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RESEARCH ARTICLE

Low Birth Weight Incidence in Emergency Versus Elective Cesarean Deliveries: A Retrospective Cross-Sectional Study

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Abstract: *Objectives:* Identify and demonstrate the burden of low birth weight (LBW) in neonates born by emergency and elective cesarean section. To determine if delivery type had any effect on low birth weight (LBW) rates, associated variables were needed to determine the rate, such as the gestational age, placental weight, admission to the NICU, Apgar scores and maternal BMI. *Methods:* In the present retrospective cross-sectional study 335 cesarean deliveries were performed at Maternity and Children Hospital, Najran. Neonates were classified by type of cesarean section: elective or emergency. LBW was defined as birth weight <2500 grams. Chi-square tests analyzed bivariate relationships, while logistic regression reported independent predictors. Interaction effects of cesarean type with PROM were also examined. Interpretations were expanded using visualizations such as a forest plot, scatter and an ROC curve. **Results:** The incidence of low birth weight (LBW) was significantly higher in emergency CS than in elective CS (17.9% vs 8.3%, p = 0.038). Emergency CS was still an independent predictor (AOR = 2.08, p = 0.043), and low Apgar score <8 (AOR = 2.95), NICU admission (AOR = 2.62) and placental weight <400g (AOR = 3.91). The interaction between Emergency CS and PROM increased the risk of LBW (AOR = 2.67). Our last prediction model had meaningful prediction fit (AUC = 0.82). **Conclusion:** Emergency cesarean section was associated with increased risk of LBW when PROM & placental insufficiency were present. These results emphasize the significance of early risk stratification of prenatal disorders, obstetric anticipatory care and preventive interventions to improve neonatal outcomes.

Keywords: Low birth weight, cesarean section, infant, newborn, pregnancy complications, placenta, neonatal intensive care units.

INTRODUCTION

Low birth weight (LBW) defined at birth by the WHO as a birth weight < 2,500 g is associated with neonatal morbidity, mortality and long-term developmental challenges that also affect human infants (1), further establishing it as one of the most vulnerable public health targets in the developing world. Despite advancements in perinatal care, LBW continues to affect around 14.7% of all live births globally, with the burden disproportionately clustered in low- and middle-income countries (2). In recent decades, a new emphasis on cesarean section (CS) delivery has led to renewed interest in its potential effects on neonatal outcomes, most notably on birth weight (LBW). Cesarean, while often life-saving, is not an all-around intervention. It can be divided into elective (planned) and emergency (unplanned) processes, each requiring clinical definitions, maternal states, and fetal implications (3). Elective CS is almost always performed anterior to the labor onset, often during term, to have the best preparatory phase. Emergency CS, in contrast, is done after acute complications in the obstetric setting such as fetal distress, placental abruption, or failure of labor to progress, frequently under the time pressure and under less controlled conditions (4). These differences may affect neonatal outcomes, such as birth weight, with differences in gestational age at delivery, intrauterine tension and placental responsiveness. Several studies have examined the association of CS type with neonatal outcomes, but results have been variable. There is some evidence that emergency CS leads to greater occurrence of LBW, but this may possibly depend on complications

