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Decision delivery interval of caesarean section and neonatal outcomes at a Tertiary Hospital in the Gambia

Abstract

Background: Following a caesarean section performed under spinal or general anaesthesia, a common implication is the association of neonatal outcome and decision delivery interval (DDI). The common assumption is, the longer the decision delivery interval, the poorer the neonatal outcome. Therefore, knowing this in our setting will inform practice and add value in our obstetrics practice.

Methodology: The design was a cross sectional study on women who had emergency caesarean section at Edward Francis Small Teaching Hospital from July to September 2023. A structured data collection tool was used to collect data. The data was entered into a computer database and analyzed using the SPSS version 26. Results were expressed in simple descriptive statistics with graphs and tables.

Results: Mean DDI was 132.5 minutes. Majority (66.2%) of the neonates had good Apgar scores at 1 minute of birth after emergency caesarean section. Majority (40.8%) of the emergency CS were performed within 75 minutes of the decision. The two (2) neonatal deaths had emergency caesarean section (EmCs) within 30 minutes and majority (62.5%) of the NICU admissions were for neonates delivered within 75 minutes of the decision. Ninety seven percent (97%) of the neonates survived.

Conclusion: A decision delivery interval of 31 to 75 minutes for emergency caesarean section was not associated with adverse neonatal outcome.

Keywords: Decision-delivery Interval, Caesarean Section, Neonatal Outcome Authors' Information

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Abbreviations: ACOG, American College of Obstetricians and Gynecologists; CS, caesarean section; DDI, decision delivery interval; EFSTH, Edward Francis small teaching hospital; EmCs, emergency caesarean section; NICU, neonatal intensive care unit; PNM, perinatal mortality; RCOG, Royal College of obstetricians and gynecologists

Introduction

Following a caesarean section performed under spinal or general anaesthesia, a common implication is decision delivery interval (DDI) and the association with neonatal outcome. The common assumption is, the longer the decision delivery interval, the poorer the neonatal outcome.[1] However, the decision concept and the clinical judgement behind such decisions may be at variance with the actual neonatal outcome. Therefore, it is essential to explore further on the decision rather than on the interval in performing caesarean section before believing an assumption and perhaps increase obstetrics interventions that could be avoided. Hence, some scholars working elsewhere defined decision-to-delivery interval as the interval between the time at which the senior obstetrician makes the decision that a caesarean section is required and the time at which the fetus (or first fetus in the case of multiples) is delivered.[1] The decision time should ideally be recorded contemporaneously in the medical notes or partogram. Obstetrics intervention is done because we would like to prevent feto-maternal morbidity and mortality which is a menace in middle and low income countries. Sustainable Development Goal (SDG) target 3.1 is to reduce maternal mortality to less than 70 maternal deaths per 100 000 live births by 2030.[2] The first month of life is the most vulnerable period for child survival, with 2.4 million newborns dying in 2020. Sub-Saharan Africa has the highest neonatal mortality rate in the world (27 deaths per 1000 live births) with 43% of global newborn deaths, followed by central and southern Asia (23 deaths per 1000 livebirths), with 36% of global newborn deaths.[3]

In the Gambia, Maternal deaths account for 17% of all deaths among women age 15-49. The maternal mortality ratio is estimated at 289 maternal deaths per 100,000 live births. The neonatal mortality rate was 29 deaths per 1,000 live births.[4]

Infant death in the first month of life (Neonatal mortality) may be associated with the events of labour. Similarly, neonatal morbidity may also be associated with events of labour ward. Therefore, exploring the relationship of decision delivery interval and neonatal outcome will add value in the knowledge of labour ward management.

In this study only one anaesthetic method (spinal anaesthesia) was used. Therefore, assessing for DDI was actually a secondary analysis of a primary study. Subarachnoid (spinal) block is a safe and effective anaesthetic procedure when the surgical site is located on the lower extremities, perineum (e.g. surgery on the genitalia or anus), or lower body wall (e.g. inguinal herniorrhaphy).[5] Subarachnoid blocks (SAB) popularly known as spinal anaesthesia however, is cheaper and brings maternal satisfaction to many mothers but the preparation also increase decision delivery interval.[6]

The use of spinal anaesthetic in emergency caesarean section in many settings including our obstetric practice in the Gambia has increased if not a norm. The skills of General anaesthesia among

trainee's may be affected as what they see more often is spinal anaesthesia. Many scholars, have reported various intervals and have some safety nets as to time intervals within which CS is performed and the neonatal outcome may not be adversely affected.[7–9] However, there are a few reports that spinal anaesthesia procedure contributes to delay in the decision-delivery interval.[10,11]

