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Decision-to-delivery interval in non-Elective Caesarean section: Is it optimal in our hospitals

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بسم الله الرحمن الرحيم

قال تعالي:

(وقل رب زدني علماً)

صدق الله العظيم

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Dedication

To:

the spirit of my wife (Hagir)
who shade my life with love and sacrifice,

&

to my children.

Acknoledgement

My great thanks and sincere love to the professor of generations, my supervisor, Prof. Abdel Salam Gerais and to every one who stretched a hand to help me.

I am also thankful to all my teachers from whom I gained this little experience, and whose guidance light the way for me.

ABBREVIATIONS

Abbreviation	Meaning
C/S	Caesarean Section
LSCS	Lower Segment C/S
ELC/S	Elective C/S
EM C/S	Emergency C/S
DDI	Decision-to-delivery interval
GA	General anaesthesia
SPA	Spinal Anaesthsia
NICU	Neonatal Intensive Care Unit
SD	Standard deviation
BW	Birth weight
U/S	Ultra Sound
ENND	Early Neonatal death
U.K	United Kingdom
KTH	Khartoum Teaching Hospital
KNTH	Khartoum North Teaching Hospital
OMH	Omdurman Maternity Hospital
SUH	Soba University Hospital
TTT	Theatre Transit Time

ABSTRACT

Objectives: To study the time interval from decision to delivery of the baby (DDI) in non ELC/S, factors influencing this period of time, and it's reflection on early neonatal and maternal outcome.

Settings: Main capital hospitals, Khartoum Teaching Hospital (KTH), Omdurman Maternity Hospital (OMH), Khartoum North Teaching Hospital (KNTH), Soba University Hospital (SUH).

Subjects: 323 non ELC/S done in the period from 1st Jan. to 31st Jan.2003.

Results: DDI found to be, 46 minutes (mean) for 273 (84%) EmC/S, 20.5 minutes (mean) for (9%) crash C/S, 66.5 minutes (mean) for 21(7%) urgent C/S. Percentage achievement of DDI < 30 min was 48%, which is comparable with that in the literature. With regard to the factors influencing the DDI like, preparation of the patient requirements, fees, (previous C/S Scar found not affecting DDI nor the state of the lady being educated or not). With general anaesthesia DDI was found to be less than DDI with spinal anaesthesia and the difference was statistically significant (P>0.05) but not affecting the early neonatal and maternal out come, seniority of the operator was also found to affect the DDI (SUH) and the difference between non EIC/S DDI done by registrar and that done by house-officer

was statistically significant also (P > 0.05) but also not affecting the outcome.

Early neonatal outcome in EmC/S group (273) we had one ENND and 272 were in good condition, 11(4%) were admitted in NICU and discharged in good condition, Apgar score at 1 min <3 =1, Apgar score at 5 min >7 =272, average weight 3.1kg. In the crash C/S 29(9%) Apgar score at 1 myn <3 =0, Apgar score at 5 min >7 =29, no admission in NICU average weight 2.9 kg. For urgent C/S 21(7%), Apgar score at 1 min <3 =0, Apgar score at 5 min >7 =21, admission to NICU were 4(19%) of the urgent group. Discharged in good condition average weight 2.8kg. With regard to maternal outcome all were favourable all 323 non EIC/S recover smoothly from anaesthesia (where G.A was used in 83%). Day three maternal haemoglobin was 70% (mean) for the EmC/S, 69% for crash C/S, and 71.5% for the urgent C/S. The need for maternal blood transfusion was like that, 3.2% for EmC/S [273 (84%)], 6.8% of the crash C/S [29 (9%)], and 0% for urgent C/S [21 (7%)].

Conclusion: In 323 non EIC/S, 48% were done in less than or equal 30 minutes. Short-term neonatal and maternal outcome was favourable.

ملخص الأطروحة

تمت هذه الدراسة الوصفية المستقبلية فى مستشفيات العاصمة المثلثة، مستشفى الخرطوم التعليمي، مستشفى الخرطوم بحري التعليمي، مستشفى الولادة أم درمان ومستشفى سوبا الجامعي فى الفترة من ١/يناير إلى ٣١/ يناير ٢٠٠٣م.

أغراض وأهداف الدراسة: قياس الفترة الزمنية من لحظة اتخاذ قرار القيصرية الطارئة إلى ولادة الطفل والعوامل المؤثرة فى ذلك الزمن سلباً وإيجاباً وتأثيره فى المدى القصير بعد الولادة على الأم وطفلها حديث الولادة.

النتائج: كانت الفترة الزمنية من اتخاذ القرار إلى ولادة الطفل تساوي ٤٦ دقيقة (المتوسط) بالنسبة للعمليات الطارئة، ٢٠,٥ دقيقة للعمليات المستعجلة جداً، ٦٦,٥ دقيقة للعمليات المستعجلة وهى زمن جيد مقارنة بالدراسات الأخرى. من العوامل المؤثرة على هذه الفترة الزمنية وجود قيصرية سابقة، نوع التخدير المستعمل (عام، نصفي، موضعي)، كذلك خبرة من يقوم بعمل القيصرية واختلاف المستشفيات المذكورة فى التحضير للمتطلبات القيصرية (محاليل وريدية، قسطرة + كيس البول، مضادات حيوية، لصقة للجرح، تحضير الدم مستعجل للعملية) هذه التجهيزات مجانية فى بعض المستشفيات وهذا يساعد على تقليل هذه الفترة الزمنية. وفى المستشفيات التى لا تقدم هذه الأدوية والخدمات يضطر ذوو المريض لإحضارها مما يؤدى إلى تأخير العملية مما ينعكس سلباً على صحة الأم والطفل.

بخصوص النتائج قصيرة الأمد بالنسبة للأطفال حديثي الولادة من ٢٧٣ قيصرية طارئة كان هناك طفل واحد توفى فى اليوم الأول والبقية بحالة جيدة، تم إدخال ١١ طفل إلى العناية المكثفة بقسم الأطفال وخرجوا بحالة جيدة، ٢٩ قيصرية طارئة جداً كان الناتج كل الأطفال بحالة جيدة لا يوجد إدخال لقسم العناية المكثفة. ٢١ قيصرية مستعجلة ، كل الأطفال

بحالة جيدة ولم يتم إدخال إلى العناية المكثفة. بخصوص متوسط أوزان الأطفال فهي كـالآتي: ٣,١كجم، ٢,٩ كجم، ٢,٨كجم بالتتالى.

النتائج بالنسبة للأمهات من حيث متوسط الـــهيموقلوبين ٧٠% ، ٦٩%، ٧١,٥% بالتتالي (الهيموقلوبين فى اليوم الثالث) كانت الإفاقة من البنج تامة، وكانت الحوجة لنقل الـــدم كالآتي: ٣,٢%، ٦,٨%، ٠% بالتتالي.

الخلاصة: ٤٨% من القيصريات غير الباردة تمت فى فترة زمنيـــة أقـــل مـــن أو تساوى ٣٠ دقيقة من اتخاذ القرار وكانت النتائج قصيرة الأمد جيدة بالنسبة للأطفال حديثـــى الولادة والأمهات.

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INTRODUCTION AND LITERATURE REVIEW

The origin of the C/S is uncertain, but it is of great antiquity there are references to it in Rabbinical writing of about 140 B.C, but it is known to have been practiced on the dead pregnant women long before this. Tradition Roman history (written seven centuries later) states that the Second King of Rome, Numb Poulous (762-715 B.C), forbade burying a woman who died during labour until the foetus had been cutout. This law later became the Lex Caesarsa, and the term caesarean section (C/S) is said to have arisen from this (Is the operation by which the foetus is delivered via an incision in the uterus after 28 weeks of pregnancy).[1]

Works on caesarean section were published in the sixteen century, but faced with the difficulties of controlling bleeding and sepsis, and in the absence of anesthesia, the mortality remained high and even in the nineteenth century Osiander wrote "of the women under go caesarean section more than two third die before, then undertaking this procedure one should allow the patient to draw up will and grant her time to prepare her self for death. The patient can not escape death if not from pain (no anaesthesia) will be from

haemorrhage (no sutures), if she escaped these two lines she will die from sepsis.[2]

Poro of Paula temporarily solved the problem of homeostasis by following caesarean section with subtotal hysterectomy and marsupializing the cervical stump in the abdominal wound, Poro's operation was abandoned in 1881, when Koehler devised satisfactory method of suturing the uterine wound with silk. Although the mortality fell in the elective cases, there was still a very high mortality after incision in the upper segment in patients who were in labour.[3]

In 1906 Frank of Cologne devised an operation, which not only employed transverse abdominal and lower segment, but excluded the lower segment from the general peritoneal cavity by suturing the upper edge of the peritoneum to the upper edge of utero-vesical peritoneum. In the next few years the lower segment operation gained popularity, and was soon found to be safe during labour even with no attempt to close off the field from the general peritoneal cavity.[4]

The first caesarean sections on a living woman on record is by Jacob Nufer in AP 1500, he cut open his wife's abdomen and brought out a live child. The fact that his wife lived give's the impression it was a case of abdominal pregnancy.

