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Decision to delivery interval and perinatal outcome for category one caesarean section in a tertiary hospital

Attah Raphael Avidime,[1] Abba Zainab,[2] Galadanchi Hadiza[1]

[1]*Department of Obstetrics and Gynaecology, Bayero University Kano/Aminu Kano Teaching Hospital, Kano.*
[2]*Department of Obstetrics and Gynaecology, Aminu Kano Teaching Hospital., Kano*

Abstract

Background: The Royal college of obstetrics and gynaecology and the American College of Obstetrics and Gynecology recommend a maximum interval of 30 minutes between the decision to perform an emergency caesarean section and delivery of the baby (DDI), when there is an immediate life threatening condition to the mother or baby. So far, this has been a herculean task in the majority of the developing nations.
Objectives: To determine the decision-to-delivery interval and perinatal outcome for category one caesarean section in Aminu Kano Teaching Hospital, Kano.
Methods: A One Year Retrospective study of category one caesarean section performed in Aminu Kano Teaching Hospital between 1st January 2018 and 31st December 2018.
Results: The mean DDI was 114.4 minutes. Only 6.2% were delivered within the recommended 30 minutes DDI. There was no significant association between the DDI and adverse perinatal outcomes but a significant association was found between the indication for the crash caesarean section and adverse perinatal outcome. The major determinants of prolonged DDI were maternity unit delays, anaesthetist delay, patient refusal to sign consent and busy operating rooms.
Conclusion: The mean DDI was longer than the recommended DDI of 30 minutes. Although this had no impact on perinatal outcome in this study. However, the perinatal outcome largely depended on the indication for the caesarean section.

Keywords: Decision-to-delivery interval, category one caesarean section, perinatal outcome

Introduction

Emergency caesarean section is indicated when delivery can lead to a reduction in the risk to the life of the mother or fetus.[1] In the past, caesarean section was traditionally classified into elective and emergency. This has been
found to be of limited value for data collection and audit of obstetric and anaesthetic outcomes because the spectrum of urgency that occurs in obstetrics is lost within a single emergency category.[2] In 2002, Lucas et al[3] proposed a new classification after a 2-part study that involved obstetricians and anaesthetists based on clinical definitions and came up with four categories. Category one caesarean section is that in which there is an immediate threat to life of woman or fetus and requires immediate delivery while in category two, the threat is not immediate. Category three is that in need of early delivery but there is no compromise whereas category four is done at a time to suit the patient and maternity unit.

Decision-to delivery interval is that interval between a decision to perform an emergency caesarean section and the actual delivery of the baby.[4] In life threatening conditions, i.e category one caesarean section, the American College of

Corresponding Author: Dr Attah Raphael Avidime

Department of Obstetrics and Gynaecology,
Aminu Kano Teaching Hospital, Kano,
PMB 3452, Kano, Nigeria.
E-mail: attahraph@yahoo.com, Phone Number: +2348060296224

Obstetrics and Gynaecology and the Royal College of Obstetrics and Gynaecology recommend a maximum interval of 30 minutes between the decision to perform an emergency caesarean section and delivery of the baby.[5] Category 2 caesarean section is safely performed within 60 to 75 minutes while category 3 caesarean section is performed within hours. In Germany, 64.6% of category one caesarean sections are performed within 10 minutes of decision while 98.9% of all category one caesarean sections are done within 20 minutes of decision to perform them.[6] Every obstetric unit should have the capacity to perform emergency caesarean section in 30min of decision for fetal safety. This is however not obtainable in the vast majority of the developing nations.

The indications for crash caesarean section include cord prolapse, failed instrumental birth with fetal compromise, maternal cardiac arrest, abnormal fetal scalp blood sample/ pH (high lactate or pH < 7.2), confirmed fetal blood (Apt's test) indicating ruptured fetal blood vessels e.g Vasa Praevia, placental abruption with a live baby, placenta praevia with major haemorrhage, identified irreversible abnormalities on the CTG that require immediate delivery (sustained fetal bradycardia and prolonged deceleration > 3min), uterine rupture and scar dehiscence. [7]

