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CLINICAL ARTICLE

Decision-to-delivery intervals and perinatal outcomes following emergency cesarean delivery in a Nigerian tertiary hospital

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ABSTRACT

Objective: To determine the decision-to-delivery interval (DDI) for emergency cesarean deliveries (CDs) at a tertiary center in Nigeria, to evaluate causes of delay, and to assess the effects of delays on perinatal outcomes. **Methods:** Between September and November 2010, a prospective, observational study was undertaken at University College Hospital, Ibadan. Events that occurred after a decision to perform an emergency CD were recorded. Associations between outcomes and the DDI were analyzed. **Results:** Among 235 emergency CDs included, 5 (2.1%) occurred within 30 minutes and 86 (36.6%) within 75 minutes. The mean DDI was 119.2 ± 95.0 minutes. Among CDs with a DDI of more than 75 minutes, logistic factors were the reason for delay in 65 (43.6%) cases. No significant associations were recorded between DDI and the 5-minute Apgar score, admission to the special-care baby unit, or perinatal mortality ($P > 0.05$ for all). In multivariate analysis, neonates delivered after 75 minutes were significantly less likely to die during the perinatal period than were those delivered within this period (odds ratio 0.13, 95% confidence interval 0.03–0.66; $P = 0.01$). **Conclusion:** Institutional delays in CDs need to be addressed. However, the DDI could be less important for perinatal outcome than are some other factors, such as the severity of the indication.

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1. Introduction

The decision-to-delivery interval (DDI) is the period between a decision to perform an emergency cesarean delivery (CD) and the actual delivery of the neonate [1]. The traditionally recommended interval is a maximum of 30 minutes [1,2]. However, the feasibility of this benchmark in busy obstetric units has been questioned [3–6]. Studies have also cast doubt on the overall benefits of the recommendation [5–8], because there is no evidence to substantiate a 30-minute standard when the risks of adverse outcome to mother or infant are considered. In a study from the US National Institute of Child Health and Human Development [9], most emergency CDs were performed within 30 minutes, but outcomes were not worsened in delayed deliveries. The investigators proffered that DDIs longer than 30 minutes did not necessarily indicate substandard obstetric practice and that shorter intervals did not guarantee the neonate's safety. It has been reported that a DDI of more than 75 minutes is needed before the delay is associated with significantly adverse maternal and fetal outcomes [7].

The UK National Institute for Health and Care Excellence (NICE) [10] differentiates between levels of emergency and recommends a 30-minute interval for CDs of category 1 (“immediate threat to the life of

the woman or fetus”) and an interval of up to 75 minutes for CDs of category 2 (“maternal or fetal compromise which is not immediately life-threatening”). These categories correlate with the classifications of emergency and urgent CD proposed by Lucas et al. [11].

Studies in low-income nations have reported difficulty in meeting the recommended 30-minute DDI because of several intrinsic factors [12,13]. The facilities required to shorten the DDI are often unavailable in low-income countries; therefore, research from these places is needed to guide recommendations for locally adapted standards [1].

The present study was conducted to determine the DDI for emergency CDs at a tertiary hospital in Nigeria, to evaluate the causes of delay, and to assess the effects of such a delay on the perinatal outcome. Given the evidence that a DDI of 30 minutes is hardly feasible in low-income countries, the safety and feasibility of a DDI of 75 minutes was explored.

2. Materials and methods

This was a prospective, observational study of all emergency CDs performed at the University College Hospital, Ibadan, Nigeria, from September 1 to November 30, 2010. A diagnosis of intrauterine fetal death before the decision for CD was a reason for exclusion (most of these exclusions were surgeries for a ruptured uterus). Patients signed informed consent for the study; if the interval was too short, consent

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was obtained after delivery. Ethics approval was obtained from the Oyo State Ethics Review Committee.

At the University College Hospital—a tertiary referral—an operating theater for obstetric cases is located within the labor ward. Trained independent observers monitored events that took place after the managing team's decision to perform an emergency CD. Any records made for a patient who subsequently declined to participate would be discarded. Information was collected on the patients' characteristics and peripartum events. When there was more than one indication for the emergency surgery, it was classified under the most urgent indication.

For the purpose of the present analysis, fetal distress, prepartum hemorrhage, and cord prolapse were considered as critically urgent indications for CD, in view of NICE's definition of category 1 [10]. The rest were considered as urgent category 2 indications. In line with the unit's protocol, the diagnosis of suspected fetal distress was made on observation of fetal heart irregularities by fetal stethoscope or cardiocotograph; there were no facilities to allow detection of fetal acidosis. The 5-minute Apgar score was assessed, because it is a better predictor of neonatal outcome than is the 1-minute score [14,15]. The 5-minute Apgar scores were grouped into three categories: 0–3 (severe asphyxia/stillbirth/immediate neonatal death), 4–6 (moderate asphyxia), and 7–10 (normal) [16].

The data were analyzed with SPSS version 16.0 (SPSS Inc, Chicago, IL, USA). Associations were determined by the χ^2 test or the Fisher exact test, as appropriate. The explanatory variables investigated were indication for CD, type of anesthesia, surgeon's rank, and time and day of the week when the surgery was performed. The main outcomes measured were the DDI, the newborn's 5-minute Apgar score, admission to the special-care infant unit (SCBU), and the perinatal mortality. The DDI itself was also used as an explanatory variable for the other outcomes. Logistic regression was used for multivariate analysis of perinatal mortality. $P < 0.05$ was considered statistically significant.