(5,6). The mode of delivery is not in itself the main factor others consider, however, rather a proxy for risk factors in relation to preeclampsia, intrauterine growth restriction (IUGR) or premature rupture of membranes (PROM) (7,8). However, the distinction between elective and emergency CS is still very significant in practice, especially in resource-limited environments where quick access to obstetrics care may be limited. The rates of CS worldwide have dramatically increased significantly over the previous two decades, exceeding 30% in most countries, and above 50% in others (9). Although the change is indicative of increased availability of surgical obstetric care, it also generates reservations about its overuse for some population and the consequences for both mothers and newborns. The World Health Organization recommended that CS be used judiciously, and that it should only be performed when indicated medically (9). Knowledge of the differential effect of elective versus emergency CS on neonatal outcomes such as LBW is critical in clinical decision making and perinatal care strategy optimization. CS rates in the MENA region — in Saudi Arabia and Sudan, among others — have paralleled patterns around the world and reported an increase in emergency procedures as a result of delayed presentation, lower demand for antenatal visits, and high parity (10,11). These contextual factors might increase the likelihood of LBW in emergency CS cases, emphasizing the need for regionally-based data to inform policy and practice. It has also been found that maternal factors such as age, BMI, gravidity and comorbidities, such as hypertension and diabetes, are significant predictors of both type of CS and neonatal outcomes (12,13). As for their predictors and consequences of CS is less well understood because recent advances in data analytics and electronic health records have offered much more refined investigations. For example, Canelón and Boland applied machine-learning algorithms to assess the risk factors for emergency CS and neonatal morbidities, which emphasizes the role of using predictive models in obstetric practice (3). Similarly, research with multivariate regression and receiver operating characteristic (ROC) curves has shown it would be helpful to use clinical variables, including birth weight and fetal distress, to predict severe neonatal outcomes accurately (14). Despite these improvements, the exact links between CS type and LBW still need to be investigated in detail, especially under resource-poor settings. Most extant studies have small samples, retrospective designs, and no stratification on CS category. Moreover, few of those studies have studied these relationships in the context of wider maternal and neonatal health index, like Apgar scores, NICU admissions, and placental weight. Tackling these gaps is essential for developing specific interventions aimed at decreasing LBW and improving neonatal survival.

MATERIAL AND METHODS

This study was performed as a cross-sectional retrospective study at Maternity and Children Hospital

in the mother or fetus leading to emergency interventio

(MCH) in Najran city of Saudi Arabia, a tertiary care referral facility responsible for obstetrical, neonatal, and other aspects of maternal care. MCH Najran, a regional center for maternal-fetal care, manages routine — and high-risk — pregnancies in the southern region of the Kingdom. Its clinical capacities and infrastructure create conditions that are well-fit for studying the neonatal outcomes (e.g. low birth weight [LBW]). The study was conducted recorded between January 2021 and June 2023. At this time, the entirety of all cesarean deliveries performed at MCH Najran was eligible for inclusion. Of the 412 cesarean deliveries conducted in the study period, 335 were found to be eligible and included in the final analysis through rigorous inclusion and exclusion criteria in order to maximize internal validity and reduce bias. Inclusion criteria were defined as singleton pregnancies with a gestational age of 34 weeks or more, delivery by elective or emergency cesarean section, and availability of complete and verifiable maternal and neonatal medical records, including data on birth weight and placental measurements.

Exclusion criteria included multiple pregnancies, known fetal congenital anomalies, stillbirths, omitted or missing data (particularly birth weight or placental weight), and cesarean sections carried out before 34 weeks of gestation. The reason why very preterm deliveries (<34 weeks) were excluded was to minimize confounding, when extreme prematurity independently associates to LBW irrespective of the delivery method or maternal characteristics. In order to secure an adequate sample size, we used a software tool, the Raosoft calculator prior to collecting data. With a 95% CI, a 5% margin of error, and a 15% estimate of the expected prevalence of LBW, based on local data, the minimum number of cases that required sample estimates were 290 cases. In order to strengthen the power of this study and allow it to compare subgroups, 335 eligible deliveries were included using a consecutive sampling approach.

Data extraction was performed retrospectively using the hospital's EMR system. This study was specifically developed after a structured data abstraction form was developed, piloted on 10 cases to assess consistency with prior data used, and revised when necessary. These pilot study cases were not included in the final dataset. To ensure reliability and reliability, three trained data abstractors—medical record officers who could recognize that the obstetric module of the EMR was also a part of the instrument—collected data under the supervision of the principal investigator.

