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Correspondence:

Dr. Pawan KB Agrawal
Dept. of General Practice & Emergency,
Chaurjahari Hospital, Rukum-West,
Nepal.

Email: agrawal.pawan@hotmail.com

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Decision to delivery time interval and outcomes in emergency caesareans by a general practitioner: a cross-sectional study from a rural referral center in Karnali Province of Nepal

Pawan Kumar Bajaj Agrawal¹, Esther Nepal², Maya Budha², Utsaha Thapa², Pukar Shrestha², Ruben Shahu², Firoza Maharjan³, Melina Rai³, Paul Chhiring Lhomi Nuppa³, John Khadka⁴, Nimrod Subba⁵, Dil Bahadur Giri⁶, Priyanka Gupta⁷, Suraj Parajuli⁸

¹Senior Consultant, Dept. of General Practice & Emergency, ²Senior Medical Officer, ³Medical Officer, ⁴Consultant, Dept. of General Surgery, ⁵Senior Consultant, Dept. of Orthopedics & Trauma Surgery, ⁶Administrator, Chaurjahari Hospital, Rukum-West, Nepal; ⁷Senior Consultant, Bluecross Hospital, Kathmandu, Nepal; ⁸Assoc. Prof., Medical University of the Americas Nevis, West Indies

Abstract

Introduction: Caesarean section, a life-saving surgery, is being performed routinely in rural and remote hospitals by obstetricians, general practitioners and advanced skilled birth attendants for prevention of maternal and neonatal morbidity. Recommended decision-to-delivery interval (DDI) time of 30 minutes in Category I and 75 minutes in Category II caesareans are difficult to achieve in resource-limited settings. This study aimed to study decision to delivery time interval in emergency caesareans in a CEONC center in rural Nepal and subsequent pregnancy outcomes.

Method: Descriptive cross-sectional study was conducted at Chaurjahari Hospital in Rukum-West over six-month period. Patient characteristics, indications, DDI and pregnancy outcomes were studied.

Result: Total number of deliveries was 450, of which 99 (22%) were caesarean deliveries. Sixty-Nine (69.7%) were emergency caesareans. Forty-Eight (70%) caesareans were Category I with median DDI of 64 minutes (IQR 53-78). 21(30%) were Category II with a median DDI of 68 minutes (IQR 60-89). Altogether, DDI of 30 minutes and 75 minutes were achieved in 3 (4.3%) and 47 (68.1%) of emergency caesareans, respectively. 57 (83%) mothers and 63 (91.3%) newborns had good outcomes with uneventful recovery. There were no maternal deaths. Two (2.9%) newborns died during NICU care, and 1(1.4%) was a fresh stillbirth.

Conclusion: Recommended decision to delivery interval of 30 minutes was difficult to achieve in resource-limited settings. Three-quarters of emergency caesareans were performed within a 75-minute interval. Shortest DDI was 13 minutes. Though, maternal and fetal outcomes were largely satisfactory, it was necessary to further lessen DDI with due precautions to ensure quality care delivery.

Keywords: Cesarean section; CEONC; General practitioners; Nepal; Pregnancy Outcome; Resource-Limited Settings; Rural Hospitals

INTRODUCTION

Caesarean section (CS) is a life-saving surgery routinely performed in rural and remote hospitals of Nepal for the prevention of maternal and neonatal morbidity and mortality.^{1, 2} The World Health Organization has recommended a CS rate of 10-15% in the general population. The caesarean section rate in rural Nepal ranged from 9-19% in different studies. Seventy-five to eighty-seven per cent of all caesarean sections were emergency in these studies.¹⁻⁷ Besides obstetricians, general practitioners (GPs) and advanced skilled birth attendants (ASBAs) have been performing CS with the help of anesthesia assistants (AAs) in rural areas of the country.^{2,5,8} NICE guidelines 2021 recommend a decision to delivery interval (DDI) of 30 minutes for Category I CS (when there is immediate threat to the life of the woman or fetus as in cord prolapse, persistent fetal bradycardia and uterine rupture) and 75 minutes for Category II CS (when there is maternal or fetal compromise which is not immediately life-threatening as in obstructed labor and non progress of labor).^{9,10}

The recommended DDI of 30 minutes in Category I CS and 75 minutes in Category II CS have been achieved in developed countries, with the shortest mean time interval documented as short as 7.7 minutes.^{10,11} Quick and swift action with due caution in such cases is indisputable. However, there have been concerns if the given time interval of 30 minutes in Category I CS is achievable and should be tailored according to local circumstances and logistics especially in rural health services.¹⁰ Studies from the resource-limited settings revealed that 60-90% of emergency CS (Category I & II) had DDI of more than 30 minutes.¹²⁻¹⁶

Decision to delivery interval can be considered as a quality indicator for assessing performance in comprehensive emergency obstetrics and neonatal care (CEONC) center.¹⁰ We failed to find any related studies from Nepal. The proper documentation of DDI and documentation of delays becomes necessary in terms of growing medico-legal awareness and quality improvement in service readiness and patient safety. Hence, we aimed to study the decision to delivery interval and associated factors in emergency caesarean in one of the CEONC center in rural Nepal and subsequent pregnancy outcomes.