Types of caesarean sections are classified by the location and direction of the uterine incision. The type of incision used to open the abdomen is not used in categorizing caesarean section, uterine incisions are divided into two major types; the first includes incision made in the upper segment of the uterine corpus. The vertical incision in this location in usually referred to as the classical incision. The second type includes incision made in the lower uterine segment. These incisions are made in the lower portion of the uterus and require that the bladder be displaced downwards to exposed the appropriate area. The most frequently used incision is the lower transverse segment incision.[5]A vertical incision also may be made in this area (De Lee). But it may involve the upper uterine segment unless the lower segment is elongated in labour, the J-shape incision is made when the operator begins a transverse lower segment incision and finds that the lower segment is too narrow.[6]

The T-shaped incision may be made for the same reason, Tran- peritoneal and extra-peritoneal caesarean sections are the techniques used to reach the uterine wall.

The rationale for the extra-peritoneal approach was formerly based on the belief that it would reduce the chance of death from

peritonitis in a patient with an infected uterus, this approach has been discarded, however, because it has not proved superior to the less complicated trans-abdominal lower uterine segment operation.[7] Of course the advantages of (LSCS) over the classical are obvious, scar rupture during pregnancy or labour is less than classical, in the classical it is 4% ten times the (LSCS) (0.4%), and the reason is simple that classical scar and due to uterine contraction and retraction, it can give way (rupture) even during pregnancy. Scar endometriosis had been reported following classical sections which is not occurring in LSCS.

According to the time of C/S it can be divided into elective when a clear indications prevails , so that C/S planned before the patient goes into labour. EmC/S when during labour a complication ensure which mandates abdominal delivery either to save the foetus to avoid or treat maternal complications.[8]

EIC/S usually performed at 38 weeks gestation, the complications are less than in the EmC/S in all aspects and specifically anaesthetic complications, risks of disimpaction of deeply engaged head and risk of prolonged rupture of membranes.[9]

Preoperative preparations includes shaving the hair of monspubis, preanaesthetic medications, the use of prophylactic antibiotic is an important consideration, aspiration of the highly acidic gastric contents with a known risk of Mendelson syndrome (pneumonitis), so different forms of antiacids used plus cricoid pressure at the time of induction of anaesthesia reduces the incidence of this syndrome, also blood should be grouped and cross-matched, it should be screened (HIV, HbsAg, HBC) at least one pint of blood should be prepared unless there is a need for more (high risk of bleeding e.g. placenta praevia), the patient also should be fasting at least six hours or in an EmC/S gastric lavage can be done.[11]

Anaesthesia for C/S whether elective or emergency is dictated by many factors and it's the consultant anesthetist duty, but generally now the trend is towards spinal anaesthesia unless there is strong indication for general anaesthesia e.g. foetal distress.[12]

With regard to the indications for C/S, whether elective or emergency it can be absolute or relative. The absolute indications are severe degree of contracted pelvis, major degree placenta praevia, two previous scars or more, successful operation for vesico-vaginal-

fistulae. Successful operation for genuine-stress-incontinence, or a relative foetal or maternal indication.[12]

With regard to surgical technique, skin incisions can be up and down or transverse (both infra-umbilical), uterine incision is almost always in the lower uterine segment (transverse), it can also be up and down in the lower segment (De Lee), or J-shaped or inverted -T, suture material for the uterus chromic catgut No. 2, visceral and parietal peritoneum can be closed or not. Sheath high polymer suture material (vicryl, Dexon) or chromic catgut No.2 or nylon. Skin can be closed in simple interrupted or vertical mattress or subcuticular or continuous locked (blanket stitch) or clips can be postopertative complications may be early or late, early complications are related to anaesthesia, intra and post opertative bleeding, thrombi-embolic-disease, sepsis paralytic-ileus. Late complications are hernias, fistulas, adhesion, keloids.[13]

A twelve-month prospective study,[14,15] identifying the DDI and its neonatal outcome was carried out in the Department of Obstetrics and Gynaecology, Oxford University Hospital, the classification of C/S was determine according to why and when the decision was made. EmC/S decision made in labour for foetal maternal or both. Crash C/S

(decision made if impending foetal demise or serious maternal compromise (e.g. cord prolapse, placenta! abruption, uterine rupture). Urgent C/S (decision made during 24 hours before delivery because of deterioration in foetal or maternal condition or both, and the results were the mean time from decision-to-delivery for hundred EmC/S were 42.9 minutes for foetal distress (P< 0.001). For 22 crash C/S the mean DDI was 27.4 minutes, for 13 urgent antepartum deliveries for foetal reasons it was 124.7 minutes and for 21 with maternal reasons, it was 97.4 minutes, the seniority of the surgeon doing the operation did not affect the DDI nor did the time of the day or the day of the week when the delivery occurred. Intrapartum sections were quicker the more advanced the labour, and general anaesthesia associated with shorter DDI than regional anaesthesia for EmC/S for foetal distress (P< 0.001).[16] Babies born within one hour of the decision tended to be more acidemic than those bom later, it was very surprising, but important findings of trend of improving cord PH-values with more prolonged DDI, which was observed for deliveries with or without foetal distress, although the values are less acidemic, among the latter babies, it is hard to explain the lower values found in the non distress babies born with short DDI, similar lack of correlation has

been found between prolonged DDI and assisted vaginal vertex delivery for foetal distress and low cord arterial pH values. As expected for those born by crash C/S their pH values were the lowest.[17,18]

Irrespective of the indication for delivery babies tended to be in a better condition when DDI is less than 30 minutes.[19]

The impact that cervical dilatation had upon the time from decision to delivery was a trend for shorter time with advancing labour. The trend for cord arterial pH values was reversed as had been outlined above. 65(17%) of the Em C/S were performed in the second stage of labour.[20,21] the time from decision to delivery was recorded for 50(77%) of them the mean (SD) time from decision to delivery was 46.6 (26.5) minutes, and the median 43 minutes, for the 17 delivery after the abandoned attempt at assisted vaginal delivery, the time from decision to delivery was 35(23.3) minutes compared with 54.5(26) minutes for 31 cases when no prior attempt at vaginal delivery had been made (P=0.02), the respective cord arterial pH values were 7.13 (0.12) (P = 0.02) one of these deliveries for a second twin born after the vaginal delivery of the first twin with a time

from decision to delivery of 17 minutes, there was two crash C/S at fully cervical dilatation.[22,23]

With regard to the type of anaesthesia used for the 100 women who had their CIS for foetal distress, 48 were done under epidural anaesthesia, the DDI was 44.5 minutes, for 26 with spinal anaesthesia it was 60.1 minutes, and for 26 with GA was 22.6 minutes, (epidural versus spinal: P <0.01), (GA versus spinal or epidural P < 0.001). The time from decision to delivery for 230 cases without foetal distress was 62.6 (32.8) minutes, for 153 managed with epidural 98.6 (36,7) minutes, for 55 with spinal was 56.8(36.6) minutes, for 19 with GA (spinal versus epidural or GA; P0.001) epidural versus GA; P > 0.05).[24]

If epidural is established in labour, it can be topped up or co-administration of GA. Th cord arterial pH was at 7.17 in babies born with GA compared with 7.21 for those born with regional block and the difference was statistically significant. With regard to the seniority of the surgeon, difference in DDI was not significant and the cord arterial pH were 7.20, 7.22, 7.23. The rule of thirty minutes as a standard for emergency caesarean section is a pragmatic rule, it is not evidence based, but widely accepted by obstetricians and medicolegal bodies in

U.K and it is a requirement by the Clinical Negligence Scheme trust. So it is important for every unit or hospital to carry out surveys of these decision-to-delivery interval, as recommended by the confidential inquiry into stillbirths and death in infancy, the aim of this is to assess how close our obstetrics unit was to achieve this target of thirty minutes for emergency caesarean section and to identify ways of improving our performance.

In a study carried out by the Department of Obstetrics, Gravesend and North Kent Hospital, Gravesend, U.K.[25,26,27] to evaluate this thirty minutes rule, is it a realistic target. An audit of all emergency caesarean sections over five separate periods in a District General Hospital, 2300 deliveries per year and a caesarean section rate of approximately 24% (elective), a survey of all emergency C/S occurring over three months was carried out, the delivery suite was fully staffed with trained midwives, obstetricians and anesthetists, and in the operating theatre there were trained operating department assistants. Operating theatre was few yards from the midwives. Decision to emergency C/S was made by a consultant, information was extracted from the case notes of the women whose decision-to-delivery interval was longer than the standard of thirty minutes in order

to identify reasons for delay. Time-sheet was then devised, which contains decision taken at, anesthetist called at, arrived at, baby delivered at and also a note at the bottom of the time-sheet that if decision to delivery is more than 30 minutes reasons must be stated.[28] The survey was then repeated four times, at 3 to 6 months intervals in order to measure the improvement in the decision to delivery interval and how the introduction of this time sheet affects the situation. In the initial survey there were 73 emergency C/S, 26 C/S (36%) were performed within the standard of 30 minutes, of the 47 C/S not achieving the 30 minutes standard, 21 were found not to be emergency C/S after review of the case notes, the main sources of delay were in transferring women to the operating theatre and in starting the anaesthesia.[29]