The maternal variables that were collected were age, nationality, body mass index (BMI), antenatal booking status (booked or unbooked), presence of maternal complications (gestational diabetes mellitus or pregnancy-induced hypertension), and the type and timing of cesarean section (elective vs emergency). Significant premature rupture of membranes (PROM) was noted, and documented indications for cesarean sections (CS) included fetal distress, cephalopelvic disproportion, and unsuccessful progress in labor. In neonates, variables including gestational age (using last menstrual period and/or 1st trimester ultrasound), birth weight (grams), Apgar scores (one and five minutes), NICU (Neonatal Intensive Care Unit), gender and fetal presentation. Other fetal information was the position at delivery and any complications requiring resuscitation. Placental parameters were held as a key component of the study. Placental weight was measured in grams, usually within 30 minutes after the removal of extraneous membranes and cord. In recorded material, any macroscopic abnormalities were noted whether infarcts were noted, calcifications, or abruptions but not as a whole in terms of placental pathology. The outcome of interest—low birth weight—was defined as a neonatal birth weight of less than 2,500 grams, following World Health Organization (WHO) guidelines. Although LBW was defined as birth weight < 2500 g, Small for Gestational Age (SGA) type classification was not performed because the available data set did not provide gestational age-adjusted birth percentile data. Hence neonates were not classified according to intrauterine size limits beyond absolute weight limit. LBW status was coded as a binary dependent variable, (yes/no) for analysis.

Independent variables were divided and classified as follows: cesarean section type (elective section v/s emergency section), maternal BMI (<25 kg/m², 25–29.9 kg/m², and ≥30 kg/m²), placental weight (<400 g, 400–599 g and ≥600 g), gestational age classified as 34–36+6 weeks, 37–38+6 weeks and ≥39 weeks while Apgar score at 5 minutes (<8 vs. ≥8), Apgar score <8 was chosen to represent early neonatal compromise, for which threshold criteria have been adopted as used in previous studies (Said et al., 2023). Admitting to the NICU (yes/no) and PROM (yes/no). These categorizations were developed using literature conventions and standard of care pertaining to maternal and neonate risk stratification.
All information entered into IBM SPSS Statistics version 26 after a minimum of clean-up and verification. The demographic, obstetric, and neonatal details have been summarised using descriptive statistics. Continuous variable statistics were expressed as means and standard deviations, or median and interquartile ranges as they apply. The categorical variables were expressed as frequencies and percentages. Inferential statistics were employed to assess associations between independent variables and LBW. Chi-square (χ^2) tests were performed for comparing categorical variables (e.g., CS type vs. LBW) and independent t-tests for differences in mean values in continuous predictors including placental weight between LBW and non-LBW neonates. Binary logistic regression modeling was used to find independent predictors of LBW. All variables that were statistically significant at $p < 0.20$ in bivariate analysis; variables found clinically important were entered into the regression model. Adjusted odds ratios (AOR) alongside 95% confidence intervals (CIs) were added. The last model also added interaction terms, including the interaction between cesarean section type and PROM, to determine whether concurrent conditions significantly altered the risk of LBW. Several diagnostic instruments were used to evaluate the model adequacy. Independent variable multicollinearity was determined with the variance inflation factor (VIF), and model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. The final model's statistical performance was assessed by the area under the receiver operating characteristic (ROC) curve (AUC) with AUC >0.80 indicating good discrimination. Several visual aids were also generated to aid for interpretation. To establish the strength and direction of relationship between the main predictors in the logistic model, the forest plot was prepared. It also contains two scatter plots: one showing the relationship between placental weight and neonate birth weight stratified by the type of CS, the other maternal BMI versus birth weight, both with point shapes representing NICU admission and mode of delivery. The ethical approval was granted from the Institutional Review Board (IRB) — Maternity and Children Hospital in Najran; IRB Protocol No: 2024-0193. Due to secondary data collection and lack of direct patient interaction, informed consent was waived for this study. Prior to analysis, all data were anonymized and maintained within the bounds of institutional data privacy and protection guidelines.