METHOD

This was a retrospective descriptive cross-sectional study in Chaurjahari Hospital over the duration of six months from July 2025 to December 2025. Consecutive sampling was employed and all the patients undergoing emergency caesarean section within the given time period were included. Chaurjahari Hospital is a 100-bed general hospital serving the catchment population of around 600,000 from three different districts (Rukum-West, Jajarkot and Salyan).

A GP with surgical obstetric skills supervised the maternity department and ensured 24-hour emergency obstetric

care. He performed nearly all caesarean sections during the study period, while a general surgeon conducted emergency procedures only during his occasional absence. All doctors resided within the hospital premises, whereas the anesthesia assistant and operating room nurse lived off-site and were called during emergencies. Ethical approval was obtained from the Internal Management Committee of Chaurjahari Hospital (Ref. No. 037; 1 January 2026) to access de-identified data. Patient consent was not required.

Emergency caesarean workflow began with nurses identifying eligible cases and notifying the on-duty medical officer, who confirmed the indication and informed the GP. Simultaneously, laboratory investigations, blood arrangements, pre-anesthesia assessment, and informed consent were completed. Antenatal patients had routine investigations performed after 37 weeks, whereas newly admitted patients required fresh investigations. Due to the absence of a blood bank, the hospital relied on a walking blood bank system, with pre-identified and cross-matched donors, reducing blood preparation time. One of the two operation rooms was almost always available for emergency cases. Caesarean sections were performed under spinal anesthesia; failed blocks were managed with repeat spinal anesthesia before ketamine sedation. A medical officer working in pediatrics attended deliveries for neonatal resuscitation if required.

The data on emergency caesarean was obtained from hospital records. The variables of interest were age, source of patient, indication for emergency caesarean, decision time, delivery time and outcome. The source of patient was categorized as admitted case (emergency indication appeared after the admission in the ward for labor / observation) and emergency case (patient arrived in the hospital with emergency indication). The decision time was the point of time when the consultant decided that the patient required operation and the delivery time was the point of time when the fetus was delivered. The maternal outcomes were noted for major surgical site infection requiring additional wound care and re-suturing, sepsis requiring additional intravenous antibiotic, post partum hemorrhage requiring blood transfusion; and death. The perinatal outcomes were studied for perinatal asphyxia and neonatal sepsis that required neonatal care unit (NICU) admission; and early neonatal death. For the purpose of this study, perinatal asphyxia was considered for newborns with low APGAR scores requiring continuous care in NICU. Neonatal sepsis was defined as a healthy newborn transferred to the ward with the mother and later developed symptoms of sepsis.

The statistical analysis was performed using Microsoft Excel 2013 (Microsoft Corporation, Redmond, Washington, USA) and Statistical Package for the Social Sciences version 21.0 (IBM Inc, Armonk, New York, USA). Numbers and percentages were used for categorical variables. Normality of the data was determined using Shapiro-Wilk test. The median with inter-quartile range was used to present the

continuous variables not fulfilling the criterion of normal distribution.

RESULT

The total number of deliveries during the study period was 450 including 99 caesareans (22%). Out of which, 69 (69.7%) were emergency caesareans. Among emergency caesareans, 48 (70%) were Category I and remaining 21 (30%) were Category II. Fourteen patients (20.3%) were under the age of 20, 54 (78.3%) were within 20 to 34 years of age and one (1.6%) was above 34 years of age. The median age was 23 years (IQR 20-26). Thirty two patients (46%) arrived in hospital with emergency indication while 37 (54%) had developed emergency indication after their admission for labor / observation in the maternity ward. Fetal distress during labor (n=42, 61%) was the most common indication followed by obstructed labor (n=7, 10%) and fetal distress not in labor (n=6, 9%) as depicted in Figure 1. The number of emergency caesarean performed during the office and out-of-office hours were 31 (45%) and 38 (55%) respectively.

