

ORIGINAL ARTICLE

Predictors of Maternal, Pediatric, and Clinicopathological Factors Associated with Postoperative Complications Following Emergency Cesarean Section Under General Anesthesia: A Retrospective Cohort Study

MUHAMMAD ATHIF AKRAM¹, MAMOONA SARWAR², HINA³, SHAZIA BAHAR⁴, MUHAMMAD IMRAN⁵, HAMID NAWAZ KHOKHAR^{6*}

¹Abu Umara Medical and Dental College / Ali Fatima Teaching Hospital, Lahore, Pakistan.

²Department of Obstetrics and Gynaecology, Ittefaq Hospital Trust, Model Town, Lahore, Pakistan.

³Department of Anaesthesia, Ameer-ud-Din Medical College / Lahore General Hospital, Lahore, Pakistan.

⁴Department of Paediatrics, Khyber Teaching Hospital, Peshawar, Pakistan.

⁵Department of Medicine, Services Hospital, Lahore, Pakistan.

⁶Department of Pathology, Sahara Medical College, Narowal, Pakistan.

Correspondence to: Dr. Shazia Bahar, Email: shaziabahar1129@gmail.com

ABSTRACT

Background: Emergency cesarean section under general anesthesia is associated with increased maternal morbidity, particularly in women with underlying obstetric and clinical risk factors. This study aimed to identify maternal and clinicopathological predictors of postoperative complications following emergency cesarean delivery under general anesthesia.

Methods: This retrospective cohort study included 120 women who underwent emergency cesarean section under general anesthesia at Ali Fatima Teaching Hospital, Lahore, and the Department of Obstetrics and Gynaecology, Ittefaq Hospital Trust, Model Town, Lahore, Pakistan, from January 2022 to January 2023. Maternal characteristics, obstetric conditions, laboratory findings, operative factors, and postoperative outcomes were reviewed. Logistic regression analysis was performed to identify independent predictors of postoperative complications.

Results: Overall, 38 women (31.7%) developed at least one postoperative complication. Postpartum hemorrhage was the most common complication (15.0%), followed by blood transfusion (12.5%), surgical-site infection (7.5%), endometritis (5.8%), and intensive care unit admission (5.0%). Multivariable analysis showed that preoperative hemoglobin <10 g/dL (aOR 3.01; 95% CI 1.30–6.96), placenta previa/accreta spectrum or placental abruption (aOR 2.91; 95% CI 1.06–7.98), BMI ≥30 kg/m² (aOR 2.18; 95% CI 1.01–4.72), category-1 urgency (aOR 2.21; 95% CI 1.01–4.84), and operative duration ≥60 minutes (aOR 3.16; 95% CI 1.32–7.56) independently predicted postoperative morbidity.

Conclusion: Postoperative complications were common following emergency cesarean section under general anesthesia. Preoperative anemia, obesity, abnormal placental pathology, category-1 urgency, and prolonged surgery were significant predictors of maternal morbidity.

Keywords: Emergency cesarean section; general anesthesia; maternal morbidity; postoperative complications; anemia; placenta previa; obesity

INTRODUCTION

Cesarean delivery is one of the most commonly performed major surgical procedures in obstetric practice and is an essential intervention when vaginal delivery poses an unacceptable risk to the mother, fetus, or both¹. With all the significant advances made in surgical technique, anesthesia and antimicrobial prophylaxis, and availability of blood products and peri-operative monitoring, there is still clinically important maternal morbidity associated with cesarean delivery. This is especially so if it is performed as an emergency as in an urgent delivery there is likely to be acute obstetric pathology, limited opportunities for optimizing the situation prior to surgery and more complex surgery and anesthetic. The previous cohort evidence has been shown that maternal complications are more common after emergency cesarean sections than elective cesarean sections and that the most urgent or "crash" cesarean sections are associated with the highest level of morbidity^{2,3}.

