal G. Maternal and Fetal Outcome in Emergency versus Elective Caesarean Section. *Journal of Nepal Health Research Council*. 2020; 18: 186–189. <https://doi.org/10.33314/jnhrc.v18i2.2093>
- [2] MacKenzie IZ, Cooke I. What is a reasonable time from decision-to-delivery by caesarean section? Evidence from 415 deliveries. *BJOG : an International Journal of Obstetrics and Gynaecology*. 2002; 109: 498–504. <https://doi.org/10.1111/j.1471-0528.2002.01323.x>
- [3] Stanislaw H, Nahum GG. Comment on “Longitudinal reference ranges for estimated fetal weight” by Johnsen et al. (*Acta Obstetrica et Gynecologica Scandinavica* 2006; 85: 286-97). *Acta Obstetrica et Gynecologica Scandinavica*. 2006; 85: 1022–1023. <https://doi.org/10.1080/00016340600804746>
- [4] Weiner E, Bar J, Fainstein N, Ben-Haroush A, Sadan O, Golan A, et al. The effect of a program to shorten the decision-to-delivery interval for emergent cesarean section on maternal and neonatal outcome. *American Journal of Obstetrics and Gynecology*. 2014; 210: 224.e1–6. <https://doi.org/10.1016/j.ajog.2014.01.007>
- [5] Su X, Mao J, Yang Y, Tan H, Lu Q, Zhao KS. Impact of Different Decision-to-Delivery Intervals on Maternal and Neonatal Outcomes in Women with a Positive Oxytocin Challenge Test: A Comparison of 75- versus 90-minute Thresholds. *International Journal of Women's Health*. 2026; 18: 569951. <https://doi.org/10.2147/IJWH.S569951>
- [6] Huang YC, Yang CC. Impact of planned versus emergency cesarean delivery on neonatal outcomes in pregnancies complicated by abnormal placentation: A systematic review and meta-analysis. *Medicine*. 2023; 102: e34498. <https://doi.org/10.1097/MD.00000000000034498>
- [7] Tantu T, Tantu T, Hailu Y, Gashaw D, Melkamu B. Prevalence and factors associated with low 5th minute APGAR score among mothers who birth through emergency cesarean section: prospective cross-sectional study in Ethiopia. *BMC Pregnancy and Childbirth*. 2025; 25: 342. <https://doi.org/10.1186/s12884-025-07456-9>
- [8] Ajibo BD, Wolka E, Aseffa A, Nugusu MA, Adem AO, Mamo M, et al. Determinants of low fifth minute Apgar score among newborns delivered by cesarean section at Wolaita Sodo University Comprehensive Specialized Hospital, Southern Ethiopia: an unmatched case control study. *BMC Pregnancy and Childbirth*. 2022; 22: 665. <https://doi.org/10.1186/s12884-022-04999-z>
- [9] Zhu QM, Shu Q, Liu ZJ. Anesthesia Management for Emergency Cesarean Section in a Severely Obese Parturient with Refractory Hypertension: A Case Report. *Chinese Medical Sciences Journal = Chung-kuo i Hsueh K'o Hsueh Tsa Chih*. 2025; 40: 232–236. <https://doi.org/10.24920/004412>
- [10] Witcher TJ, Jurdi S, Kumar V, Gupta A, Moores RR Jr, Khoury J, et al. Neonatal Resuscitation and Adaptation Score vs Apgar: newborn assessment and predictive ability. *Journal of Perinatology*. 2018; 38: 1476–1482. <https://doi.org/10.1038/s41372-018-0189-5>
- [11] Aloui H, Azouz E, Frikha H, Rami H, Aoun D, Ben Aba N, et al. Fetal sacrococcygeal teratoma type I: A case report. *Radiology Case Reports*. 2024; 20: 920–923. <https://doi.org/10.1016/j.radcr.2024.10.120>

- [12] Chiu HY, Chen HH, Wang CW, Lu H, Wu CH, Yang CC, et al. The risks of emergency C-section, infant health conditions and postpartum complications in Taiwanese primiparous women with gestational diabetes mellitus: A propensity matched cohort study. *Taiwanese Journal of Obstetrics & Gynecology*. 2024; 63: 880–886. <https://doi.org/10.1016/j.tjog.2024.01.039>