In the subsequent four surveys that followed the above mentioned, and after the introduction of the time sheet into the case notes, the results show an improvement in the number of C/S achieving a decision-to-delivery interval of 30 minutes. This improvement continued with each survey, reaching a maximum of 71% (the previous surveys not more 40% of emergency C/S were done with DDI <30 minutes),[30] simple linear regression shows an

improvement of 10.3% per survey (95% confidence limits + 5.3 to + 15.2%). The X2 for trend is 16%, P< 0.001. It had been shown clearly that this generally agreed recommendation that emergency C/S, should be achieved within 30 minutes, of the decision to operate.[31,32,33] Although it is not an evidence based rule, the confidential inquiries of stillbirths and death in infancy in the U.K recommend that all hospitals trust will be required to audit this standard, the first survey showed that in the majority of emergency C/S, the DDI was more than 30 minutes, but with subsequent surveys about this, DDI and after introduction of the time sheet, improvement in DDI was noticed.[34]

The problem of failed spinal anaesthesia or inadequate top ups will always cause delay that can not be compensated. In this study failed spinal anaesthesia occurred in less than 3% of emergency C/S, and a firm policy of resorting to general anaesthesia in all emergency C/S if 15 minutes after the decision for emergency C/S regional anaesthesia is inadequate.[35,36]

At the end, this study addresses two issues which are quite important, the definition of emergency C/S that varying in degrees of emergency would have resulted in different degrees of urgency in the

response of the midwifery and obstetric staff i.e. many emergency C/S in the study were reclassified as non-emergency C/S. The next issue is whether a more attainable standard to be set, there is no scientific evidence that failure to achieve the 30 minutes target is associated with an adverse neonatal or maternal outcome.[37] The evidence suggests that achieving the 30 minutes standard in foetal distress does not benefit the neonate.[38]

Chauhan, et al.,[39] suggested that an interval between decision and incision in some instances allow intrauterine resuscitation of the foetus. An investigations into assisted vaginal delivery for foetal distress did not show that a decision to delivery interval longer than 30 minutes had adverse consequences for the neonate.

Schauberger CW in AU[40] studies evaluating the 30 minutes interval in emergency C/S, in Department of Obstetrics and Gynaecology, Gundersen Clinic. This study evaluated how much percentage of EmC/S done in this time and also evaluate morbidity associated with prolonged DDI, it is a retrospective, patient control study of records from 75 patients undergoing emergency C/S, and two different control groups were undertaken, results analysed, 36% of emergency C/S were done in less than 30 minutes, a significantly

greater number of infants in the group that delivered in less than 30 minutes, experienced five minutes Apgar score less than six. There was no significant difference in maternal morbidity associated with emergency C/S, and in conclusion, the 30 minutes interval is obtainable in a large number of patients, but did not have a beneficial effect on the neonatal morbidity. There was no significant morbidity seen in patients, who underwent emergency C/S, so other parameters should be considered a part from DDI.

Another study by Dennis J in AU[41] in Human Deployment Research Unit, Park Hospital for Children, Oxford, England, found that 230 term infants with measured acid-base status in umbilical arterial blood at birth were selected from 1210 consecutive deliveries for detailed neuro-developmental follow up at age 4 years, 203 were examined, cutoff points approximately 1 SD from the mean (pH less than or equal to 7.1, base deficit greater than 12 mmol/L) were used to define acidosis, no statistically significant association between acidosis and developmental outcome were found. The highest proportion of unimpaired children were found among those who were most severely acidotic at birth (pH less than or equal to 7.04, 2SD below mean), but this finding was not statistically significant. These

findings suggest that the ability of the foetus to produce an acidosis in response to the stress of labour may be beneficial to the long-term outcome. The 10 non acidotic babies with 1 minute Apgar score less than or equal to 3 shared statistically significant deficits in some areas. Co-incidence acidosis was not associated with worse outcome for infant with low Apgar score. Another study done by Chauhan SP in AU[42] about C/S for foetal distress, does decision-incision time make a difference?. The study compared the perinatal outcomes in babies at term in whom the decision-incision time for C/S was due to suspected foetal distress. All parturients who underwent emergency C/S primarily for possible foetal distress, during a three years period were identified retrospectively. Student's t-test and chi-2- test were utilized and $P < 0.05$ was considered significant. A regression analysis of decision-incision time and umbilical arterial pH was performed. Results of this study from 1991 to 1993, 1.3% of term labouring patients underwent emergency C/S delivery for the primary induction of possible foetal distress. In 61(52%) patients, the decision-incision time was 30 minutes, while it exceeded 30 minutes in remaining 56 women. The two patients groups were similar in maternal demographics, antepartum complications, oxytocin usage, thick

meconium, type of abnormal foetal heart rate tracing that prompt surgery.

Usage of aminotransfusion (41% versus 36%) general anaesthesia (97% versus 93%), mean birth weight, Apgar score <7 at five minutes, two adverses outcome were observed more frequently in association with decision-incision time >30 minutes: (1) lower mean umbilical arterial pH. (2) admission to neonatal intensive care unit (P=0.008), when the incision was made longer than 30 minutes after the decision, there was no apparent adverse neonatal outcome, so in conclusion although a C/S decision-incision time <30 is a desirable goal for the foetus possibly in distress, failure to achieve this goal is not associated with measurable negative impact on neonatal outcome.

In a study[43] of emergency C/S delivery in patients undergoing a trial of labour with a transverse lower segment scar in the Department of Obstetrics and Gynaecology, University of Texas, Health Science Center at San-Antonia, a retrospective review was undertaken to examine the operative start up time of 30 minutes. What concerns this thesis is one which has a short operative start up time being critical in terms of perihatal and maternal morbidity and

mortality. During the five years period, 1156 patients underwent a trial of labour with 745 (62%) delivered vaginally and 411 patients undergoing repeated C/S, 125(26%) met the criteria for review of medical records for a possible emergency abdominal delivery, the remainder of the C/S were performed for failure of labour to progress or malpresentation recognized during labour. With regard to the indications for non EIC/S, they were 18(1.6%) of 1156 underwent crash C/S for cord prolapse (3), placental abruptio were 4, for foetal distress were 8 and for uterine scar complication were 3. Perinatal morbidity and mortality, one death (intrauterine) resulted from ruptured uterus. Two of the live-born infants delivered by EmC/S had 5 minutes Apgar score of 6, so from that study it is obvious that out 115 patients who underwent a trial of scar, the rate of foetal distress necessitating emergency C/S was found to be 0.69% of all patients undergoing a trial of labour. In all these emergency C/S a short operative start up time may have been important in one patient presenting with maternal haemorrhage, but could not be identified as being critical in any of the newborn infants, except for reasons that related to the previous scar, and here it is insufficient uterine blood flow, others like insufficient umbilical artery blood flow, decrease arterial oxygen

content; these are the main causes of hypoxia in the foetus. Other mechanisms like foetal anaemia or increased foetal oxygen need is relatively and according to these basis attentative definition of foetal distress is as follows. It is (progressive foetal asphyxia that if not corrected or circumvented will result in decompensation of the physiologic responses and cause permanent brain and other organ damage.

In a prospective study[44] of 360 patients delivered by EmC/S to assess a policy of anaesthesia recommending, epidural analgesia early in labour, in circumstances when a strong possibility of eventual delivery by C/S was suspected. When the decision-to perform a C/S was taken the obstetrician indicated the degree of urgency in term of a proposed decision to delivery time (PDDT), interval of <10 minutes, 11-30 minutes or >30, as well as reasons for the operation with regard to results. The proposed decision-to-defivery time in minutes in these emergency C/S, only 48(13%) women had emergency C/S for foetal distress with no other warning signs, 194(77%) of those having the section under epidural, the block was already established. In 56 of these patients, foetal distress was present and the mean time from induction to adequate block was 16.17 minutes. In this group 47

patients had an induction to adequate block interval < 10 minutes. The less urgent cases where the block was initiated after the decision to operate, more time was required and in one instance 80 minutes elapsed from the start of the epidural to delivery. The induction to delivery interval with epidural anaesthesia is often longer than the time taken to achieve an adequate block and because the operation may be delayed for reasons other than anaesthesia, the mean incision to delivery interval (3-7 min, 7.03 SD) cases slightly longer than general anaesthesia group (2-7 min, 5.07 SD) ($P < 0.001$). The time from uterine incision to delivery and to the end of the operation did not differ significantly between epidural and general anaesthesia. There was no significant difference in the neonatal condition of 307 infants born at >35 weeks gestation between those in the epidural group and those in the general anaesthesia group.

Fewer babies born with GA had a one minute Apgar score > 8 [34(47%) versus 147(63%)], ($P<0.005$), but this is not important clinically, because maternal condition is quite satisfactory.

Some obstetricians consider epidural anaesthesia not suitable for EmC/S unless there is no limitation of time, but this objection does not apply if the block is already established.

In a case report also about crash C/S a 39 years old lady admitted in early labour at term and membranes ruptured with cord prolapse and no foetal heart sound heard, Doppler U/S detected foetal heart. Cervical os was 5 cm dilated, foetal heart at 80/min, crash C/S was done within 10 minutes which yielded a baby 3.04 kg with Apgar score of 8 and 10 min at 1 and 5 minutes respectively.[45]

In a retrospective study carried out in district Maternity Hospital[46] using the oxford obstetrics data system and oxford region register of early childhood impairment for one hundred thirty two cases of cord prolapse, the perinatal outcome Apgar score at one minute and five minutes and major handicap at three years of age was compared to the DDI in each delivery. All cases of cord prolapse were managed at John Radcliff Hospital, Oxford between Jan 1984 and December 1992.