According to Royal College of Obstetricians and Gynecologists (RCOG) and American College of Obstetricians and Gynecologists (ACOG), the recommended decision to delivery interval (DDI) for category 1 caesarean section urgency classification is within 30 min.[12,13] Emergency Cesarean section (EmCs) can improve infant and/or maternal outcomes when decision delivery interval occur within 30 minutes as recommended by both colleges in such category of urgency classification. However, in many settings including our practice we have observed that achieving DDI of 30 minutes is difficult and we are worried about immediate neonatal outcome and survival within the first month of life. Also in some other places, scholars working in resource limited developing nations achieving the set target time of DDI was difficult and fetal deaths have occurred while waiting for EmCs.[14–17] Therefore, hospitals providing obstetric care should be able to respond to obstetric emergencies within the recommended time.[8,9,18]

In Ethiopia, the EmCS access is high.[19,20] However, similar to other developing nations, poor neonatal outcomes after delivery by EmCS were high, more so delivering within 30 minutes of such category of urgency is difficult.[21]

The relationship of DDI and feto-neonatal outcome is so strong that it is essential we put it in the right perspective in our practice. Our study was conducted on women who had emergency CS under spinal anaesthesia and we intended to determine DDI and neonatal outcome. The indication for EmCS was not included in the study.

Methodology

A cross sectional study design was used to conduct this research. The study population was women who had emergency caesarean section at Edward Francis Small Teaching Hospital between July and September 2023.

Sample size was calculated with G power 3.1 software. A sample size of 70 with effect size at 30% = 0.3, Power at 90, t-test at 0.05. Thirty percent (30%) was an assumption that 1 out of 30 emergency CS may have neonatal morbidity and or mortality, as neonatal mortality in the Gambia is estimated at 29 per 1000 live births in the Gambia demographic health survey of 2019/2020. This was used as the effect size to get a sample size of 70.

Inclusion and exclusion criteria

Women who were scheduled for caesarean section with the age range of 15 – 49yrs. The study was conducted on women who had emergency CS under spinal anaesthesia. The women who had elective CS were excluded.

Recruitment of study participants: this was conducted consecutively as they were prepared for emergency CS on the labour ward.

The age of participants were grouped from 15 years because reproductive age is 15 to 49 years.. However, none of the study participants was 15 or 16 years old. The youngest age was 17 years. Therefore, there was no parental consenting during the study.

Data collection

The study was conducted with a prospective data collection. The research assistant used a structured tool to collect information on both discrete and continuous variables. The sociodemographic characteristics, reproductive history; Urgency of Caesarean section (CS), decision delivery interval (DDI). The outcome measures includes the neonatal condition, DDI in relation to neonatal Apgar scores, NICU and survival. The outcome measure was on neonatal condition which was assessed by Apgar scores, admission into NICU and dead or alive. Apgar score of less than 7 at 5 minutes was used to describe fetal compromise. The Apgar score was correlated to time taken to achieve delivery from when the decision was reached. Apgar scores stratification includes <or 5 at 1 minute; < or 7 at 5 minutes; > or 6 at 1 minute. However, Apgar of 7 or less at 5 minutes was used for neonatal asphyxia. The indication for emergency CS was not a critical variable however, in our practice emergency CS is for obstetric conditions that present with life threatening condition to either or both mother and baby.

Data analysis

Data was entered into computer database and consistent checks instituted to ensure errors were corrected before analysis. Data was analyzed with SPSS version 26 and results expressed by simple descriptive statistics in tables and graphs.

Ethical considerations

Ethical approval was requested and secured from Research and Ethics Committee of Edward Francis Small Teaching Hospital. The letter of approval was used to have access to patients and medical files at the Obstetrics and Gynaecology department. Informed consent was obtained from all participants and personal information were confidential.

Results

Socio-demographic characteristics

A total of 71 participants who had emergency CS were analyzed. Majority belong to the age group between 21 to 30 years, 43(60.6%). The study population had a mean age of 28 years (SD±6.1). Majority of patients were married, 65(91.5%), with Muslim religion, 61(85.1%) and a secondary educational level 33(46.5%) predominant.