The indications for emergency cesarean section are quite variable and include NRFS, placental abruption, placenta previa with hemorrhage, cord prolapse, obstructed/delayed labor, failure of labor progression, severe hypertensive disorders, uterine rupture, and other non-reassuring clinical situations⁴. Such clinical situations can considerably affect the postoperative outcome of the mother without regard to the type of operation⁵. A woman undergoing an emergency cesarean delivery may be anemic, unstable, infected, have a hypertensive disease, be obese, or have had previous uterine surgery; and issues like placenta previa, placental abruption, and placenta accreta spectrum may significantly increase the risk for blood transfusion and major hemorrhage. A systematic review assessing transfusion transfusion in cesarean delivery found placenta previa, placental

abruption, emergency cesarean delivery, multiple gestation, and lower preoperative hematocrit to be important risk factors for transfusion during cesarean delivery. Placenta previa has also been linked with significantly higher morbidity for haemorrhage, transfusion and hysterectomy⁶.

The type of anesthesia administered is another key element of perioperative management. Unless contraindicated, neuraxial anesthesia is usually the method of choice for cesarean delivery as it does not require airway instrumentation or the exposure to many of the physiological effects of general anesthesia⁷. However, general anesthesia is still essential in certain obstetric emergencies, when rapid delivery is urgently needed, neuraxial anesthesia is unsuccessful or contraindicated, or maternal hemorrhage and hemodynamic instability precludes regional anesthesia⁸. While anaesthetic safety has been enhanced by modern airway devices, monitoring techniques and rapid sequence induction protocols, challenges remain in the use of general anaesthetic in obstetric patients in particular with regard to difficult airway management, failed tracheal intubation, pulmonary aspiration, haemodynamic response to laryngoscopy, anaesthetic awareness, and postoperative respiratory complications⁹.

Importantly, the link between general anesthesia and poor outcomes is dependent on the clinical context where general anesthesia is used¹⁰. General anesthesia is used for women who require very urgent delivery, or who are in severe maternal or fetal compromise, and it is hard to distinguish the effect of anesthetic technique from the indication for emergency surgery¹¹. However, observational and population studies have shown associations of increased maternal morbidity in women delivered by cesarean section under general anesthesia as compared with neuraxial anesthesia, and it is important to recognize that there may be residual confounding by indication. Thus, when performing cesarean section under general anesthesia for emergency, the evaluation of risks should not only be based on anesthesia methods but also on the combined effect of maternal factors,

Received on 06-09-2023

Accepted on 29-12-2023

obstetric diseases, laboratory indicators, urgency of operation, and the difficulty of operation¹².

Postoperative complications after cesarean delivery include a wide range of adverse events, such as postpartum hemorrhage, need for blood transfusion, surgical-site infection, endometritis, respiratory problems, acute kidney injury, venous thromboembolism, unplanned reoperation, and intensive care unit admission^{13,14}. There are a number of possible risk factors that have been linked to these outcomes that may be identifiable. Maternal obesity has been related to higher rates of wound morbidity after cesarean section in all studies; other risk factors for SBI include emergency surgery, anemia, longer surgery duration, diabetes, and premature rupture of membranes. Likewise, severe postpartum hemorrhage after cesarean delivery is related to maternal and obstetric factors such as anemia, abnormal placental attachment, uterine atony, multiple pregnancy and other signs that predispose to postpartum hemorrhage. In emergency situations, these factors can all be present and lead to an additive increase in perioperative risk¹⁵.

Preoperative anemia is especially important in this regard since the amount of hemoglobin will affect the physiologic reserve when surgical blood loss occurs¹⁶. Thus, even with a moderate bleed, women who present for surgery with low hemoglobin may be more clinically unstable and at greater risk of requiring a blood transfusion. Similarly, obesity can make the surgery more technically challenging and longer, and previous cesarean deliveries can lead to intraabdominal adhesions and abnormal placental attachment. Prolonged rupture of membranes, infectious complications (e.g. chorioamnionitis), may predispose women to postoperative endometritis and surgical-site infection. All of these results show that morbidity after emergency cesarean section is not likely to be a single event but rather it is a combination of maternal, obstetric, clinicopathological, anesthetic, and surgical events¹⁷.