Details relating to maternal age, parity, gestation, antenatal complication, labour onset, rupture of membranes, presentation, type of delivery, attendant, DDI, Apgar score and cord gases were determined from record (cord prolapse) diagnosed after membranes ruptured and cord palpated, below or beside the presenting part on vaginal examination in all cases; cord compression was reduced by

placing the mother in knee-chest position, and/or by digitally elevating the presenting part.

The degree of dilatation of the cervix and station of the presenting part were noted, timing of membrane rupture, diagnosis of cord prolapse and DDI were recorded; incase of twin pregnancy only the foetus in question was included in the neonatal statistics, Incase labour is monitored by CTG it is retrieved and reviewed by independent obstetrician.

Apgar score recorded at one minute and five minutes of < 7 were taken as markers of potential birth asphyxia. Acidemia was defined as an umbilical cord pH <7.10 and base deficit >12 mmol/L Stillbirth plus early neonatal death were established from the notes. Neonatal death was identified from special care baby unit. Cases of cerebral pafsy, deafness, or blindness were identified from Oxford register of early child-hood impairment.

For the 132 cases of cord prolapse over the period of the study, there were 56283 births i.e. incidence of cord prolapse one in 426 total birth, which correlates with other studies (one in 408, and one in 439), 101 babies (77%) were singleton, 12(9%) were the first twin, and 19(14%) were second twin, 124 babies born a live six were

fresh stillbirth, six were neonatal death, one baby was found to have cerebral palsy at three years of age.

Twenty-three were vaginal cephalic, with DDI < 20 min. In 22 and one <30 min, Apgar score 1 min < 3 = 2, 5 min Apgar score <7= zero, pH <7.4 = zero, base deficit >12 mmol = 5. Those vaginal breech about 9, eight delivered in < 10 min, one < 20 min, 1 min Apgar score < 3 = 2, 5 min <7 = zero. pH < 7.10 = zero, base deficit >12 mmol/L = 3 with those delivered by crash C/S about 99, 15 with DDI <10 min, 49 DDI <20, 21 DDI <30 min, 3 DDI <60 min, 6 DDI >60 min, i.e. 64% born with DDI < 30 min, with regard to the FSB about six all were preterm and all vaginal delivery, 4 of them breech, 2 cephalic with DDI > 100 min, with regard to the neonatal death also were six, five were preterm, one term, all of them delivered by EmC/S, 4 of them as breech, two cephalic. The diagnosis to delivery interval had a little effect on Apgar score at 1 min, 5 min, if delivery occurred within 30 min (again this standard is working) and after 30 min DDI, there is increase in the number of neonates with low Apgar score.

Foetal acidemia in umbilical cord did not correlated closely with Apgar score nor DDI. 126 of the babies survived, 38 where admitted to special care baby unit, only one baby died directly due to cord

prolapse and it was the first of term twin. The baby with cerebral palsy was extremely premature and acidemic at birth, pH = 6.92, Apgar score 1 min =1, 5 min = 6, depite the DDI <17 min.

In a separate study analysis of umbilical cord blood for gases, the detection of foetal acidemia was not enough because whether it was metabolic or respiratory needed to be clarified.

The German Society of Gynaecology and Obstetrics has published standards for obstetrical services.[47] Concerning equipments, personnel and organization.

All obstetrical services must be able to perform an emergency C/S, with a twenty minutes interval from decision to delivery (D-D time). This study represent an analysis of the 75 EmC/S performed at the University Hospital Gross Hadren of Munich, during the interval from 1987 to 1994, this being level 3 hospital, there is a 24 hours obstetrical, anaesthesia, neonatal services and personnel is readily available.

The operation can and has been done in each delivery room. The incidence of EmC/S was 0.6% compared to total caesarean rate of 19% during the period of the study, 55% of the patients who had EmC/S presented with gestational age of less than 37 weeks, and

35% of less 32 weeks. The mean time elapsed between decision and delivery (D-D time) was less 12.8 minutes; however, the 90 percentile was 22 minutes, and exceeded the recommended D-D time of 20 minutes. The mean decision to incision interval represented 9.1 minutes and 3.6 minutes were needed between incision and delivery. There was a significantly higher frequency of EmC/S performed during day time and evening hours compared to early morning (08.00am). However, the D-D time interval examined for these three time period showed only minor, non significant differences. In conclusion an efficient EmC/S delivery requires a co-coordinated team effort with excellent co-operation between obstetrics and anaesthesia and neonatology, this study demonstrates that even in this optimal setting a decision to delivery time within the 20 minutes interval can not always be achieved, based upon our results and other studies we recommend a D-D time of 30 minutes.

We can observe a/so this study point to the D-D time and it's importance and from this study and the above mentioned studies that 30 minutes DDI is an attainable target and supported by most of the obstetrics and gynaecological bodies. With regard to the maternal outcome in these women delivered by non-elective C/S, most of the

morbidity and mortality were related to general anaesthesia in unprepared patient, Mendelson syndrome. Febrile morbidity, more blood transfusion, in the postnatal period, higher proportion had a urinary catheter left inside after surgery, the incidence of wound infection is more, intrauterine infection and chest infection were higher, more women required antibiotics. The study also found that all postoperative morbidity scale was high in this group of women who delivered with non elective C/S.

In another study[48] umbilical cord blood erythroblast count as an index of intrauterine hypoxia in EmC/S, found that in comparison with spontaneous vaginal delivery they found for EmC/S cord pH was significantly lower and the leucocytes and erythroblast count was higher than those delivered vaginally. The 5 minutes Apgar score was > 7 in all infants, this study suggests that leucocytosis is a non-specific response of the foetus to labour, whereas erythroblostosis reflects foetal tissue hypoxia.

In a study of EmC/S during labour, response times and type of anesthesia.[49] 18% of 212 consecutive EmC/S at term where classified as truly urgent (requiring delivery within 20 minutes). The interpretation of the intrapartum CTG, was generally accurate

although after an independent review of the tracings, six cases classified originally as urgent had Apgar score >4, among the urgent cases the median total time interval from decision to operate to delivery of the baby (DDI) was 25 minutes (109 between 20-33 min). One third of the urgent cases had total time interval exceeding 30 minutes and the longest delay was 56 minutes acidotic foetal blood samples results and antipartum haemorrhage produced most rapid responses. Nine percent of the babies required special baby care unit admission, seven percent of the patients in the study had had general anaesthesia for their operations. Although the achievement of a total time interval delay of between 20 and 30 minutes was possible with regional anaesthetic techniques, a general anaesthesia was needed to obtain a time interval of <20 minutes.

In conclusion, regional anaesthestic techniques can prolong response times, which are acceptable for the majority of urgent C/S with the administration of general anaesthetic occasionally justified for foetal interest.

In a study of anaesthesia for EmC/S for foetal distress[50] as this type of delivery is always urgent. Emergency anaesthesia is required, general anaesthesis is usually chosen in these cases.

Because it is quick anaesthetic technique and because of fears concerning the haemodynamic consequences of regional anaesthesia.

Maternal risks of GA which is the leading cause of anaesthesia (difficult intubation and Mendelson syndrome) but also neonatal consequences (increase the need for neonatal resuscitation) have challenged this policy. Indeed spinal anaesthesia and exclusion of pre-existing epidural, this analgesia are more and more used during emergency C/S, a better evaluation of the patient's problem based-upon preanaesthetic outpatient visit during last trimester of pregnancy allows a more rational approach to meet the patient's requirement should an EmC/S be necessary. For example a prophylactic epidural instituted soon after the beginning of labour may be life saving in a patient with obvious signs of difficult intubation. A clear definition of safe standards of equipments and practices either to prevent Mendelson syndrome or to cope with a failed intubation drill is of greatest importance. Finally, comprehensive communication between the anaesthetic and obstetrical teams is one of the most useful ways to facilitate safer approach of the management of obstetric EmC/S.

In order to set standards for assisted vaginal delivery i.e. decision-to delivery interval a prospective study[51] of all operative vaginal deliveries of live singleton pregnancies with foetus presenting by the vertex was conducted over the period 1 November 1997 to 1 February 1998. The staff engaged in the clinical provision of the services were not advised of the study in advance or during the collection of data, DDI was recorded.