3. Results

During the study period, there were 662 deliveries, 327 (49.4%) of which were CDs. Overall, 250 (76.5%) of the CDs were emergencies; 77 (23.5%) were elective procedures. A total of 235 women (94.0% of all emergency CDs) fulfilled the inclusion criteria for the study. The mean age of the study participants was 29.7 ± 5.2 years. Almost half

Table 1
Demographic and obstetric characteristics of the study participants.^a

Variable	All participants (n = 235)	DDI <75 min (n = 86)	DDI ≥75 min (n = 149)	P value
Age, y				0.35
<20	6 (2.6)	2 (2.3)	4 (2.7)	
20–24	31 (13.2)	14 (16.3)	17 (11.4)	
25–29	83 (35.3)	27 (31.4)	56 (37.6)	
30–34	67 (28.5)	30 (34.9)	37 (24.8)	
35–39	42 (17.9)	12 (14.0)	30 (20.1)	
≥40	6 (2.6)	1 (1.2)	5 (3.4)	
Parity				0.38
Nulliparous	113 (48.0)	43 (50.0)	70 (47.0)	
Primiparous	49 (20.9)	15 (17.4)	34 (22.8)	
Multiparous	67 (28.5)	24 (27.9)	43 (28.9)	
Grand multiparous ^b	6 (2.6)	4 (4.7)	2 (1.3)	
Booking status				0.50
Booked	100 (42.6)	34 (39.5)	66 (44.3)	
Unbooked	135 (57.4)	52 (60.5)	83 (55.7)	
Pregnancy duration at delivery				0.06
Preterm	52 (22.1)	14 (16.3)	38 (25.5)	
Term	172 (73.2)	65 (75.6)	107 (71.8)	
Post-term	11 (4.7)	7 (8.1)	4 (2.7)	

Abbreviation: DDI, decision-to-delivery interval.

^a Values are given as number (percentage).

^b ≥5 deliveries.

Table 2
Distribution of decision-delivery intervals (n = 235).

Decision-to-delivery interval, min	No. (%)
≤30	5 (2.1)
31–75	81 (34.5)
76–120	77 (32.8)
121–180	35 (14.9)
181–240	18 (7.7)
241–300	7 (3.0)
301–360	5 (2.1)
>360	7 (3.0)

the participants were nulliparous (Table 1). The mean pregnancy duration at delivery was 38.0 ± 2.9 weeks. Only 100 (42.6%) women had received prenatal care in the hospital; the rest were referred as emergencies. No significant differences were recorded when participants were divided on the basis of whether the DDI was less than 75 minutes or at least 75 minutes (Table 1).

The mean DDI observed in the study was 119.2 ± 95.0 minutes. The median and mode values were 88 minutes and 70 minutes, respectively. The range was 5–750 minutes; the 5-minute interval occurred for a case of cord prolapse. Only in 5 (2.1%) cases did delivery occur within 30 minutes of the decision. Overall, 86 (36.6%) neonates were born within 75 minutes (Table 2).

Suspected fetal distress was the most common indication for CD (Table 3). Overall, 85 (36.2%) CDs were performed for a category 1 indication, only 3 (3.5%) of which were performed within 30 minutes. A total of 150 (63.8%) CDs were conducted for category 2 indications, 51 (34.0%) of which were performed within 75 minutes. Cord prolapse was associated with the shortest mean DDI (Table 3).

Among CDs with a DDI of more than 75 minutes, the observed causes of delay were mostly intrinsic (Fig. 1): logistic reasons (e.g. unavailability of materials, drugs, or consumables; electrical problems; and water shortages) accounted for most delays, followed by lack of blood for transfusion and lack of theater space (usually because a more urgent surgery was being conducted). Personnel delays included delays that occurred when surgeons, nurses, anesthetists, and pediatricians were attending to another patient.

Senior resident doctors performed 116 (49.4%) emergency CDs, registrars performed 110 (46.8%), and consultants performed 9 (3.8%). Regional anesthesia (subarachnoid block) was used for 196 (83.4%) CDs; the other 39 (16.6%) were conducted with general anesthesia. Epidural blocks were not used for any emergency surgeries in the present series.

Most neonates had a good outcome: 177 (75.3%) had a normal 1-minute Apgar score. The modal Apgar score at 1 minute was 9 (observed in 89 [37.9%] newborns). Three (1.3%) newborns were fresh stillbirths.

Table 3
DDI by indication for CD (n = 235).

Indication	No. (%)	DDI, min ^a
Category 1		
Prepartum hemorrhage	27 (11.5)	96.1 ± 57.7
Cord prolapse	4 (1.7)	31.3 ± 17.7
Suspected fetal distress	54 (23.0)	96.0 ± 41.8
All	85 (36.2)	93.0 ± 48.3
Category 2		
Failure to progress/failed induction of labor	40 (17.0)	107.4 ± 61.2
≥2 previous CDs but labor began spontaneously before planned CD	20 (8.5)	147.2 ± 80.5
Severe pre-eclampsia/eclampsia	34 (14.5)	131.9 ± 117.7
Prolonged obstructed labor	22 (9.4)	83.6 ± 35.0
Undiagnosed malpresentation in labor	18 (7.7)	154.2 ± 134.0
Other	16 (6.8)	236.1 ± 183.4
All	150 (63.8)	134.1 ± 110.6

Abbreviations: DDI, decision-to-delivery interval; CD, cesarean delivery.

^a Values are given as mean ± SD.

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