The two (2) neonatal deaths had emergency caesarean section (Emcs) within 30 minutes of the decision and majority (62.5%) of the NICU admissions were for neonates delivered within 75 minutes of the decision.

Discussion

The mean DDI reported in our study was 132.5 minutes which was lower than 183.24 minutes reported in an Indian study[15] but comparable with the study in Nigeria[17] that reported mean DDI of 145.3 minutes. Some scholars working in Tanzania[14] reported range of time as in shortest and longest time emergency caesarean section is achieved and corelated with indication for caesarean section and neonatal outcome. Table 1; shows socio-demographic characteristics of the study population which suggested that majority of them were in the age group between 21 to 30 years, 43(60.6%) and mean age of 28 years which was comparable with the study conducted by Owonikoko et al.[17] In their study age was not identified as a determinant of DDI.

Table 1 Distribution of women by socio-demographic characteristics. EFSTH; July to September 2023. n= 71

Socio-demographic characteristics	N	%
Age		
15 to 20	7	9.9
21 to 30	43	60.6
31 to 40	18	25.3
x41 to 50	3	4.2
Marital status		
Married	65	91.5
Single	6	8.5
Religion		
Christian	10	14.1
Muslim	61	85.1
Level of Education		
Islam/Arabic	10	14.1
Primary	13	18.3
Secondary	33	46.5
Tertiary	9	12.7
No formal education	6	8.5

In this study, we had two perinatal deaths, indication of EmCs was fetal distress and surgery was performed immediately within 30 minutes yet both had zero Apgar scores at one minute of birth. Table 3; shows that majority (40.8%) of the EmCs were performed at 31 to 75 minutes of the decision by the most senior member of the team. The Apgar scores shows that most (66%) of the neonates had good Apgar scores at one minute of delivery. These findings were similar to what is reported by scholars working in Nigeria[17] Tanzania[14] and Ethiopia.[19] The findings may suggest that if there was no acute immediate life threat of the fetus EmCs with DDI longer than 30 minutes may not be associated with poor neonatal outcome.

Table 2 Reproductive health characteristics. EFSTH; July to September 2023. n= 71

Clinical characteristics(general)	N	%
Parity		
Para (0 to 3)	55	77.5
Para (4 to 8)	16	22.5
Previous History of CS		
No	57	80.3
Yes	14	19.7
Gestational Age (weeks)		
28 to 31	2	2.8
32 to 36	20	28..2
37 to 41	49	69

Majority had low parity of 0 to 3= 55 (77.5%), 19.7 approximately 20% had previous CS and predominantly CS was performed at term (69%).

Table 3 The relationship of decision delivery interval (DDI) and Apgar Score

DDI (Minutes)						
APGAR Scores	**0-30**	**31-75**	**76-120**	**>120**	**n**	**%**
≤ 5 αt 1 μιν	2	7	2	0	11	15.5
≤ 7 αt 5 μινσ	2	6	1	4	13	18.3
≥6 αt 1 μινυτε	2	16	14	15	47	66.2
Total	6	29	17	19	71	100

Mean DDI was 132.5 minutes. Eleven (15.5%) neonates had low Apgar score at 1 minute of birth. Thirteen (18.3%) had low Apgar score at 5 minutes. Majority (66.2%) of the neonates had good Apgar scores at 1 minute of birth. Majority (40.8%) of the emergency CS were performed within 75 minutes of the decision.

Figure 1; shows that majority (62.5%) of the neonatal intensive care unit (NICU) admissions were for neonates delivered within 75 minutes of the decision. This is expected as most of the deliveries occurred within this time and many babies with suspected fetal compromise at or immediately after emergency caesarean delivery were taken to neonatal intensive care for review, observation or admission as the case requires.

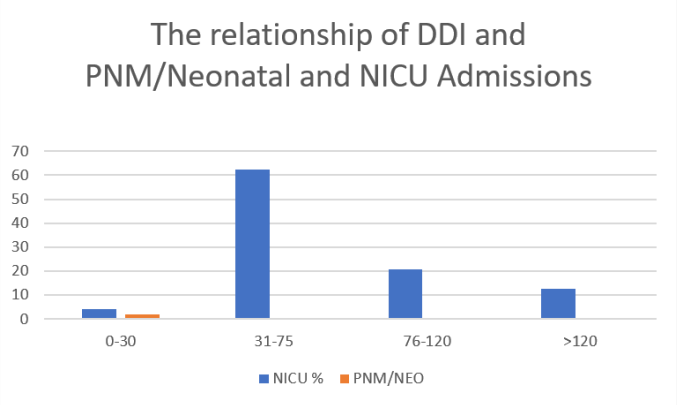

Figure 1 The decision delivery interval and perinatal/neonatal mortality and admission into neonatal intensive care unit (NICU).