Prolonged DDI is considered a third phase delay in emergency obstetric care.[4] Evidence suggest that any delay is usually associated with the delay in transfer to theatre.[8,9,10] Notable causes of delay include maternity unit delays due to non availability of basic investigations, arrangement for blood and medications and delay in shifting patient to theatre. Anaesthetic delays include non availability of operating table and type of anaesthesia administered. General Anaesthesia is associated with a shorter DDI but worse perinatal outcomes than regional anaesthesia.[8] Yakasai et al reported anaesthetic delay as the commonest cause of delay in Kano.[11] Other causes of delay include poor communication between team members and patient factors such

as refusal to sign consent. Day time CS has been found to have longer DDI than CS performed during call hours.[8] Seniority of managing surgeon did not affect the interval in Mackenzie IZ study.[12]

Most of the studies done to determine the DDI and perinatal outcome have shown positive results for category one caesarean section when done within 30 minutes of decision whereas prolongation of time interval for more than 60 minutes lead to adverse fetal outcome.[10] Nakintu et al showed no maternal or fetal adverse outcome in mothers whose DDI was within 30 minutes.[13] The studies done across Nigeria did not show a significant correlation between the decision delivery interval and adverse perinatal outcome though most of them were not specific for category one caesarean section.[11,14,15,16] Furthermore, confirmatory tests of fetal distress are not readily available and many fetuses delivered for this reason have a good 5 minutes APGAR score. These studies consistently showed that the recommended DDI of 30 minutes is not currently feasible in Nigeria. Cord prolapse and antepartum haemorrhage were found to be associated with worse perinatal outcome.[8] In view of this, Mishra et al recommend that crash CS for cord prolapse and catastrophic antepartum haemorrhage should be a separate group.[17]

Aim

To determine the decision-to-delivery interval and perinatal outcome for category 1 caesarean section in Aminu Kano Teaching Hospital.

Inclusion Criteria

To determine the indications for category 1 caesarean section in Aminu Kano Teaching Hospital from 1st Jan 2018 to 31st Dec 2018.

To determine the decision to delivery interval for category 1 caesarean.

section in Aminu Kano Teaching Hospital from 1st Jan 2018 to 31st Dec 2018.

To determine the perinatal outcome of babies delivered by category 1.

caesarean section from 1st Jan 2018 to 31st Dec 2018.

To determine the causes of delay in performing category 1 caesarean section in Aminu Kano Teaching Hospital from 1st Jan 2018 to 31st Dec 2018.

Materials and method

This is a retrospective study carried out in the department of Obstetrics and Gynaecology of Aminu Kano Teaching Hospital, Kano, Kano state. Labour ward and theatre registers were used to extract file numbers of patients that had category 1 caesarean section and their case notes were

retrieved from the medical records department of the hospital. The case records and antenatal data of all the women who had category1 caesarean section at Aminu Kano Teaching Hospital from 1st January 2018 to 31st December 2018 were retrieved and analysed. Data was analysed using SPSS version 21. Qualitative data was analysed using Fisher's test of statistical significance. Frequency and percentages were used for quantitative variables.

Results

A total of 2999 deliveries occurred during the study period of one year. Out of these, 584 were caesarean sections and 14 were laparotomies for ruptured uterus giving a caesarean section rate of 19.9%. Of this, 333 were performed as emergency. Category one caesarean section accounted for 77 cases giving an overall prevalence of 2.6% of the total deliveries, 12.9% of the total caesarean sections and 23.12% of emergency caesarean sections. Fourty eight folders were retrieved giving a retrieval rate of 62.3%.

Table 1 shows the sociodemographic characteristics of the study population. The age of the study population ranged between 20 and 40 years with a mean of 29.9 years. Majority of the women fell in the 30-34 years age group (31.3%). Their parity distribution ranged from 0-9 with primigravidity constituting 25% while multigravidity and grandmultiparity accounted for 37% each. Majority of the women presented at term (64.6%) while only 8.3% were post term. Eighty seven percent of the women were either booked at AKTH or another facility while 13% were unbooked.

Table 2 shows the various indications for category one caesarean section. The commonest indication for category 1 caesarean section was fetal distress accounting for 31.3%. Other indications were abruptio placenta with a live fetus (20.8%), cord prolapse (16.7%), ruptured uterus (14.6%), pathological CTG requiring urgent delivery (8.3%) and placenta praevia with major haemorrhage (8.3%).