- [13] Gabbay-Benziv R, Ashwal E, Lahav-Ezra H, Rabinerson D, Wiznitzer A, Ben-Haroush A, et al. Decision-to-delivery interval in suspected placental abruption - association with pregnancy outcome. *The Journal of Maternal-fetal & Neonatal Medicine : the Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*. 2014; 27: 1680–1683. <https://doi.org/10.3109/14767058.2013.871703>
- [14] Wang Y, Xiao S, Zhang S, Qiu C. Incidence of neonatal asphyxia and associated risk factors: a systematic review and cumulative meta-analysis. *BMC Pediatrics*. 2025; 25: 844. <https://doi.org/10.1186/s12887-025-06249-5>
- [15] Beckmann M, Calderbank S. Mode of anaesthetic for category 1 caesarean sections and neonatal outcomes. *The Australian & New Zealand Journal of Obstetrics & Gynaecology*. 2012; 52: 316–320. <https://doi.org/10.1111/j.1479-828X.2012.01457.x>
- [16] Bidon C, Desgranges FP, Riegel AC, Allaouchiche B, Chassard D, Bouvet L. Retrospective cohort study of decision-to-delivery interval and neonatal outcomes according to the type of anaesthesia for code-red emergency caesarean sections in a tertiary care obstetric unit in France. *Anaesthesia, Critical Care & Pain Medicine*. 2019; 38: 623–630. <https://doi.org/10.1016/j.accpm.2019.05.005>
- [17] Singh S, Klumpner TT, Rajala B, Li J, Servin M, Schumacher R, et al. Association of the dose of maternal general anaesthesia during Caesarean delivery with 5-minute Apgar scores: a retrospective single centre cohort study. *BJA Open*. 2026; 17: 100534. <https://doi.org/10.1016/j.bjao.2026.100534>
- [18] Biancu M, Cappellacci F, Piras S, Bura R, Manca A, Canu GL, et al. Splenectomy and Emergency Cesarean Delivery for Traumatic Splenic Rupture in a Patient in the Third Trimester of Pregnancy: A Case Report. *Annali Italiani Di Chirurgia*. 2025; 96: 713–717. <https://doi.org/10.62713/aic.3736>
- [19] Cojocaru L, Salvatori C, Sharon A, Seung H, Nyman K, Kodali BS, et al. General versus Regional Anesthesia and Neonatal Data: A Propensity-Score-Matched Study. *American Journal of Perinatology*. 2023; 40: 227–234. <https://doi.org/10.1055/s-0042-1757861>
- [20] Alhawsawi E, Bahkali N, Aljadani S, Jambi A, Almwled A, Al Basri S. Implementation of a crash cesarean section policy and its impact on maternal and neonatal outcomes at King Abdulaziz University Hospital: A retrospective study. *Medicine*. 2024; 103: e40645. <https://doi.org/10.1097/MD.00000000000040645>
- [21] Sun M, Song X, Shi W, Li Y, Shan N, Zhang H. Delayed umbilical cord clamping in cesarean section reduces postpartum bleeding and the rate of severe asphyxia. *Clinical and Experimental Obstetrics & Gynecology*. 2017; 44: 14–16. <https://doi.org/10.12891/ceog3116.2017>
- [22] Ogba EI, Chukwudi NK, Izuka OM, Adizua UC. Prevalence of Perinatal Asphyxia Using Apgar Scores and Cord Blood pH and the Relationship between the Two Methods: A Study of FMC Umuahia. *Nigerian Journal of Clinical Practice*. 2024; 27: 117–123. https://doi.org/10.4103/njcp.njcp_563_23
- [23] Tuncali B, Ozsoy HM. Combined spinal epidural anesthesia and non-invasive positive pressure ventilation for emergency cesarean section in a parturient with acute pulmonary edema due to pre-existing multivalvular cardiac disease. *Clinical and Experimental Obstetrics & Gynecology*. 2017; 44: 622–623. <https://doi.org/10.12891/ceog3397.2017>