Although there are numerous manuscripts addressing complications related to cesarean delivery, much of the evidence looks at cesarean sections as a whole or compares maternal and neonatal outcomes when cesarean sections are performed under general anesthesia versus neuraxial anesthesia¹⁸. Fewer studies have investigated this subset of women who have emergency cesarean section under general anesthesia and who have explored maternal factors, laboratory variables, obstetric pathology, and perioperative factors as potential predictors of postoperative complications. This distinction is clinically relevant as emergency cesarean delivery under general anesthesia is a very critical pre- and post-operative situation where early identification of susceptible women may impact on the preparation of blood products, anesthetic planning, senior surgical involvement, infection-prevention measures, post-operative monitoring and intensive or high-dependency care. Modern texts on obstetric anesthesia thus focus on recognising the circumstances and patients at greatest risk for, or of, having general anaesthetic rather than on the technique alone¹⁹.

The present study was intended, therefore, to determine maternal and clinicopathological factors for postoperative complications in women who received emergency cesarean section under general anesthesia. It was also aimed to identify independent risk factors for postoperative morbidity after controlling for possible confounding factors. Knowledge of easily-accessed predictors could help in early risk stratification in the perioperative period and promote targeted preventive measures and post-operative monitoring of women at highest risk²⁰.

MATERIALS AND METHODS

Study Design and Setting: This retrospective cohort study was conducted at Ali Fatima Teaching Hospital, Lahore, Pakistan, and the Department of Obstetrics and Gynaecology, Itefaq Hospital Trust, Model Town, Lahore, Pakistan. Medical records of women who gave birth via emergency cesarean section (C-section) under general anesthesia between January 2022 and January 2023 were

examined. The study aimed to assess the maternal, obstetric, clinicopathological and perioperative factors that are related to postoperative complications after emergency cesarean section under general anesthesia.

Study Population and Sample Size: A total of 120 women who underwent emergency cesarean section under general anesthesia during the study period were included in the analysis. Eligible cases were detected from the obstetric operation register, anesthesia records, inpatient register, operative notes and postoperative records. Patients who were eligible and met the selection criteria were selected consecutively and included in the study until the desired sample size was reached (120 patients).

Inclusion and Exclusion Criteria: Women with complete obstetric, anesthetic, operative and post-operative records who had an emergency cesarean section under general anesthesia in the study period, aged 18 or above, were included in the study. Patients had to have sufficient documentation to determine if the patient had any postoperative complications. Elective cesarean section, patients treated under purely spinal or epidural anesthesia (without general anesthesia), incomplete or unavailable medical records, major non-obstetric surgical procedures performed during the same admission, and patients transferred immediately after surgery to a different healthcare facility with poor documentation of the postoperative outcome were excluded.

Data Collection: Data was gathered by a structured data collection form from the hospital medical records in a retrospective manner. Data were collected from obstetric case notes, anaesthetic charts, operative notes, laboratory records, nursing notes, intensive care records and discharge summaries. Maternal factors included age, parity, body mass index, gestational age, history of previous cesarean section, history of any other uterine or abdominal surgery, diabetes mellitus, hypertensive disorders of pregnancy, preeclampsia/eclampsia, and other maternal comorbidities documented.

Hemoglobin concentration, platelet count and any other hematological and biochemical parameters available in the laboratory were considered as the preoperative laboratory variables. Preoperative anemia was defined as hemoglobin <10 g/dL for the principal predictor analysis. Obstetric and clinicopathological factors were indication for emergency cesarean section, fetal distress, obstructed or prolonged labor, prolonged rupture of membranes, suspected or confirmed chorioamnionitis, placenta previa, placenta accreta spectrum, placental abruption, multiple pregnancy, and other clinically relevant obstetric abnormalities. Placental pathology was considered to be placenta previa, PAS, or placental abruption.

Anesthetic and Operative Characteristics: All Women in the study had cesarean delivery under general anesthesia. When documented, indications for general anesthesia included immediate need for delivery, contraindication to neuraxial anesthesia, failed or inadequate neuraxial anesthesia, maternal hemorrhage or hemodynamic instability, and other clinically documented indications. Perioperative variables were the urgency of cesarean delivery, length of surgery, estimated blood loss, intraoperative hypotension or hemodynamic instability, difficult airway documentation, uterine atony, need for additional uterotonic agents, blood transfusion in the operating room and extension of surgery, and documented intraoperative injury.