Two hundred and twenty five deliveries were studied and divided into two groups. Those assisted with forceps, and those assisted with ventouse the DDI was recorded as mean decision to delivery interval according to the time of the day. The range of DDI was 5-10 minutes, for the 134 cases with no foetal distress, the primary indication was delay in the second stage of labour, in 125 maternal distress. In seven, for prophylaxis with a history of intracranial hamorrhage for two women. The mean (SD) DDI for women delivered by a consultant (8 deliveries) was 36.8 minutes, for 4-5 trainees deliveries was 28.4 minutes, for years 1-3 trainees deliveries was 38.4 minutes in three instances the consultant was called out-of-hours to attend. The anaesthetic used for delivery influenced block (182 epidural, 14 spinal) the mean (SD) was 35.9

minutes (compared with 24.1 minutes for 29 women delivered with local perinea! infiltration (P = 0.001). If epidural was in place for the first stage of labour, the DDI was 33.3 minutes, in those 177 cases, which was significantly quicker than the 59.8, for the 19 cases in whom the block was given for delivery (P <0.001). For 91 women having assisted vaginal delivery because of suspected foetal distress, the mean (SD) interval was 27.8 minutes using a regional block in 73 cases and 19 minutes using local perineal infiltration in 13 cases (P =0.3). Increasing acidemia was not observed following deliveries without foetal distress, until the DDI is >60 minutes although one baby born after 67 minutes with 5 minutes Apgar score of < 9, cord arterial pH < 7.15 and base excess of > 12 mmol/L Maternal outcome, more lacerations with forceps than with ventouse, so in conclusion the mean interval from decision to delivery of 26.5 min for foetal distress was approximately 7 minutes shorter than the median time of 34 minutes quoted by.[51] For EmC/S for foetal distress in 1989. In that study as in present one, the anaesthesia used for delivery influenced the interval, with regional blockade resulting in a longer delay. They found no direct correlation between the interval and neonatal condition at birth, although there was a direct correlation between longer

intervals and admission to the special care baby unit. In view of this results reported here for assisted vaginal delivery for foetal distress, it is perhaps unreasonable to expect a C/S to result in delivery within 30 minute of the decision as presently recommended, while it is clear that every effort should be made to improve our results. It must be recommended that DDIs reported were obtained in a large well staffed hospital, and anaesthesia present at all the time, less well staffed units may face difficulties to achieve similar or better times.

OBJECTIVES

The objectives of this study are;

1. To measure decision to delivery interval in non-elective caesarean section (DDl) in minutes.
2. Factors influencing this interval.
3. It's implications on early neonatal and maternal outcome.

PATIENTS AND METHODS

This is a prospective descriptive hospitals based study, carried out during the period 1st Jan. to 31st Jan 2003, in 323 non El C/S were done.

Study area:

The study was carried out in the main capital hospitals, Khartoum Teaching Hospital (KTH), Soba University Hospital (SUH), Omdurman Maternity Hospital (OMH), Khartoum North Teaching Hospital (KNTH). These Hospitals cover most the obstetric and gynecologic patients, it cover population in Khartoum State (all the three big cities with it's rural surroundings also referred cases from other parts of the country). These hospitals accept booked, referred and casuality patients.

The departments of obstetrics and gynecology in all these Hospitals are covered by senior consultants, junior consultants, registrars and house-officers. The cover for the labour room is twenty four hours from 08.00 a.m to 02.30 p.m all consultants are available, after 02.30 p.m there is usually one consultant on call until 08.0 a.m. Fridays are covered by rotation and the activities of these obstetrics

and gynecological units involve casualties, in patients wards, labour room, major, minor and septic theatres and referred clinics.

Study populations:

Pregnant ladies admitted to labour rooms or inpatients, or referred patients during the period from 1st of Jan. to 31st of Jan 2003.

Inclusion criteria:

Pregnant women with decision to be delivered by non-ElC/S (emergency C/S, crash C/S, urgent C/S).

Data collection:

A questionnaire was designed containing information about, demographic details, pregnancy details, indication for non EL C/S, stage of labour, grade of obstetrician managing the case, time of decision to non El C/S, time at arrival to theatre (TTT), time start of anesthesia, time delivery of the baby, type of anaesthesia used, time and day of delivery, neonatal outcome (Apgar score at 1 min, 5 min birth weight, admission to NICU, condition at discharge), maternal outcome with regard to recovery from anaesthesia, need for blood transfusion, condition at discharge.

The clarification of non EL C/S was determined according to why and when the decision was made as follows, emergency C/S decision made in labour for evolving foetal distress, failure to progress in labour or maternal reasons, crash C/S decision made if impending foetal death or serious maternal compromise anticipated like (cord prolapse, placental abruption, ruptured uterus).

Urgent C/S decision made during the twenty four before delivery because of deteriorating foetal or maternal condition before onset of labour. Foetal distress was diagnosed in labour by Pinard stethoscope intermittent auscultation and presence of fresh meconium, CTG, Doppler U/S were used also in monitoring during labour, as in SUH.

Forms filled under direct supervision in >95%, data entered on master sheet, statistical analysis was computerized (SPSS).

RESULTS

During the period of the study, three hundreds twenty three, (323), non ELC/S were done, 273(84%) were EmC/S, 29(9%) were crash C/S, 21(7%) were urgent C/S (Fig.1).

Figure 2 and Table 1 illustrate the types of non ELC/S and decision-to-delivery interval (DDI) in minutes (mean). These non ELC/S will be dealt separately as follows, Emergency caesarean section (EMC/S) (Table 2), 273 EmC/S were done in the study hospitals, the mean DDI was 45 minutes, relative Apgar score at 1min <3 = 1, Apgar score at 5 min >7= 272, with 11 admissions, all discharged in good condition (P>0.05) (P = 0.0621), indications for EmC/S were, failure of progress in labour were 183(68%), foetal ^distress were 50 (18%), feto-maternal indications were 40(14%) of EMC/S respectively. One baby was lost as early neonatal death in the foetal distress group. Maternal outcome (Fig. 3), average day three haemoglobin is 70%, 3.2% needed blood transfusion (P> 0.05) (P = 0.0720). Anesthesia used in EmC/S, 97.1% were done under G.A., 2.9% under spinal anesthesia, EmC/S done under G.A have DDI less than DDI for spinal anaesthesia, but the early neonatal and maternal outcome is not affected (Fig. 4), although the difference in DDI

between the two groups is statistically significant (P < 0.05). These are the two types of anesthesia used in the study and actually the available anaesthesia beside the local. With regard to seniority of the surgeon doing the operation the difference in DDI between these done by consultant or a registrar is not statistically significant (P>0.05) and has no effect on early neonatal and maternal outcome (Tables 3 and 4). Also there is no effect of the time of day or day of the week on DDI or in the maternal or foetal outcome. Crash caesarean sections, There were 29(9%) of the total non ELC/S done as crash C/S 20(69%) were cord prolapse, 5(17%) placenta! abruption, 4(14%) placenta praevia (Table 5). Relative DDI were 20, 19, 22 respectively. Relative neonatal out come, Apgar score 1 min < 3 = zero, zero, zero respectively. Apgar score 5 min > 7 = 20, 5,4, respectively. Average weight equal 2.8, 2.7, 2.9 kg respectively. Maternal outcome (Fig.3) (P>0.05), (P = 0.0721), day 3 Hb% (69%) (average), 6.8% need blood transfusion. Urgent caesarean sections (Table 6 and Fig. 4) there were 21 urgent C/S (7%) of all non ELC/S, 10 (48%) were due to severe IUGR, 6(29%) were due to maternal compromise, 5(23%) were due to feto-maternal indications, DDI were 65, 70, 60.5 minutes respectively. Apgar score 1 min <3= zero, zero, zero respectively.

Apgar score at 5 min >7=10, 6, 5, respectively. Four babies admitted (in the IUGR group), were admitted and discharged in good condition (P>0.05) (P = 0.321). Maternal outcome (Fig.3) day 3 Hb% is 71.510, no blood transfusion.

Neonatal outcome in our study, 323 babies were delivered by non- ELC/S 84%, 9%, 7% EMC/S, crash C/S and urgent C/S respectively, we lost one baby as early neonatal death that it's Apgar score at 1 min < 3 and died five minutes later. For the 323 all with Apgar score at 5 min >7, and most of the admission to NICU is due to factor not related to labour that is severe IUGR [4(27%)] of total admission to NICU (15). And all those admitted discharged in good condition (Table 6 and Fig. 5) (P > 0.05),(P= 0.545), (P>0.05) (P= 0.611) respectively. Average weight 2.8 kg. For the early neonatal death, the operation was EMC/S done under GA. Term baby, DDI =95min, multiple problems delays in preparation of C/S requirements (I. V fluids plaster, canula, blood, fees for the operation). Differential values for different hospitals were found in (Tables 7, 8, 9 and 10).

All maternal outcome was favourable that average day three Hb% was 70.1%, all mothers recovered smoothly from anaesthesia

(Tables 11,12,13,14 and 15) (P>0.05, P> 0.05, P> 0.05 and P> 0.05 respectively).

With regard to effect of parity on DDI (Table 16) (P > 0.05) it is found to be statistically not significant (Tables 17,18,19), previous C/S scar had no effect on DDI and the difference in DDI with or without scar was statistically significant (P<0.05) (Fig. 6).

Table 17 and Fig. 7 show the relation of DDI when GA is used for 126 EMC/S, DDI was < 30 minutes, for 17 crash C/S, DDI was <23 minutes, for 5 urgent C/S DDI < 32 minutes with relative maternal outcome as follows: day 3 Hb% =71%, all smooth recovery from anaesthesia and 3,2% need blood transfusion (P<0.05) (P = 0.002).

Tables 20, 21, 22 show reasons for delay in DDI, in different hospitals of the study. TTT include preparation of the patients in (KTH, KNTH), all I.V fluids, plaster, catheter, urine bag, blood preparation, fees should be prepared by the patient or her relatives, while in SUH and OMH these emergency items considered to be the responsibility of the these hospitals.

Table No. 1: Type of non El C/S and Ddi (in min)

Type of non El C/S	Total	DDI min (Mean)
Em C/S	273	45.0 min
Crash C/S	29	22 min
Urgent C/S	21	63.0 min

Table No. 2: Indication of Em C/S, DDI, early neonatal outcome.