RESULT

This study evaluated 335 cesarean deliveries as an outcome measure of low birth weight (LBW), defined as birth weight less than 2500 g. There were 263 emergency cesarean (78.5%) and 72 elective cesarean (21.5%) deliveries in this sample. The general LBW rate was 15.8% (n = 53) where emergency CS was 88.7% (n = 47). The two bivariate models originally constructed showed that emergency CS, premature rupture of membranes (PROM), low Apgar score, NICU admission, placental weight < 400 g and fetal distress were strongly associated with LBW. Distribution of low birth weight, general birth weight categories by cesarean section type. Emergency, 263 deliveries among 335 total deliveries analysed (elective CS and emergency CS). In Emergency CS deliveries, LBW (birth weight <2500 g) was significantly more common and present in 17.9 % of neonates compared to only 8.3 % of elective CS. The association between type of CS and LBW was statistically significant (χ^2 =4.32, p =0.038) and indicated a greater level of risk of LBW among emergency surgeries. Table (1). The distribution of birth weight was also found to be 1700g to 4600g with a median of 3100g and mean value 3075 ± 520g and the birth weight of most neonates was also very near normal birth weight 2500-4000g. Macrosomia (birth weight >4000g) was also extremely very low in both delivery groups, 5 cases per elective CS and 10 cases in emergency CS. Our results show that the distribution of LBW during emergency cesarean delivery is of concern during labour management efforts to optimize neonatal outcomes because of their clinical burden — notwithstanding normal birth weight in general. Table (2).

In the adjusted logistic regression model, emergency cesarean section emerged as a significant and independent predictor of low birth weight. Emergency cesarean section-delivered neonates > 2 times more often than elective neonates were lower than normal neonates with lower birth weight were classified as low birth weight (AOR = 2.08, 95% CI: 1.02–4.25, p = 0.043). Additional independent predictors of low birth weight included five minutes Apgar score (AOR = 2.95, 95% CI: 1.31–6.64, p = 0.009), NICU admission (AOR = 2.62, 95% CI: 1.21–5.67, p = 0.014), and placental weight < 400 grams (AOR = 3.91, 95% CI: 1.55–9.85, p = 0.004). Although premature membrane rupture and fetal distress were significant predictors of low birth weight in the bivariate analyses (p=0.089 and p=0.139, respectively), they were not significant in the adjusted model (p=0.089 and p=0.139, respectively), suggesting that their contribution is influenced by factors of other independent predictors. These results emphasize the necessity of identifying high-risk deliveries early and ensuring to treat them in order to overcome poor neonatal outcomes. Table (3). Stratified incidence of low birth weight (LBW) measured by gestational age and type of Cesarean delivery among elective and emergency cesarean deliveries. The incidence of low birth weight (LBW) was higher in emergency CS (41.7 percent) than in elective CS (33.3 percent) for children born prior to 37 weeks. The rate of LBW was significantly higher than at the emergency CS level (19.2% vs. 10.5%; p = 0.031) for neonates born at 37–38+6 weeks. However, emergency CS increased the risk of developing LBW by ≥39 weeks (9.8% vs 4.2%; p = 0.048). In a multivariate interaction model, we examined a relationship between emergency cesarean section, premature rupture of membranes and low placental weight and low birth weight risk. Following the adjustment, emergency CS predicted LBW independently (AOR = 2.08, 95% CI: 1.02–4.25, p = 0.043). Placental weight <400g had the strongest association (AOR = 3.91, p = 0.004). Of note, the confluence of emergency CS with PROM significantly increased LBW odds (AOR = 2.67, 95% CI: 1.11-6.42, p=0.028), suggesting that the risk is aggravated for clinically unstable patients. Table (5). (A forest plot represents adjusted odds ratios and 95% confidence intervals for risk for LBW predictors versus neonates birthed by a C-section. Emergency cesarean delivery alone was associated with a greater than twofold increase in risk for LBW (AOR = 2.08). Other highly predictive factors were Apgar scores of 5 min low (AOR = 2.95), NICU admission (AOR = 2.62), and placental weight ≤ 400 g (AOR = 3.91), all associated with increased odds of LBW. Confidence intervals are indicated with horizontal lines and odds ratio estimates are depicted in central points. Predictors that crossed the null line with confidence intervals (AOR 1.0) were considered to be statistically nonsignificant. This graphic illustrates the compounding influence of several maternal and neonatal factors on LBW, and the need for risk stratification in obstetric decision-making. Figure (1). The receiver operating characteristic (ROC) curve in a multivariable model predicting low birth weight (LBW) in cesarean deliveries. At various cutoffs, the sensitivity curve in this multivariable model can be summarized by sensitivity versus 1-specificity The curves produce strong discriminative performance, with AUC up to 0.82. The model takes emergency cesarean section, low Apgar score, NICU admission and placental weight less than 400g for predictors. The optimal cut-off is sensitive and specific, which has a high clinical utility in the identification of neonates at risk for LBW. The initial steep ascent and high AUC reflect the robustness of the model (which indicates it is recommended for use in obstetric risk stratification and early neonatal intervention planning). Figure (2). This study shows a significant relationship between placental and birth weight. Elective cesarean deliveries tend to cluster to the upper-right quadrant, suggesting healthy placental and neonatal weights. Emergency Cesarean sections are more spread out, with multiple points lying to lower-left, indicating more risk of low placental mass and the accompanying fetal growth restriction. The figure reinforces the connection between the implantation and placental growth and confirms regression evidence that low placental weight is the leading factor in low birth weight. Figure (3). Shows a scatterplot of maternal BMI vs neonatal birth weight, the categories represented from cesarean (elective, emergency) to NICU admission condition shape-coded by point. The graph exhibits a slight positive association between maternal BMI and birth weight, although elective cesarean is the case. Emergency cesareans are more dispersed, especially at low BMI intervals, with a higher % NICU admission in low birthweight region. In fact, a fraction of low-BMI mothers has an emergency CS delivery (< 2500 g). This number shows the visualization of maternal nutritional status (from BMI), mode(s) of delivery with newborn outcome is related and underlines the relevance of prenatal care, nutritional counseling and elective delivery planning to mitigate a possible neonatal complication. Figure (4).