The decision-to-delivery interval (DDI) ranged between 20 and 720 minutes. The mean DDI was 114.4 minutes (1.9hrs) and the median was 89 minutes. The recommended DDI of 30 minutes was achieved in 6.2% of cases while 93.8% were delivered after 30 minutes interval. Table 3 shows the average DDI for the various indications. Cord prolapse had the shortest mean DDI of 49.5 minutes while the longest mean DDI of 302 minutes was observed with placenta praevia with major haemorrhage. The mean DDI for the commonest indication (fetal distress) was 94 minutes. The majority of the women had general anaesthesia (60.4%), 31.3% had spinal anaesthesia while 8.3% had a failed spinal that was converted to general anaesthesia. Most of the surgeries were performed by the senior registrars (72.9%), 20.8% were performed by the registrars and 6.3%were done by the consultants. However, seniority of managing surgeon did not affect the DDI. Call time caesarean sections were associated with a shorter mean DDI (102.3 minutes) than those performed during working hours (127.6 minutes).

Table 4 gives a summary of the observed adverse perinatal events. Majority of the cases (60.4%) did not experience any adverse perinatal and fatal outcomes while 39.6% had at least one adverse outcome. Some of the babies had more than one adverse outcome giving a cumulative occurrence of the individual complications at 56.2% (i.e 27 complications in 19 babies). The fetal complications studied were low APGAR score at 5 minutes, neonatal intensive care admission, still births and early neonatal deaths. The commonest adverse outcome was Low APGAR score at 5 minutes observed in 18.6% of cases. Neonatal intensive care admission was seen in 16.7% of cases, 14.6% were stillbirths and 6.3% of the neonates died during the early neonatal period. However, when these data were subjected to statistical test, there was no difference in occurrence of fetal outcome in those done within 30 minutes of the DDI or more.

It was observed that adverse perinatal outcome occurred more frequently
in some indications than with others. This was seen in 100% of those with ruptured uterus, 50% of those with placenta praevia and major haemorrhage, 40% 0f abruptio placenta and live baby, 37.5% of cord prolapse, 25% of pathological CTG and 6.7% of patients with fetal distress. The association between indication for caesarean section and occurrence of adverse perinatal outcome was statistically significant.

The reasons for delay in achieving the WHO recommended decision to delivery interval of 30 minutes for category 1 caesarean section are presented in table 5. The commonest cause of delay

was shifting patients to theatre during the change over period for labour ward and theatre staff, occurring in 48.9%. This was followed by anaesthetist delay in 13.3%. Patient delay in obtaining consent for surgery and resuscitation accounted for 11.1% each. Lack of theatre space was the reason in 8.9% of cases while delay in getting blood was the least occurrence found in 6.7% of the cases.

Table 6 shows the relationship between the decision delivery interval and occurrence of adverse perinatal outcome. No statistically significant association was found between the decision to delivery interval and occurrence of adverse perinatal outcome.

Table 7 shows the relationship between indication for category one caesarean section and occurrence of adverse neonatal outcome. A statistically significant association was found between the various indications for caesarean section and occurrence of adverse neonatal outcome.

Table 1: Socio demographic characteristics

Characteristics	Frequency	%
Age distribution (yrs)		
20-24	9	18.7
25-29	11	22.9
30-34	15	31.3
35-39	12	25.0
40-45	1	2.1
Total	48	100
Parity distribution		
0	12	25.0
1-4	18	37.5
>/ 5	18	37.5
Total	48	100
Gestational age		
Preterm	13	27.1
Term	31	64.6
Post term	4	8.3
Total	48	100
Booking status		
Booked	42	87
Unbooked	6	13
Total	48	100

Table 2: Indications for category 1 CS

Indications	Frequency	%
Fetal distress	15	31.3
Abruptio placenta	10	20.8
Cord prolapse	8	16.7
Ruptured uterus	6	14.6
Placenta Praevia	4	8.3
Pathological CTG	4	8.3
Total	48	100

Table 3: Average DDI for the various Indications for CS

Indications	Mean (min)	Median (min)	Range (min)
Cord prolapse	49.5	47.0	35-75
Abruptio placenta +live baby	80.7	60.0	20-187
Fetal distress	94.0	90	29-180
Pathological CTG	103.0	100.5	32-179
Ruptured uterus	179.5	120.0	102-500
Placenta praevia	302	200.0	88-720