Indication of EM C/S	Total	DDI. min (Mean)	Apgar score		Admission to NICU	Discharge
			1 min	5 min		
Fetal distress	50	30	<3 =1	> 7 = 49	2	Good condition
F. OP	183	31	<3 = 0	> 7 = 183	-	-
Feto. Mil. Indication	40	32	<3 = 0	> 7 = 40	9	Good condition

Table No. 3: DDI and seniority of the operator, demographic data, …etc (KNTH).

Type of non EL C/S	Total	Age yr (Mean)	seniority			DDI min (Mean)			Apgar at 1min			Apgar at 5min			ADD to NICU			Blood transfusion		
			C (1)	R (2)	H (3)	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
EM C/S	29	29.4		24	4		69.4	70		1			28	4		4			3	
Crash C/S	4	26.7	1	3		20	20		5	0		10				1			1	
Urgent C/S	1	28		1			45			5			10							

Table No. 4: DDI and seniority of the operator, demographic data, .. etc (SUH).

Type of non EL C/S	Total	Age yr (Mean)	seniority		DDI min (Mean)			Apgar at 1min			Apgar at 5min			Admission to NICU			Blood transfusion		
			R (2)	H (3)	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
EM C/S	16	22.3	13	3		53	83		0			13	3		2			1	
Urgent C/S	7	28.7	5	2		146	75		0			5	2		3	1			

Table No. 5: Indication of crash C/S, DDI, early neonatal outcome.

Indications of reach C/S	Total	DDI. min (Mean)	Apgar score		Admission to NICU	Average weight (Kg)	Condition on discharge
			1 min	5 min			
Cord prolapse	20	20	<3 =0	> 7 = 20	None	2.5	In good condition
Placental abruptio	5	19	<3 = 0	> 7 = 5	None	2.7	-
Placenta praevia (Major type)	3	22	< = 0	> 7 = 4	None	2.9	-

Table No. 6: Indication of urgent C/S, DDI, early neonatal outcome.

Urgent C/S	Total	DDI. min (Mean)	Apgar score		Admission to NICU	Condition discharge
			1 min	5 min		
Severe IUGR (WHO criteria)	10	65	<3 =0	> 7 = 10	4	In good condition
Maternal indications	6	70	<3 = 0	> 7 = 6	-	-
Feto-maternal Indication	5	60.5	< = 0	> 7 = 7	-	-

Table No. 7: Indications of non El C/S, DDI, [SD], Age, and neonatal outcome (KNTH).

Type and indication of non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Apgar score 1min < 3	Apgar score 5min > 7	Wt. of baby (kg)
EM C/S	29	29.4 [5]	67.2	1	28	3.3
F.O.P	18	28.5 [6]	71.9	0	18	3.4
Fetal distress	9	24[4]	55.5	0	9	3.2
Feto-mat. causes	2	28.2 [8]	85	0	2	3.5
Crash C/S	4	26.7 [7]	20	0	4	3.2
Cord prolapse	3	26.6 [6]	20	0	3	2.8
Placental abruption	1	27 [5]	25	0	1	2.5
Urgent	1	28 [6]	45	0	1	4

Table No. 8: Indications for non El C/S, DDI [SD], Age relative neonatal outcome (SUH).

Type and indication of non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Apgar score 1min < 3	Apga score 1min > 7	Wt. of baby (kg)
EM C/S	16	22.3 [7]	53.1[34.5]	0	16	3.0
Fetal distress	4	25.7 [5.5]	36.5[22.3]	0	4	3.1
F.O.P	6	30[5]	40 [27]	0	6	3.2
Feto. maternal	6	28.3 [4.5]	93.3[72.5]	0	6	2.7
Urgent C/S	7	28.7 [3.8]	125.7[85.7]	0	7	2.9
Fetal compromise	3	25.3 [5]	70[52.5]	0	3	3.8
Eeto. Maternal	4	31.2 [3.2]	167.5[122.5]	0	4	2.1

Table No. 9: Indications for non El C/S, DDI [SD], and relative maternal outcome (KTH).

Indication for non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Apgar score 1min < 3	Apga score 1min > 7	Wt. of baby in kg (mean)	Admission to NICU
EM C/S	102	28.3 [4.5]	38.6[27]	0	102	3.5	12
F.O.P	32	28.8 [3.9]	42.5[29.2]	0	32	3.2	0
Fetal distress	24	26[5]	38.3[26.8]	0	24	3.3	0
Feto. maternal	46	30 [5]	39.4[28]	0	46	3.2	0
Crash C/S	8	29.2 [4.7]	24.3[13]	0	8	3.2	0
Cord prolapse	5	29.8[4.9]	17[11.2]	0	5	3.4	0
APH	2	24.5[5.3]	25[18.2]	0	2	2.9	0
Impending UT rupture	1	36[1.2]	20[11]	0	1	2.7	0
Urgent C/S	8	29[4]	68.7[42.7]	0	0	2.3	0
S. IUGR	7	27[4.9]	71[53.5]	0	0	1.7	0
Mat. Compromise	1	25[5.3]	30[16.6]	0	0	2.3	0

Table No. 10: Non El C/S, DDI [SD], relative neonatal outcome (OMH).

Type and of Non El C/S	DDI min (mean)	Apgar score 1min < 3	Apga score 1min > 7	Admission to NICU	Baby Wt. (kg)
EM 126	30[19.2]	0	126	6	3.2
Crash 17	23 [12.3]	0	17	0	3.2
Urgent 5	32[22.2]	0	5	2	3

Table No. 11: Indications of non El C/S, DDI, [SD], Age, and maternal outcome (KNTH).

Type and indication of non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Day 3 HB%	Maternal blood transfusion	Mat. Recovery from anesthesia
EM C/S	29	29.4 [5]	67.2	74.8	2	Smooth
F.O.P	18	28.5 [6]	71.9	75.2	1	Smooth
Fetal distress	9	24[4]	55.5	75.5	0	Smooth
Feto-mat. causes	2	28.2 [8]	85	67.5	0	Smooth
Crash C/S	4	26.7 [7]	20	61.2	1	Smooth
Cord prolapse	3	26.6 [6]	20	63.3	0	Smooth
Placental abruption	1	27 [5]	25	55	1	Smooth
Urgent	1	28 [6]	45	70	0	Smooth

Table No. 12: Indications for non El C/S Age, DDI [SD], relative maternal outcome (KNTH).

Type and indication of non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Day 3 HB%	Maternal blood transfusion
EM C/S	16	22.3 [7]	53.1[34.5]	72.0	1
Fetal distress	4	25.7 [5.5]	36.5[22.3]	68.7	0
F.O.P	6	30[5]	40[27]	70.8	1
Feto. maternal	6	28.3 [4.5]	93.3[72.5]	76.6	0
Urgent C/S	7	28.7 [3.8]	125.7[85.7]	75.0	0
Fetal compromise	3	25.3 [5]	70[52.5]	71.6	0
Eeto. Maternal	4	31.2 [3.2]	167.5[122.5]	77.5	0

Table No. 13: Indications of non El C/S, DDI [SD] Age, relative maternal outcome (KTH).

Indication for non El C/S	Total	Age (yr) (mean)	DDI min (mean)	Days 3 maternal Hb%	Maternal blood transfusion
EM C/S	102	28.3 [4.5]	38.6[27]	70	6
F.O.P	32	28.8 [3.9]	42.5[29.2]	72	0
Fetal distress	24	26[5]	38.3[26.8]	72	0
Feto. maternal	46	30 [5]	39.4[28]	66	6
Crash C/S	8	29.2 [4.7]	24.3[13]	66.8	3
Cord prolapse	5	29.8[4.9]	17[11.2]	75	0
APH	2	24.5[5.3]	25[18.2]	55	2
Impending UT rupture	1	36[1.2]	20[11]	50	1
Urgent C/S	8	29[4]	68.7[42.7]	69	3
S. IUGR	7	27[4.9]	71[53.5]	70	2
Mat. Compromise	1	25[5.3]	30[16.6]	60	1

Table No. 14: Non El C/S, DDI [SD], relative maternal outcome (OMH)

Type and of Non El C/S	DDI in min	Day 3 maternal Hb%	Maternal blood transfusion	Recovery from anaesthesia
EM C/S (126)	30	70 %	3	Smooth 100%
Crash (17)	23	72 %	0	Smooth 100%
Urgent (5)	32	71 %	0	Smooth 100%

Table No. 15: Relation of DDI to anaesthesia, neonatal, and maternal outcome (OMH).

Type and of Non El C/S	DDI in min	Type of anaesthesia	Apgar score 1min < 3	Apgar score 5min > 7	Maternal recovery	Day 3 maternal Hb%
EM (126)	30	GA	0	126	Smooth	700
Crash (17)	23	GA	0	17	Smooth	72
Urgent (5)	32	GA	0	5	Smooth	71

Table No. 16: Correlation between parity, DDI, in non EL C/S.

Type and No. of El C/S	Total	PG (1)	Multipera (2)	DDI min	
				1	2
EM C/S	273	158	115	30	32
Crash C/S	29	20	9	22.3	25
Urgent C/S	21	20	1	23	22.1

Table No. 17: Relation of previous C/S to DDI and neonatal and maternal outcome (KLTH).