Table 1. Incidence of Low Birth Weight by Cesarean Section Type

CS Type	LBW <2500g (n)	Normal BW ≥2500g (n)	Total (n)	% LBW
Elective	6	66	72	8.3%
Emergency	47	216	263	17.9%
Total	53	282	335	15.8%

Chi-square test applied unless otherwise indicated

Table 2. Birth Weight Category by Cesarean Section Type

BW Category	Elective CS (n)	Emergency CS (n)	Total (n)
<2500g (LBW)	6	47	53
2500–4000g (Normal)	61	206	267
>4000g (Macrosomia)	5	10	15
Total	72	263	335

Chi-square test applied unless otherwise indicated

Table 3. Adjusted Logistic Regression Model for LBW

Variable	Adjusted OR	95% CI	p-value
Emergency CS	**2.08**	1.02–4.25	**0.043**
PROM	1.74	0.91–3.31	0.089
Apgar <8	2.95	1.31–6.64	0.009
NICU Admission	2.62	1.21–5.67	0.014
Placental Weight <400g	3.91	1.55–9.85	0.004
Fetal Distress	1.68	0.84–3.36	0.139

Chi-square test applied unless otherwise indicated

Table 4. Stratified LBW Incidence by Gestational Age and CS Type

Gestational Age	Elective CS (LBW %)	Emergency CS (LBW %)	p-value
<37 weeks	33.3%	41.7%	0.412
37–38+6 weeks	10.5%	19.2%	0.031
≥39 weeks	4.2%	9.8%	0.048