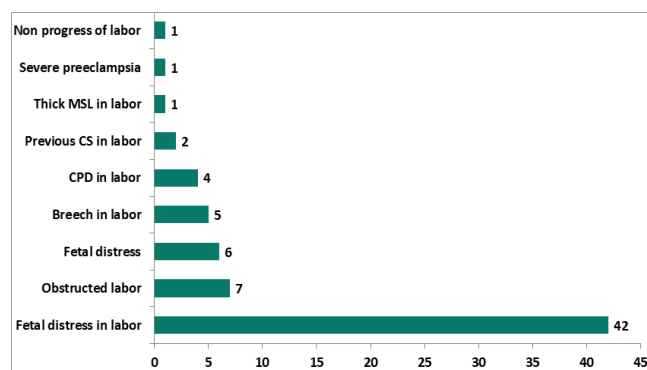


Figure 1. Indications of emergency CS during the study

Decision to delivery interval (DDI) ranged from 15-151 minutes in Category I and 13-132 minutes in Category II caesarean. The median DDI in Category I and Category II caesarean was 64 minutes (IQR 53-78) and 68 minutes (IQR 60-89) respectively. The overall median DDI was 65 minutes (IQR 55-82). The recommended DDI of 30 minutes was achieved in two (4.2%) of Category I and of 75 minutes in 13 (61.9%) of Category II caesarean. Three emergency caesarean (4.3%) had DDI within 30 minutes and 47 (68.1%) had DDI within 75 minutes.

Table 1. Maternal and fetal outcomes in emergency caesarean

Maternal Outcome	Category I f (%)	Category II f (%)	Overall f (%)
Good	39 (81%)	18 (86%)	57 (83%)
PPH (requiring transfusion)	2 (4%)	2 (9%)	4 (6%)
Pneumonia	1 (2%)	0	1 (1%)
SSI	6 (13%)	1 (5%)	7 (10%)
Neonatal Outcome			
Good	43 (90%)	20 (95%)	63 (91%)
Fresh still birth	1 (2%)	0	1 (1%)
Birth asphyxia	2 (4%)	1 (5%)	3 (4%)
Early neonatal death	2 (4%)	0	2 (3%)

Fifty seven mothers (83%) had good post-operative outcomes as depicted in Table 1. Seven mothers (10%) developed surgical site infection, four (6%) required blood transfusion and one (1%) developed pneumonia. Sixty three newborns (91.3%) had good outcome. However, three (4.3%) had birth asphyxia and required NICU care with good outcome, two (2.9%) died during treatment in NICU and one (1.4%) was fresh still birth.

DISCUSSION

The study showed that the caesarean rate in Chaurjahari Hospital was 22 % and majority of them was emergency (70%). Chaurjahari Hospital is a CEONC hospital with 4 birthing centers within 1 hour driving distance. The difficult cases from these birthing centers are referred to Chaurjahari Hospital for possible need of surgery. Hence, the caesarean rate in Chaurjahari Hospital exceeded the WHO recommendation of 10% caesarean in general population.³ Several studies from hospitals in rural Nepal demonstrated a caesarean rate of 10-15%, while those from teaching hospitals and large public hospitals revealed a caesarean rate upto 51%.^{1,2,5,6,17-19} Fear of labor pain, ease of access, birth on a particular auspicious day and lesser trauma to pelvic floor resulting in more satisfactory return to sexual life are the major motivating factors for mothers preferring caesarean over vaginal deliveries. On the other hand, unrealistic expectations from the patients thereby increasing the chances of litigation on service providers and financial factors compel the care-providers to terminate deliveries in a more controlled environment of caesarean in a definite time interval with lesser burden of unexpected variables and emergency calls.^{3,5,19} Certain strategies like caesarean audits for indication and labor care guide implementation have been advocated to curb the soaring caesarean rate.¹⁸

Teenage pregnancy was fairly common as shown by the study (20%) despite the fact that the legal age of marriage in the country was 20 years. This finding was slightly higher compared to other studies in similar setting.^{2,4,7} Lack of education, poverty and societal norms could be the contributing factors in promoting teenage marriage and pregnancy.^{20,21} This finding also highlighted the need of awareness and access to contraception in teenage population through adolescent friendly services. Teenage pregnancies are also more prone to caesarean because of inadequate growth of pelvis resulting cephalo-pelvic disproportion (CPD) and lesser labor pain threshold. The median age and proportion of elderly pregnancy was consistent with that of other studies.^{2,4,7}

The proportion of emergency caesarean in this study was 70%. Almost all studies from rural and public hospitals revealed that the emergency caesarean accounted for almost three-quarters of total caesarean. The common causes of elective caesarean in these institutions were CPD not in labor, failure of induction, mal-presentation

and previous caesarean.^{2,5,6,17,18} The relative proportion of Category I & II caesarean varied significantly among different studies. The proportion of Category I caesarean (immediate threat of life to mother or fetus) ranged from 23-63% while that of Category II (maternal or fetal compromise not immediately life threatening) ranged from 37-77%.²²⁻²⁴