Emergency cesarean sections were categorized based on the degree of urgency documented in the medical record. Category 1 cesarean section was considered to be one that was performed when there was emergency threatening the life of mother or fetus and the speediest delivery was required. For statistical analysis, other urgent procedures were combined as category 2 or category 3 emergency cesarean deliveries. Predictor analysis was carried out on the groups of <60 minutes and ≥60 minutes operative duration, which was documented from the reported start of surgery to the end of skin closure.

Outcome Measures: The main outcome was the maternal postoperative complication, defined as occurrence of at least one

complication during index hospitalization or in available postoperative follow-up period after ECG. Postoperative complications included postoperative respiratory complications, acute kidney injury, surgical-site infection, postpartum endometritis, or other pelvic infection, venous thromboembolism, intensive care unit admission, unplanned reoperation or relaparotomy, and maternal mortality.

Postpartum haemorrhage was defined by clinical diagnosis as made by the obstetric team treating the mother, based on estimated blood loss and/or need for therapeutic intervention, when available. Surgical-site infection (SSI) and postpartum endometritis were judged to be present if they were clinically diagnosed by the treating team and treated with appropriate antimicrobial therapy. Secondary outcomes were individual postoperative complications, need for blood transfusion, intensive care unit admission and length of postoperative hospital stay.

Statistical Analysis: The data were entered and analyzed using IBM SPSS Statistics version 2012. Normally distributed continuous variables were summarised as mean $\pm$ standard deviation and non-normally distributed continuous variables were summarised as median and interquartile range. Data on categorical variables were presented as frequencies and percentages. The participants were classified as two groups based on the occurrence or not of at least one postoperative complication.

Independent-samples t-test or Mann-Whitney U-test (for continuous variables) and chi-square test or Fisher's exact test (for categorical variables) were used for comparisons between continuous and categorical variables, respectively. Univariable logistic regression analysis was used to identify association between potential predictor variables and postoperative complications and crude odds ratios and 95% confidence intervals calculated. Variables with a p value <0.10 from univariable analysis and those considered a priori to be clinically important were eligible to be included in the multivariable logistic regression model.

Next, multivariate logistic regression analyses were conducted to determine independent risk factors for postoperative complications; adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were presented. Possible multicollinearity of independent variables was evaluated prior to building the final model. The area under the receiver operating characteristic curve was used to assess model discrimination and the Hosmer-Lemeshow goodness-of-fit test was used to assess calibration. A two-sided p value <0.05 was considered statistically significant.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board, before data analysis. Since this was a retrospective study with the review of the medical records, the need for informed consent for each individual was waived based on institutional policy. All patient data was de-identified during data extraction and confidentiality was respected throughout the research.

RESULTS

Baseline Maternal and Clinicopathological Characteristics: A total of 120 women who underwent emergency cesarean section under general anesthesia between January 2022 and January 2023 were included in the final analysis. The average maternal age was 29.7 years $\pm$ 5.4 years and the average gestational age at delivery was 37.1 weeks $\pm$ 2.6 weeks. Of the 46 women, 38.3% had a BMI ≥ 30 kg/m², and 31.7% had a preoperative hemoglobin concentration <10 g/dL. Twenty-eight women (23.3%) had hypertensive disorders of pregnancy and 15 (12.5%) had suspected or clinically documented chorioamnionitis. Twenty-one women (17.5%) had a placenta previa, placenta accreta spectrum or placental abruption. There were 56 (46.7%) Category-1 caesarean deliveries and 37 women (30.8%) had an operative time ≥ 60 minutes. The total postoperative complication rate was 38 women (31.7%) and 82 women (68.3%) had an uncomplicated postoperative course (Table 1).

Preoperative anemia, category-1 urgency, two or more previous cesarean sections, abnormal placental pathology,

prolonged operative duration and chorioamnionitis were significantly higher among the women who had postoperative complications. Pre-op Hb <10 g/dl was seen in 52.6% of the women with complication vs. 22.0% of the women without complication ($p=0.001$). Similarly, an operative duration ≥ 60 minutes was observed in 52.6% of women who developed complications compared with 20.7% of women without complications ($p<0.001$). In addition, complications also were more common among women with placenta previa, placenta accreta spectrum, or placental abruption (31.6% vs. 11.0%; $P=0.005$), as shown in Table 1.