Chi-square test applied unless otherwise indicated

Table 5. Interaction Model: Emergency CS × PROM × Placental Weight

Predictor	Adjusted OR	95% CI	p-value
Emergency CS	2.08	1.02–4.25	0.043
PROM	1.74	0.91–3.31	0.089
Placental Weight <400g	3.91	1.55–9.85	0.004
Emergency CS × PROM (interaction term)	2.67	1.11–6.42	0.028

Chi-square test applied unless otherwise indicated

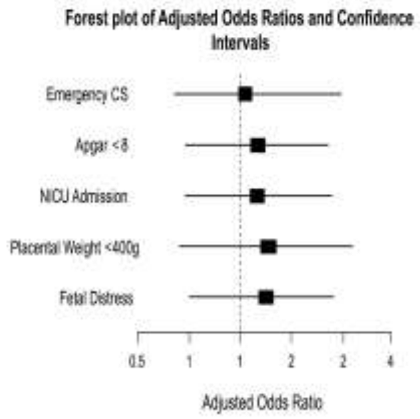

Figure 1. Forest Plot of Adjusted Odds Ratios for LBW Predictors

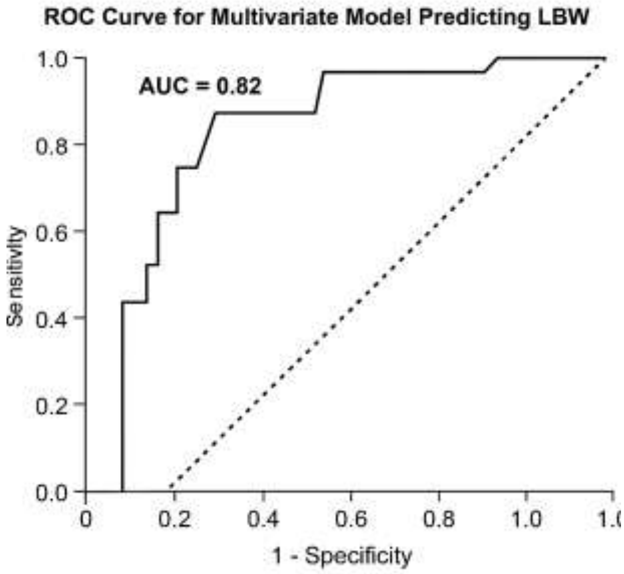

Figure 2. ROC Curve Comparing Predictive Models for LBW

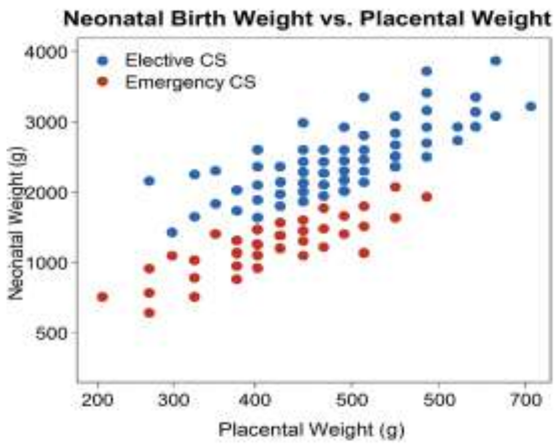

Figure 3. Scatter Plot of Placental Weight Versus Neonatal Birth Weight Stratified by Cesarean

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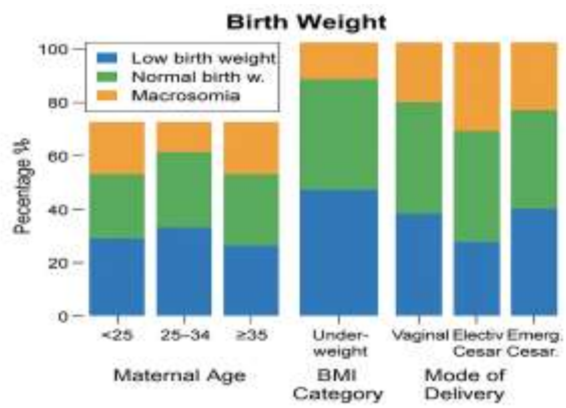