Type of non EL C/S	Previous C/S (1)	No previous C/S (2)	DDI in min (Mean)		Apgar score in 5 min > 7	Maternal blood transfusion	Admission to NICU	Type of anaesthesia	
			(1)	(2)				GA	SP
EM C/S	7	22	62	69	28	2	3	7	22
Urgent C/S	1	0	45	60	1	0	0	1	0
Crash C/S	0	4	0	20	4	0	0	4	0

Table No. 18: Relation of previous C/S to DDI and relative neonatal and maternal out come (KTH).

Type of non EL C/S	Previous Scare (1)	No previous Score (2)	DDI in min (mean)		Apgar at 5min > 7		Maternal blood transfusion		Admission to NICU	
			1	2	1	2	1	2	1	2
EM C/S	48	54	26	32	43	74	3	3	4	6
Crash C/S	1	7	30	26	1	8	1	2	0	0
Urgent C/S	1	7	180	52.8	1	8	1	2	0	0

Table No. 19: Relation of DDI to the presence or absence of previous scar (OMH).

Type and of Non El C/S	Previous scar (1)	No previous scar (2)	DDI in min (mean)	
			(1)	(2)
EM 126	60	66	30.1	31
Crash 17	0	17	0	23
Urgent 5	0	5	0	32

Table No. 20: Reasons for delay in 17 non EL C/S, DDI, anaesthesia, TTT (SUH).

No.	Type of C/S	Gestational age	Anaesthesia	DDI in Min	Apgar score at 5min	TTT in Min	Comments
1	Urgent	37 +2	Spinal	300	10	270	Most time in preparation TTT
2	Urgent	35 +	Spinal	255	10	180	TTT prolonged + spinal anesthesia
3	EM C/S	37 +	Spinal	180	10	20	More time to establish spinal anaesthesia
4	EM C/S	37 +	Spinal	135	10	60	TTT prolonged to stabilize PT + spinal anaesthesia
5	Urgent	37 +	Spinal	90	10	60	TTT prolonged + spinal failure
6	EM C/S	37 +	Spinal	90	10	40	TTT prolognged + delay in spinal
7	EM C/S	37 +	Spinal	85	10	60	TTT prolonged + spinal delay
8	EM C/S	37 +	Spinal	70	7	20	TTT prolonged + spinal delay
9	Urgent	37 +	GA	60	10	10	Failed inhibition prolonged DDD
10	Urgent	37 +	GA	60	10	0	No cause found
11	Urgent	37 +	Spinal	60	10	10	Spinal delay
12	Urgent	37 +	Spinal	60	7	20	TTT prolonged
13	EM C/S	-	GA	55	8	10	Intra operative difficulties
14	Urgent	37 +	Spinal	55	10	5	Spinal delay
15	EM C/S	37 +	GA	55	8	20	TTT prolonged
16	EM C/S	37 +	GA	37	10	20	TTT prolonged
17	EM C/S	37 +	GA	35	10	15	TTT prolonged

Table (21): Reasons for delay in four EM C/S (OMH).

No.	Type of non EL C/S	Gestational age	Type of anaesthesia	DDI in Min	TTT in min	comments
1	EM C/S	TERM	GA	45	5	No reason stated good neonatal outcome
2	EM C/S	37 + 4	GA	45	15	TTT prolonged good neonatal outcome
3	EM C/S	TRRM	GA	45	15	TTT prolonged good neonatal outcome
4	EM C/S	TERM	GA	60	15	TTT prolonged + time for resuscitation

Table (22): Reasons for delay in 28 non-elective C/S (KNTH).

No.	Type of non EL C/S	Gestational age	Type of anaesthesia	DDI in Min	Apgar score at 5min	TTT in min	Comments
1	EM C/S	37 + 1	GA	60	10	10	Delay in blood preparation
2	Urgent	T	GA	45	10	15	TTT prolonged
3	EM C/S	T	GA	60	10	15	TTT + blood preparation
4	EM C/S	T	GA	60	8	10	IV fluids + blood prep
5	EM C/S	T	GA	40	10	10	Anaesthesia prolonged
6	EM C/S	38 + 1	GA	60	10	30	TTT prolonged + blood prep
7	EM C/S	37 + 3	GA	45	10	15	TTT prolonged
8	EM C/S	T	GA	45	8	15	TTT prolonged
9	EM C/S	38 + 1	GA	80	8	20	TTT prolonged + blood + anaesthesia
10	EM C/S	37 + 4	GA	90	10	30	Prolonged TTT + blood bank
11	EM C/S	T	GA	60	8	30	TTT prolonged
12	EM C/S	37 + 3	GA	60	8	30	TTT prolonged
13	EM C/S	T	GA	60	10	30	TTT prolonged
14	EM C/S	T	GA	65	10	35	TTT prolonged
15	EM C/S	T	GA	45	10	15	TTT prolonged
16	EM C/S	T	GA	60	8	30	TTT prolonged
17	EM C/S	T	GA	95	4	15	Multistep delay ennd
18	EM C/S	T	GA	90	8	30	TTT + multiple causes
19	EM C/S	37 + 1	GA	90	8	30	TTT + multiple causes
20	EM C/S	T	GA	80	10	40	TTT + blood prep
21	EM C/S	T	GA	90	8	25	TTT prolonged + others
22	EM C/S	T	GA	90	10	45	TTT prolonged + blood
23	EM C/S	T	GA	60	8	15	TTT + blood prep
24	EM C/S	T	GA	105	10	45	TTT prolonged + multplace
25	EM C/S	T	GA	105	10	20	Blood prep + closed theatre in out pt
26	EM C/S	T	GA	45	8	15	TTT prolonged
27	EM C/S	T	GA	60	10	15	TTT + blood prep
28	EM C/S	T	GA	90	8	30	TTT prolonged + blood prep