The study observed in figure 2; that ninety seven percent (97%) of the neonates survived after emergency caesarean section irrespective of the Apgar scores, DDI and NICU admissions. Other researchers had reported similar findings.[22–24] However, a national review of population based birth registry in Ethiopia[21] showed that about 14% of the newborns were stillbirths or died shortly after birth. The 14% is very significant as this was a population based study. Also some scholars working elsewhere had reported that when mean DDI exceeds 75 minutes, there was a 4.6 fold increase in the risk to the life of neonate while the maternal outcome was not significantly affected.[12,13]

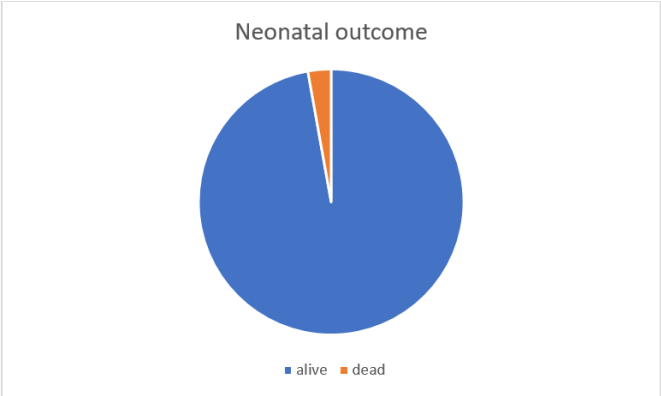

Figure 2 Neonatal outcome of the emergency CS: Ninety seven percent (97%) of the neonates survived.

The dead neonates had DDI of less than 30 minutes which may justify the saying that neonatal survival at emergency CS (EmCs) may depend more on the indication of the EmCs and not primarily on DDI.

Table 2 shows approximately a quarter (20.0%) had repeat caesarean section in this study and Majority 55 (77.5%) had low parity of 0 to 3. Similarly, in the study reported by scholars working in Ethiopia and The UK suggests that survival of neonates after caesarean section does not depend on how many previous caesarean sections or parity of the parturient.[21,24]

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Conclusion

Mean DDI was 132.5 minutes. At emergency cs the decision delivery interval of 31 to 75 minutes was the time majority of the deliveries occurred. Although majority of the neonates were taken to NICU but all survived. The two neonatal deaths had cs within 30 minutes yet no Apgar scores at delivery, therefore the reason for EmCs and intrauterine condition of the fetus may have strong implication as to neonatal survival than DDI of within 75 minutes.

Study limitations

This study was not population-based and mainly included women who underwent Caesarean Section at Edward Francis Small Teaching Hospital (EFSTH). As a result, we were not able to apply the findings of the research to the entire Gambian population. Also the same size was small and may not detected rare neonatal morbidities. By default all emergency CS were performed under spinal anaesthesia, which we consider also a limitation.

Declarations

Ethics approval and consent to participate:

Ethical approval was requested and secured from Research and Ethics Committee of Edward Francis Small Teaching Hospital. The letter of approval was used to have access to patients and medical files at the Obstetrics and Gynaecology department. Informed consent was obtained from all participants and personal information were confidential.

Consent to publish

Not applicable.

Availability of data and material:

The datasets generated and/or analysed during this study are available and can be shared on reasonable request. The corresponding author should be contacted. The contact details includes: Matthew Anyanwu; Consultant Obstetrician and Gynaecologist, Edward Francis Small Teaching Hospital Banjul. anyanwum@yahoo.comm, +2207786700.

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None.

Conflicts of interest

There is no competing interests between the authors.