Postoperative Maternal Complications: A total of 38 (31.7%) of the 120 women had at least one postoperative maternal complication. The most common complication documented was postpartum bleeding (18 women, 15.0%) followed by blood transfusion (15 women, 12.5%). Nine women (7.5%) had surgical-site infection, and seven (5.8%) had postpartum endometritis or pelvic infection. Six women (5.0%) needed intensive care unit admission postoperatively and four (3.3%) had respiratory complications. There were three cases of acute kidney injury (2.5%) and two unplanned reoperations or relaparotomies (1.7%) among the women. Table 1 showed that one patient (0.8%) had developed venous thromboembolism and also there were no maternal deaths.

Hemorrhagic complications were the most common postoperative complications as shown in Table 2. 15.0% suffered from postpartum hemorrhage and 12.5% had to be transfused with blood. Infectious complications were also seen, with incidence of surgical site infection in 7.5% and endometritis/pelvic infection in 5.8% of patients. There were relatively few complications that required intensive care or further surgery.

Women who had postoperative complications had a longer length of stay at the hospital. The median hospital stay after surgery was 5 days (IQR 4-7 days) in women with complications and 3 days (IQR 3-4 days) in women without complications ($p<0.001$).

Predictors of Postoperative Complications

Maternal BMI ≥ 30 kg/m², preoperative hemoglobin <10 g/dL, two or more previous cesarean sections, chorioamnionitis, abnormal placental pathology, category-1 urgency and operative duration ≥ 60 minutes were factors associated with higher odds of postoperative complications on univariable logistic regression analysis. There was also an association with an increased risk of hypertensive disorders of pregnancy, but this was not statistically significant.

All variables with a p value <0.10 on univariable logistic regression analysis and variables thought to be clinically important were included in the multivariable logistic regression model. Postoperatively, anemia, obesity, abnormal placental pathology, category-1 urgency and operative time ≥ 60 minutes were independently associated with postoperative complications as shown in Table 3.

Preoperative anemia was one of the strongest independent predictors of postoperative morbidity. Women with a preoperative hemoglobin concentration <10 g/dL were at approximately three times the risk of postoperative complications than those with a higher hemoglobin concentration (aOR 3.01; 95% CI 1.30–6.96; $p=0.010$). Other placental abnormalities were also found to be independently associated with postoperative morbidity with placenta previa, placenta accreta spectrum or placental abruption resulting in almost three fold odds of adverse postoperative outcomes (aOR 2.91; 95% CI 1.06–7.98; $p=0.038$).

The longest operative time (≥ 60 min), had the strongest adjusted association with postoperative morbidity (aOR 3.16; 95% CI 1.32 – 7.56; $p=0.010$). As demonstrated in Table 3, maternal BMI ≥ 30 kg/m² was associated with more than twofold increased adjusted odds of complications (aOR 2.18; 95% CI 1.01-4.72; $p=0.047$), and the same was true for emergency cesarean delivery of category-1 (aOR 2.21; 95% CI 1.01-4.84; $p=0.047$).

The final multivariable logistic regression model demonstrated acceptable discrimination, with an area under the receiver operating characteristic curve of 0.81 (95% CI 0.73–0.89).

In the study cohort, the Hosmer-Lemeshow goodness of fit test resulted in a p value of 0.62, suggesting good calibration.

Table 1: Maternal and Clinicopathological Characteristics According to Postoperative Complication Status

Variable	Total (n=120)	Complications (n=38)	No complications (n=82)	p value
Age, years, mean $\pm$ SD	29.7 $\pm$ 5.4	30.5 $\pm$ 5.7	29.3 $\pm$ 5.2	0.251
Age $\geq$ 35 years	26 (21.7%)	11 (28.9%)	15 (18.3%)	0.185
BMI $\geq$ 30 kg/m ²	46 (38.3%)	21 (55.3%)	25 (30.5%)	0.009
Multiparity	67 (55.8%)	24 (63.2%)	43 (52.4%)	0.271
$\geq$ 2 previous cesarean sections	24 (20.0%)	12 (31.6%)	12 (14.6%)	0.030
Preoperative Hb $<$ 10 g/dL	38 (31.7%)	20 (52.6%)	18 (22.0%)	0.001
Hypertensive disorder of pregnancy	28 (23.3%)	13 (34.2%)	15 (18.3%)	0.053
Diabetes mellitus	14 (11.7%)	6 (15.8%)	8 (9.8%)	0.337
Chorioamnionitis	15 (12.5%)	8 (21.1%)	7 (8.5%)	0.049
Placenta previa/accreta/abruption	21 (17.5%)	12 (31.6%)	9 (11.0%)	0.005
Category-1 urgency	56 (46.7%)	24 (63.2%)	32 (39.0%)	0.014
Operative duration $\geq$ 60 min	37 (30.8%)	20 (52.6%)	17 (20.7%)	$<$ 0.001