Table 4: Observed adverse perinatal outcomes

Adverse outcome	Frequency	%
Low APGAR at 5 min	9	18.6
SCBU admission	8	16.7
Still births	7	14.6
Early neonatal death	3	6.3
Total	27	56.2

Table 5: Reasons for delay in achieving recommended DDI of 30 min

Cause of delay	Frequency	%
Shifting to theatre	22	48.9
Anaesthetist delay	6	13.3
Patient delay	5	11.1
Resuscitation	5	11.1
Busy theatre	4	8.9
Blood arrangement	3	6.7
Total	45	100

Table 6: Relationship between DDI and adverse perinatal outcome

	Adverse outcome		Total	Statistical test
DDI	+	–		**Fisher's exact test 2.09 P-value 0.267**
Achieved	**0**	**3**	**3**	
Not achieved	**19**	**26**	**45**	
Total	**19**	**29**	**48**	

Table 7: Relationship between indication for CS and adverse perinatal outcome

	Adverse outcome		Total	Statistical test
Indication	**_**	**+**		**Fisher's exact test 19.217 P value is <0.001**
Fetal distress	**14**	**1**	**15**	
Placental abruption	**6**	**4**	**10**	
Cord prolapse	**4**	**4**	**8**	
Pathological CTG	**3**	**1**	**4**	
Ruptured uterus	**0**	**7**	**7**	
Placenta praevia	**2**	**2**	**4**	
Total	**29**	**19**	**48**	

Discussion

The prevalence of category one caesarean section from this study is 2.57% of total deliveries. This is lower than the 3.8% reported in a study by Leah et. al.[18] The mean age of the women is 29.9 years. This is similar to 27.2 years reported by Yakasai et al.[11] from a previous study in Kano and 28.9 years by Owonikoro et al in Ogbomoso.[16] Eighty-seven percent of the women were booked in this study. This is much higher than 51.3% reported by Owonikoro et al.[16]

The commonest indication for category one caesarean section in the study
is fetal distress. This is similar to the findings of Leah et al[18] in Australia and Clare et al[8] in Singapore whose studies were done specifically for category one caesarean section but contrary to the findings of Owonikoro et al[16] and Yakasai et al[11] who reported cephalopelvic disproportion as the commonest indication from their studies because they considered emergency caesarean section in general.

The average decision-to-delivery interval for category one caesarean section from this study was 114.4 minutes. This is much greater than the recommended DDI of 30 minutes by the RCOG and ACOG. This is far higher than 9.4 minutes reported by Clare et al[8] in Singapore, 27.4 minutes by Mackenzie et al[12] in the United Kingdom, 36.3 minutes by Gupta et al[20] in India, 60 minutes by Hirani et al[4] in Tanzania and 106.3 minutes by Chukwudi et al[15] in University of Benin Teaching Hospital. This is however lower than 137 minutes reported by Yakasai et al[11] in Kano and 511 minutes found by Onah et al,[14] at University of Nigeria Teaching Hospital Enugu, though these studies were not specific for category one caesarean section. The median DDI was found to be 89 minutes. This is close to 82 minutes revealed by Khemanat et al[19] in Thailand but much lower than 178 and 290 minutes reported from two hospitals in Kenya.[22] Only 6.2% (3) of the caesarean sections were done within the WHO recommended DDI of 30 minutes. This is quite low when compared to the 100% achieved in Germany and India as shown in the studies done by Heller et al[6] and Clare et al[8] respectively. It is much lower than 59% achieved in Chauhan et al[21] and 18.8% in a study by Khemanat et al[19] in Thailand. These differences may be attributed to the advanced healthcare, availability of personnel and equipment in developed countries compared to the developing country like ours where this study was done. However, it is higher than 0.7% achieved by Nakintu et[13] al in Uganda,1% by Hali et al[22] in Kenya and 5.7% by Chukwudi et al[15] in University of Benin Teaching Hospital (UBTH), Nigeria.