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References

1. Chauleur C, Collet F, Furtos C, et al. Identification of factors influencing the decision–to–delivery interval in emergency cesarean sections. *Gynecol Obstet Invest*. 2009;68:248–254.
2. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. 2023.
3. World Health Organization. Newborn mortality. 2022.
4. Gambia Bureau of Statistics (GBoS) and ICF. 2021. The Gambia demographic and health survey 2019–20. Banjul, The Gambia and Rockville, Maryland, USA: GBoS and ICF.
5. Swarup Sri Varaday. Subarachnoid spinal block. Drugs & Diseases > Clinical Procedures. 2018.
6. Nuhu Si, Embu Henry, Shambe Iornum. Prevalence of Post–Dural puncture headache among caesarean section patients in North Central, *Nigeria Journal of Medical Sciences*. 2017.
7. Organization WH. WHO recommendations non–clinical interventions to reduce unnecessary caesarean sections: World Health Organization; 2018.
8. Health FMo. Management protocol on selected obstetrics topics: Federal Democratic Republic of Ethiopia; 2010.
9. Tashfeen K, Patel M, Hamdi IM, et al. Decision–to–delivery time intervals in emergency caesarean section cases: repeated cross–sectional study from Oman. S*ultan Qaboos Univ Med* J. 2017;17(1):e38–42.
10. Hirani BA, Mchome BL, Mazuguni NS, et al. The decision delivery interval in emergency caesarean section and its associated maternal and fetal outcomes at a referral hospital in northern Tanzania: a cross–sectional study. *BMC Pregnancy Childbirth*. 2017;17(1):411.
11. Radhakrishnan G, Yadav G, Vaid NB, et al. Factors affecting "decision to delivery interval" in emergency caesarean sections in a tertiary care hospital: a cross sectional observational study. *Int J Reprod Contracept Obstet Gynecol*. 2013;2(4):651–656.
12. Soltanifar S, Russell R. The National Institute for health and clinical excellence (NICE) guidelines for caesarean section, 2011 update: implications for the anaesthetist. *Int J Obstet Anesth*. 2012;21(3):264–272.
13. Obstetricians ACo, Safety GCoP. Improvement Q: ACOG Committee Opinion No. 487: preparing for clinical emergencies in obstetrics and gynecology. *Obstet Gynecol*. 2011;117(4):1032–1034.
14. Hirani BA, Mchome BL, Mazuguni NS, et al. The decision delivery interval in emergency caesarean section and its associated maternal and fetal outcomes at a referral hospital in northern Tanzania: a cross–sectional study. *BMC Pregnancy Childbirth*. 2017;17(1):411.
15. Radhakrishnan G, Yadav G, Vaid NB, et al. Factors affecting "decision to delivery interval" in emergency caesarean sections in a tertiary care hospital: a cross sectional observational study. *Int J Reprod Contracept Obstet Gynecol*. 2013;2(4):651–656.
16. Kamotho D, Pertet A, Ogwayo I. Decision to incision interval for emergency caesarean section and postoperative outcomes in a resource limited rural Kenyan public hospital. *Int J Reprod Contraception Obstetrics Gynecology*. 2018;7(7):2573.
17. Owonikoko K, Olabinjo A, Bello–Ajao H, et al. Determinants of Decision to Delivery Interval (DDI) in Emergency Caesarean Sections in Ladoke Akintola University of Technology Teaching Hospital Ogbomoso, Nigeria. *Clin Mother Child Health*. 15:294.
18. Gholitabar M, Ullman R, James D, et al. Caesarean section: summary of updated NICE guidance. *BMJ*. 2011;343(nov23 1):d7108.
19. Ayano B, Guto A. Indications and outcomes of emergency caesarean section at St Paul's Hospital Medical college, Addis Ababa, Ethiopia 2017:(afoul month retrospective cohort study). investigation in gynecology research and women health 2018.
20. Abebe FE, Gebeyehu AW, Kidane AN, et al. Factors leading to cesarean section delivery at Felegehiwot referral hospital, Northwest Ethiopia: a retrospective record review. *Reprod Health*. 2015;13(1):6.
21. Fesseha N, Getachew A, Hiluf M, et al. A national review of cesarean delivery in Ethiopia. *Int J Gynecol Obstet*. 2011;115(1):106–11.
22. HE Onah, N Ibeziako, AC Umezulike, ER, et al. Decision–delivery interval and perinatal outcome in emergency caesarean sections. *Journal of Obstetrics and Gynaecology*. 2005;25(4):342–346.
23. Chukwudi OE, Okonkwo CA. Decision – delivery interval and perinatal outcome of emergency caesarean sections at a tertiary institution. *Pak J Med Sci.* 2014;30(5):946–950.
24. May RL, Clayton MA, Richardson AL, et al. Defining the Decision–to–Delivery Interval at Cesarean Section: Narrative Literature Review and Proposal for Standardization. *Obstetric Anesthesia Digest*. 2022;77(1):96–104.