Table 2: Distribution of Postoperative Maternal Complications

Postoperative complication	n	%
Any postoperative complication	38	31.7
Postpartum hemorrhage	18	15.0
Blood transfusion	15	12.5
Surgical-site infection	9	7.5
Endometritis/pelvic infection	7	5.8
Intensive care unit admission	6	5.0
Respiratory complication	4	3.3
Acute kidney injury	3	2.5
Unplanned reoperation/relaparotomy	2	1.7
Venous thromboembolism	1	0.8
Maternal mortality	0	0.0

Table 3: Logistic Regression Analysis of Predictors of Postoperative Complications

Predictor	Crude OR (95% CI)	Adjusted OR (95% CI)	p value
Age $\geq$ 35 years	1.82 (0.75–4.40)	1.34 (0.50–3.60)	0.558
BMI $\geq$ 30 kg/m ²	2.82 (1.27–6.25)	2.18 (1.01–4.72)	0.047
Preoperative Hb $<$ 10 g/dL	3.95 (1.76–8.88)	3.01 (1.30–6.96)	0.010
Hypertensive disorder	2.32 (0.99–5.43)	1.73 (0.70–4.30)	0.236
$\geq$ 2 previous cesarean sections	2.69 (1.08–6.68)	1.82 (0.68–4.88)	0.232
Chorioamnionitis	2.86 (0.96–8.52)	2.20 (0.68–7.08)	0.186
Placenta previa/accreta/abruption	3.74 (1.43–9.77)	2.91 (1.06–7.98)	0.038
Category-1 urgency	2.68 (1.21–5.92)	2.21 (1.01–4.84)	0.047
Operative duration $\geq$ 60 min	4.25 (1.87–9.64)	3.16 (1.32–7.56)	0.010

DISCUSSION

The present study evaluated maternal and clinicopathological factors associated with postoperative complications among women undergoing emergency cesarean section under general anesthesia¹. Almost 33% of the women had 1 or more postoperative complications. The most common adverse outcomes were postpartum hemorrhage and transfusion, followed by surgical site infection, endometritis, intensive care unit admission, and respiratory complications. Preoperative anemia, obesity, abnormal placental pathology, category-1 urgency, and duration of the operation were independent risk factors for postoperative morbidity by multivariable analysis^{2,3}.

A hemoglobin of $<$ 10 g/dL preoperatively proved to be one of the most significant risk factors for postoperative complications⁴. Women with anemia were about three times as likely to be morbid as those women with higher hemoglobin levels. Maternal anemia decreases the physiological reserve and can make her more susceptible to the effects of the peri-operative blood loss, especially if cesarean delivery is required. Previous studies have also shown that low preoperative hemoglobin is a risk factor for transfusion and hemorrhagic complications after cesarean section. These findings highlight the need of antenatal diagnosis of anemia and correction of anemia wherever possible⁵.

As well, abnormal placental conditions, such as placenta previa, placenta accreta spectrum and placental abruption, were significantly linked to postoperative complications. These are well-known causes of obstetric hemorrhage, and can lead to increased

blood loss, transfusion, longer operating times and admission to intensive care^{6,7}. Previous studies have shown higher rates of maternal haemorrhagic morbidity in women with placenta previa (PP) and abnormal placental adherence (APA) [2,3]. Consequently, the results of the present study agrees with the known association of placental abnormalities with poor maternal outcomes⁸.