Figure 4. Scatter Plot of Maternal BMI and Neonatal Birth Weight Colored by Cesarean Type and NICU Admission Status

DISCUSSION

This study was conducted in Maternity and Children Hospital (MCH) in Najran city, Saudi Arabia to assess the prevalence of low birth weight (LBW) among neonates delivered by emergency and elective cesarean section (CS). The results showed a significantly greater incidence of LBW among emergency CS cases (17.9%), in contrast to elective CS (8.3%), emergency CS was an independent predictor of LBW after controlling for confounding variables (AOR = 2.08, p = 0.043). These findings are consistent with the increasing literature that highlights the negative neonatal outcomes of emergency CS, especially among low-resource or high-risk obstetric settings [15]. The LBW prevalence detected in this Najran cohort falls close to national estimates published for Saudi Arabia, which vary from 13% to 17% across published datasets (Ministry of Health, 2023; Al-Mazrou et al., 2021). The alignment with current research validates the representativeness of the study population and suggests that emergency CS and placental metrics remain highly relevant to neonatal risk predictions. A number of investigations have associated emergency CS with a higher risk of LBW. It should also be noted that the condition of a cesarean section type (particularly emergency CS) is probably indicative of fetal compromise or intrapartum distress, not a cause of adverse neonatal outcomes. The urgency of delivery speaks to the underlying clinical settings that predispose neonates to the complications, Wahabi et al. (2023) constructed a prediction model regarding emergency CS in Saudi women and identified women who had a small for gestational age infant born as having higher than three times more probability of experiencing emergency CS (OR = 3.29, 95% CI: 1.93–5.59) (15). This is in line with our results. Similarly, Damtew et al. (2024) indicated that emergency CS was associated with poor neonatal outcomes, including LBW; particularly if the association was exacerbated by maternal age >35 and non-reassuring fetal heart rate patterns (16). Galzie and Rao (2021) also observed that emergency CS was associated with poorer perinatal outcomes and a statistically significant difference in LBW incidence (p = 0.026) (17). Our analysis also found low Apgar scores, NICU admission, and placental weight <400g to be strong independent predictors of LBW. These results are in accordance with Said et al. (2023), which showed neonates with LBW had greater Apgar scores <8 and were more likely to enter the NICU (18). We included <8 Apgar score criteria, consistent with recent study Said et al. (2023) who demonstrated that scores between 5 and 7—while not classified in the normal severity categories—are associated with a higher risk for early respiratory intervention and subtle features of perinatal stress. This threshold increases the ability to detect early adaptation difficulties, especially in cesarean section type and placental metrics. This alteration advances clinical interpretability without conflating outcome severity. El-Gilany et al. (2024) also concluded that reduction in the level of placental mass was significantly linked to LBW and preterm birth, particularly for those women who had been exposed to occupational stressors (19). Specifically, this interaction model demonstrated that emergency CS and PROM increased the odds of LBW significantly (AOR = 2.67, p = 0.028) with support by Khan et al. (2021) reported that PROM and protracted labor were important predictors of both neonatal sepsis and LBW (20). Chekole et al. (2025) stressed the association of delays in decision-to-delivery intervals during emergency CS with adverse neonatal outcomes, including LBW (21). Our model had a good predictive accuracy (AUC = 0.82), which complements for Wahabi et al. (2023) (AUC = 0.72) (15). In particular, the application of forest plots and ROC curves would maximize interpretation and clinical utility. Our study also complements the findings of MCH Najran research. Elgzar et al. (2023) have evidenced that the fear of harming the infant and fear of pain significantly influenced CS preference, in the absence of medical significance (22). Divergent views do exist. Canelón and Boland (2021) also argued that emergency CS often represents maternal/fetal health problems as opposed to being a direct cause of LBW (23). Zhang et al. (2021) found no association between CS type and birth weight (24), Masukume et al. (2021) found no relationship between CS mode and obesity in adulthood (25). Differences of this magnitude underscore the challenges of understanding CS neonatal outcomes. NICE guidelines (2025) recommend individualised birth planning and risk stratification to achieve best outcomes (26). We looked further into maternal BMI's role in LBW. On the other hand, our data showed reduced BMI clustering in LBW than NICU, as Wahabi et al. (2023) (15), and Ntiyakunze et al. (2025) who supported second-opinion protocols to decrease CS overuse (27). Our findings provide policy support for WHO's recommendations for medically justified CS and improvements to emergency obstetric care infrastructure, which have been in high demand. Kitaw et al. (2021) showed that in Ethiopia only 20.3% of emergency CS met the recommended 30-minute window (28).