As a referral center, the hospital received difficult cases having immediate threat to life of mother and /or fetus. The decision to perform caesarean in half of the emergency cases (46%) was made as soon as the cases appeared in emergency or labor ward. The difficult cases, which were Category II in birthing centers, were likely to pass the considerable time period of 1-3 hours while being referred and received at the referral center and subsequently present as Category I. Fifty four percent of the emergency caesarean were the ones admitted with expectation of normal labor or for trial of labor in possible CPD and developed emergency indications during labor or observation. Fetal distress was the sole cause for Category I caesarean. Obstructed labor, breech in labor, CPD in labor and non progress of labor were the common indications in Category II. This finding aligned with the finding of similar other studies.^{5,6,17,19}

In our study, both Categories I & II caesareans had similar ranges of DDI from around 15 to 150 minutes. The recommended DDI was achieved in 4% of Category I and 62% of Category II. Though the developed world had been able to achieve the recommended DDI, the resource limited settings in developing world had been struggling to accomplish it. The median DDI in these resource limited settings ranged from 36-127 minutes for Category I and 38- 133 minutes for Category II. As per these studies, only 0.5-46% of Category I and 13-96% of Category II had been performed within the recommended time interval. According to these studies, the factors responsible for delay could be divided into three general headings: patient related factors, anesthesia related factors and obstetrician related factors. Delay in obtaining consent for caesarean from patients and patients' relatives, delay in laboratory investigations and delay in blood arrangement were included in patient related factors. Similarly, delay in assembly of anesthesia and operating room personnel (because they live out of the hospital premises and sometimes the communication network does not work), lack of spare operating room and lack of general anesthesia facility (spinal anesthesia takes time to evolve and situation becomes worse in case of repeat spinal because of failure) came under anesthesia related factors. Lack of adequate speed (less experience in case of new surgeons and exhaustion in case of experienced ones) and peritoneal adhesions in previous laparotomy cases were considered as obstetrician related factors.^{10-12,14,22-24}

Almost half of the emergency caesarean (55%) was performed during out-of-office hours. Out-of-office hour's caesareans exerted undue pressure in healthcare delivery especially in resource limited settings where same personnel were responsible for services even during

the office hours. Further it was difficult to assemble the entire operating team during these odd hours as not all of them were provided in-house accommodation because of financial constraints of the institution. These caesareans also suffered from difficulty in getting timely laboratory results and blood arrangements resulting in relatively longer DDI.^{12,22}

Maternal outcomes were generally favorable, with no maternal deaths. A few women developed surgical site infections requiring prolonged hospitalization, postoperative pneumonia, or primary postpartum hemorrhage necessitating blood transfusion. Most newborns had good outcomes; however, three (4%) developed birth asphyxia, two (3%) died during NICU treatment, and one (1%) was a fresh stillbirth. Previous studies from resource-limited settings have reported adverse maternal outcomes in 4–17% and adverse neonatal outcomes in 14–21% of emergency caesarean deliveries.^{12,23,24} Although the benefit of achieving a decision-to-delivery interval (DDI) within 30 minutes remains debated, conditions such as cord prolapse and severe fetal bradycardia require immediate intervention. Therefore, emergency caesarean should be performed within the shortest feasible time while maintaining patient safety. Timely antenatal investigations after 37 weeks, birth preparedness and complication readiness counseling, advance blood donor arrangements, in-house operating teams, regular caesarean audits, and emergency drills would help reduce delays and improve maternal and neonatal outcomes.

This study could serve as a reference for other institution in the country. Despite the best efforts, the study had some limitations. It was a single center study so it might be difficult to generalize the findings in different settings. The association between the time delays and perinatal outcomes were not studied. The actual delaying factors involved in prolongation of decision to delivery interval were not recorded. These could be the scope for further studies.

CONCLUSION

The recommended decision to delivery interval of 30 minutes was difficult to achieve in resource limited settings of rural Nepal. Only three-quarters of the emergency caesarean could be performed within the 75 minutes interval. However, the shortest DDI documented was as short as 13 minutes on a rare occasion. The pregnancy outcomes were satisfactory. And, the entire team including the nurses in maternity ward, medical officers, anesthesia assistant, operating surgeon and nurse should thrive to shorten DDI in emergency caesarean with due precautions.

DECLARATIONS

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Conflict of Interest

We do not have any conflicts of interest to declare.

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Ethical Approval

Received from the Internal Management Committee of Chaurjahari Hospital, Rukum, on 1st January 2026 with reference number 037.

Consent of the Study

Not applicable

Consent for Publication from Authors

All authors consented for publication of the findings.

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