Postoperatively, maternal obesity also was a significant independent risk factor. Obesity may make cesarean delivery more technically challenging, may increase the time of surgery, and may cause wound complications, infection and anesthetic difficulties⁹. Elevated BMI has been shown previously to be a risk factor for surgical-site infection and postoperative complications in cesarean delivery among women⁴. These results indicate that obese women who undergo emergency surgery might be more closely monitored perioperatively and that their postoperative wound should be carefully monitored¹⁰.

There was a significant increase in the postoperative risk associated with category-1 emergency cesarean delivery. Typically, these surgeries are carried out with no time to optimise the mother and fetus before surgery, in a situation where the mother or fetus is in immediate danger¹¹. Women can therefore be admitted for surgery in a state of bleeding, significant fetal compromise, hemodynamic instability, or other acute obstetric problems. In addition, previous studies have shown increased maternal morbidity associated with emergency/CAESAR and crash-emergency cesarean delivery versus elective cesarean deliveries⁵.

The longest operative time (60 minutes or more) had the highest adjusted correlation with postoperative complications¹². If

surgery is prolonged, it may be a sign of more surgery to do because of complications that can be caused by adhesions from past cesarean sections, obesity, abnormal placement of the placenta, difficult removal of the baby, hemorrhage, and/or other surgeries. Longer procedures can also result in greater tissue handling, which can lead to blood loss or infection. Thus, longer operation times could be an important in vivo marker for better postoperative monitoring¹³.

Chorioamnionitis and multiple prior cesarean sections were associated with complications in the initial analysis but were not independently associated after adjusting for other variables¹⁴. They can have overlapping effects with other risk factors including length of surgery, abnormal placentation, infection and complexity of surgery. Likewise, there was a higher incidence of hypertensive disorders among women who had complications, but they were not independently associated with the main outcome. However, these are still clinically relevant conditions especially in women treated with general anesthesia due to possible hemodynamic instability and other complications during surgery^{6,15}.

The results of this study can be applied to the management of women who are to undergo emergency cesarean under general anesthesia¹⁶. Women may be identified as being at a higher risk because of identification of anemia, obesity, abnormal placental pathology, extreme surgical urgency, and anticipated operative complexity. Earlier access to blood products, involvement of senior obstetrician, anaesthetist, closer haemodynamic monitoring and increased postoperative surveillance may be helpful in such cases¹⁷.

There are certain limitations of the study. The retrospective design relied on the completeness and accuracy of medical records and the relatively small sample size (120 women) might have restricted the ability to assess for rare complications¹⁸. Furthermore, all participants received general anesthesia; thus, no effort was made to draw conclusions regarding the difference between general and neuraxial anesthesia. Although this is limited in its scope, it was clinically informative data, because it was from a very high-risk population for obstetric surgery, and it was information about factors associated with morbidity after obstetric surgery^{19,20}.

CONCLUSION

The incidence of complications after emergency cesarean section was high. Preop anemia, obesity, abnormal placental pathology, category-1 urgency and prolonged operative time were independent factors associated with increased postoperative morbidity. These factors may be recognized early to enhance the planning, monitoring and outcomes of mothers during surgery.

Competing Interests: The authors declare no competing interests.

Funding: No external funding was received for this study.

Authors' Contributions:

MAA: Conceptualization, study design, manuscript drafting.

MS: Data collection, methodology, clinical interpretation.

H: Anesthesia-related assessment, data interpretation.

SB: Supervision, manuscript review, correspondence.

MI: Clinical interpretation, manuscript review.

HNK: Data interpretation, critical revision.

All authors reviewed and approved the final manuscript.

Acknowledgment: The authors acknowledge the support of the Departments of Obstetrics and Gynaecology and Anesthesiology at Ali Fatima Teaching Hospital, Lahore, and Ittefaq Hospital Trust, Model Town, Lahore, for facilitating access to the clinical records required for this study. The authors also appreciate the cooperation of the medical and nursing staff involved in the care of the study patients.

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This article may be cited as: M. A. AKRAM, M. SARWAR, HINA, S. BAHAR, M. IMRAN, H. N. KHOKHAR, Predictors of Maternal, Pediatric, and Clinicopathological Factors Associated with Postoperative Complications Following Emergency Cesarean Section Under General Anesthesia: A Retrospective Cohort Study. *Pak J Med Health Sci*, 2023; 18(1): 1056-1060.