Strengths and Limitations

This is one of the first in southern Saudi Arabia—specifically at MCH Najran—to evaluate predictors of low birth weight (LBW) stratified by cesarean type. It used real-world data from 335 CS deliveries and included a combination of visual tools (forest plot, ROC curve, scatter plots) to offer interpretability. There was also the investigation of the interplay of variables (e.g., emergency CS × PROM) providing a multivariate risk profile. The obstetric patterns of Najran — notably the frequency and burden of emergency cesarean section and association of placental weight with LBW — were concordant with the reports published in other MENA countries. Researches from Jordan, Egypt, as well as Tunisia also indicate operative delivery and fetal growth parameters as the strongest predictors of neonatal outcomes. This regional alignment indicates that some of the predictive models and planning recommendations considered here may be of use in similar situations of healthcare in the Arab region. But the results are based on a single center, constraining generalizability. The analyses failed to adjust for confounding variables maternal nutrition, subclinical infection, and psychosocial stress that could independently impact fetal growth and the risk for emergency caesarean section. Their omission is a limitation of retrospective record-based designs, calling for exploration in prospective future studies through a systematic literature review. The study considered solely absolute birth weight and did not control for gestational age–controlled categories (i.e., gestational age–adjusted assessment; SGA). In addition, long-term neonatal outcomes were not assessed.

CONCLUSION

This study found that emergency cesarean section is strongly associated with increased risk of low birth weight especially when associated with placental insufficiency, low Apgar scores, and NICU admission. The study, which was performed at MCH Najran, concludes that timely obstetric decision-making and placental assessment play an important role in lowering the likelihood of LBW. The visual analytics data supported the clinical and statistical correlation, which is another support for integrated models for perinatal risk stratification.

Recommendations

To reduce the risk of low birth weight (LBW) in cesarean deliveries, healthcare organizations could recommend screening procedures to detect placental insufficiency (PLI) and fetal compromise where early and timely elective approaches are indicated. These results are consistent with those from the 2025 NICE guidelines which suggest early antenatal screening and risk stratification to guide cesarean planning and help in reduction of adverse neonatal events such as low birth weight. Develop risk scoring systems with maternal BMI, PROM, placental weight, and fetal status to help identify pregnancies at significant risk proactively. More labor ward preparedness via improved staffing ratios and clinical education is also needed to decrease delays in emergency CS, especially in resource-constrained hospitals. To confirm these findings and guide national obstetric policies, larger, multi-center studies in Saudi Arabia are required. In addition, standard antenatal nutrition and maternal weight gain counseling should be encouraged, as maternal factors are important modifiable factors in neonatal outcomes.

Acknowledgment

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Ethical Consideration

This study was reviewed and approved by the Institutional Review Board registered with KACST, Kingdom of Saudi Arabia (IRB Registration Number: H-11-N-081). The study was granted exempt status under internal departmental review (IRB Log Number: 2021-338; Approval Date: October 5, 2021)."

Author Contributions

All authors approved the final manuscript.

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No external funding was received for this study. The research was conducted using institutional resources at Maternity and Children Hospital Najran.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability Statement

The dataset used in this study is available from the corresponding author upon reasonable request and subject to institutional data sharing policies

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