The shortest mean DDI in this study was observed in cases of cord prolapse. This is the same as the finding of Yakasai et al[11] in a previous study in the

same hospital but contrary to cephalopevic disproportion and uterine rupture as was the case in a study by Hirani et al.[4] in Tanzania. This could be attributed to a possible difference in relation to perception of the emergency with the different indications for surgery. The mean DDI for fetal distress was 94 minutes. This is higher than 71.1 minutes reported by Mackenzie et al[12] for the same indication in the UK being an industrialized country. This study showed that caesarean sections done during call time were associated with a shorter mean DDI (102.3 minutes) compared to those performed during the day time (127.6 minutes). Elective cases done during working hours make theatre space unavailable thereby prolonging the DDI. This is the same as the finding of Nakintu et al[13] in Uganda whose study was done in a similar low resource setting but contrary to that of Clare et al[8] where caesarean sections performed during call duty had a longer mean DDI probably because of more manpower during office hours.

No adverse perinatal outcome was observed in the majority (60.4%) of cases in this study. This is similar to the findings of Yakasai et al[11] and Nakintu et al[13] whose studies were also done in low resource settings. The concept of fetal distress is poorly defined in low resource settings due to unavailability of confirmatory tests like fetal scalp blood sampling for pH and lactate. The commonest adverse outcome observed in the study was low 5 minutes APGAR score identified in 18.6% of cases. This is similar to 20.9% found by Yakasai et al[11] in a previous study but higher than 6.7% found by Khemanat et al[19] and 5.8% observed in Leah et al[18] study. Other complications that were looked into include SCBU admission, stillbirths and early neonatal deaths. Perinatal death occurred in 20.8% of cases.

No significant association was found between DDI and perinatal outcome. This is contrary to the findings of Heller et al[6] in Germany whose study revealed for the first time an association between DDI and adverse fetal outcomes, being the largest population based (39,291), risk adjusted analysis in this topic. Tsankova et al also showed a positive correlation for category one caesarean section.[10] A study done by Clare et al[8] did not reveal a significant correlation between DDI and perinatal outcome. Leah et al[18] found that perinatal outcome depends on gestational age and indication for delivery where cord prolapse and abruptio placenta had the worst perinatal outcome. This is comparable to the findings from this study where ruptured uterus, cord prolapse and abruptio placenta were most commonly associated with adverse outcomes. Tomlinson et al[1] stated that certain indications necessitate a much shorter DDI but evidence suggests that the majority of neonates can be safely delivered within a longer time interval. Current tools for the diagnosis of fetal distress are imperfect therefore concept of fetal distress is poorly defined as reflected in this study because despite being the commonest indication (15), 31.3%, it was the least associated with adverse fetal outcome (1), 6.7%.

The major cause of failure to meet the 30 minutes recommended by WHO was wheeling the patient to theatre. This accounted for about half of the delays and is the same as the finding of Gupta et al[20] and Onwudiegwu et al[23]. In contrast, patient factor accounted for 53.5% of the delays reported by Owonikoro et al.[16] Other delays were due to anaesthetist delay as reported by Onah et al[14] and Chukwudi et al[15] as the leading cause of delay in their studies, Fayyaz et al[9] found busy theatre as the commonest delay in his study in Pakistan. Other delays found in this study include serving of emergency medications and arranging for blood especially in patients with antepartum haemorrhage and severely elevated blood pressure with some degree of anemia.

Conclusion

The mean DDI for category one caesarean section at Aminu Kano Teaching Hospital was found to be 114.4 minutes which is high compared to WHO recommendation of 30 minutes. Only 6.2% of the caesarean sections were performed within the 30 minutes recommended DDI for category one caesarean section. However, the DDI had no impact on perinatal outcomes in this study. Achieving the 30 minutes DDI may not be feasible in most Nigerian hospitals. Maternity unit delays constitute the major delays in carrying out emergency caesarean sections. This need to be reduced in order to overcome the 3rd phase delay in receiving the definitive care by women with labour

complications.

Recommendations

The hospital management should encourage effective communication and team work between the doctors, nurses and other adhoc staff to ensure timely delivery of services.

Proper documentation should always be done in clear hand writing by doctors in patient case notes as well as appropriate filling of the CS proforma and post-operative notes.

Increasing the number of heath personnel; doctors, nurses, and especially anesthetists will go a long way in reducing DDI.

Limitations

1. Difficulty retrieving case notes from record office and missing folders.
2. Confounding factors such as prematurity and late presentation of patients contributed to occurrence of adverse outcomes.
3. Follow-up to determine late neonatal deaths was not feasible.

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