Fig. 1: Typers of non El C/S

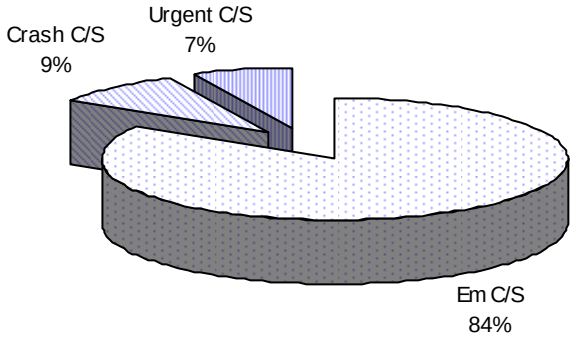


Fig. 2: Relation between the type of non El C/S and DDI

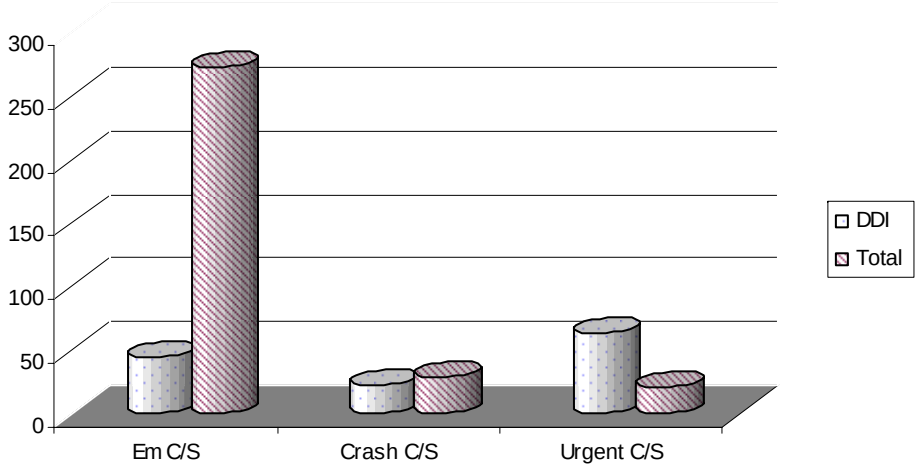


Fig. 3: Correlation between DDI and early maternal outcome

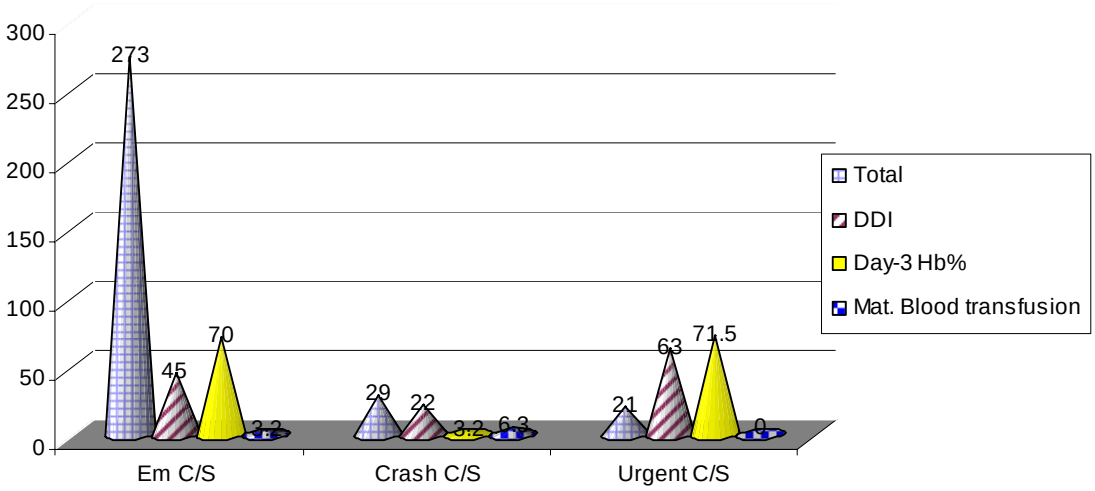


Fig. 4: Relation between DDi and type of anaesthesia

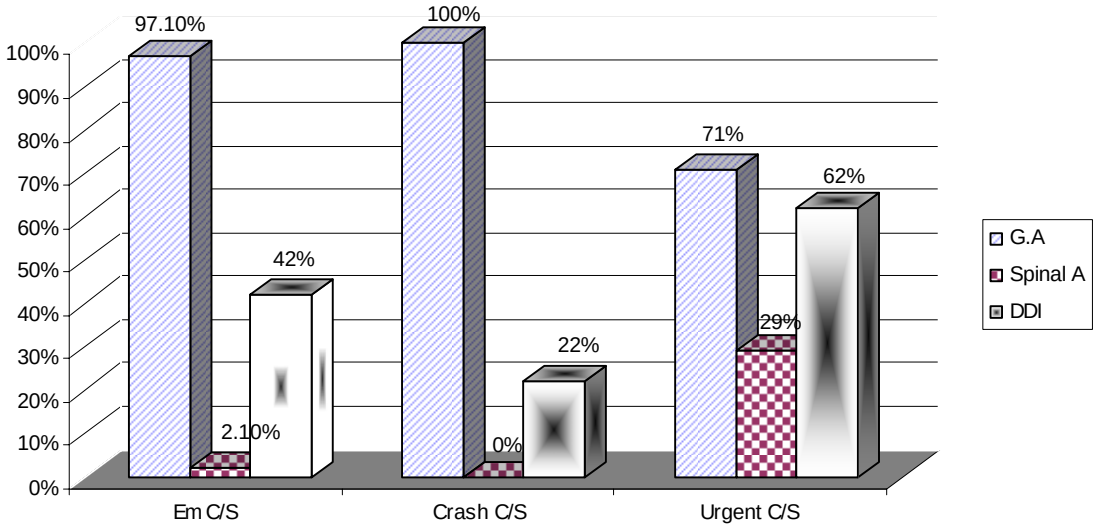


Fig. 5: Correlation between DDI and neonatal outcome

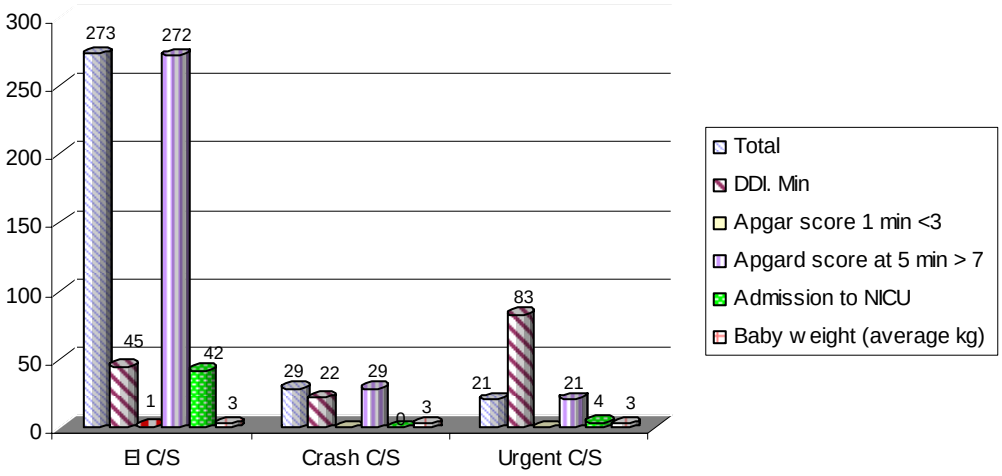


Fig. 6: DDI in non El C/S previous scar and non previous scar

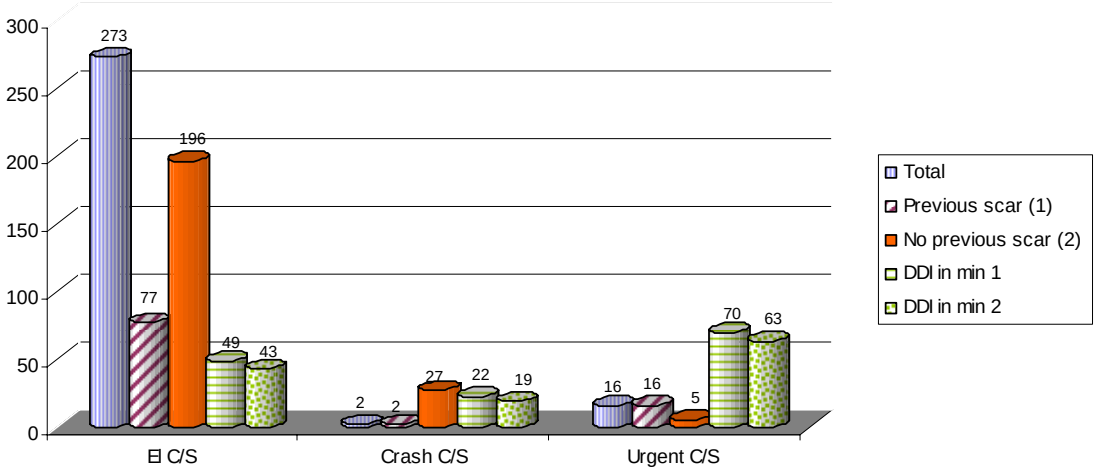
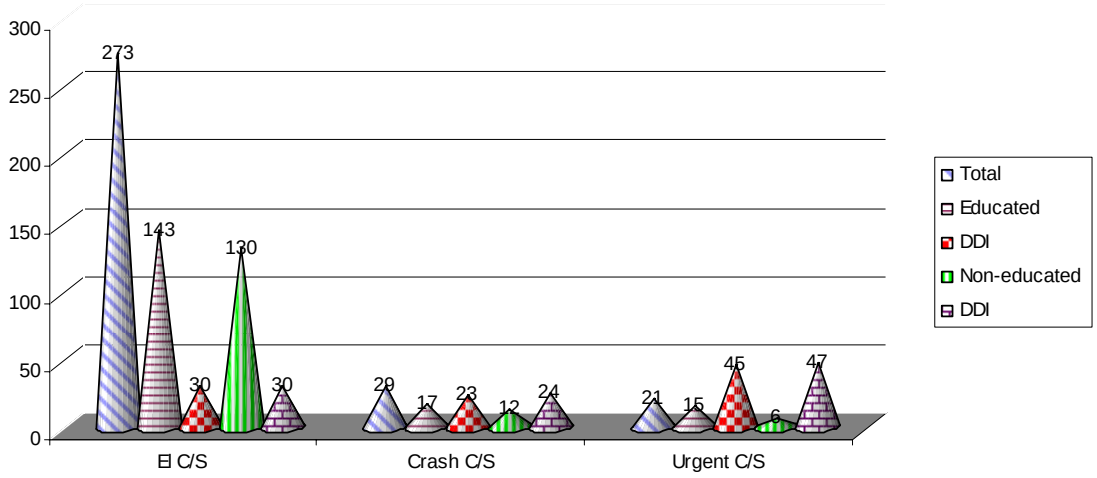


Fig.7: Type of non El C/S, DDI, Educated and non educated



DISCUSSION

This study addresses the issue of decision to delivery interval (DDI), which is very important due to introduction of clinical governance and evidence based intervention, it is also of medicolegal importance.[14]

Our study shows that in the main capital hospitals (KTH, SUH, KNTH OMH) during the period 1st Jan. To 31 Jan. 2003, there were 323 non ELC/S, 273(84%) were EMC/S, 29(9%) were crash C/S, and (21)7% were urgent C/S. Relative DDI were 46 min, 20.5 min 66.5 min respectively, they were comparable with results[15] which were 42.9 minutes for EMC/S, 27.4 minutes for crash C/S and 124.7 minutes for urgent C/S, with regard to the urgent the result were better i.e. double the DDI in our study. In our study 240(48%) EmC/S were done <30 minutes,[15] only 40% of EMC/S done in < 30 minutes in that study.

With regard to the factors influencing this interval, we found that in OMH and SUH, supplies item for non ELC/S should be from within the hospital not to be brought by the relatives, no fees for non ELC/S. In KTH, KNTH, the patient must prepare all the needed items like I.V fluids catheter and urine bag, canula, antibiotic and plaster but there is no fees for non ELC/S (different variables among hospital).

Sometimes the time will be late night which makes this task more difficult if not impossible (all pharmacies may close). In KNTH there is the problem of blood preparation and this may need a long time (it resulted in one neonatal death).

The types of anesthesia was found to be related directly to the prolongation of DDI (difference between GA versus spinal A).[16] In our study also the results proved to be like that, but has no reflection on short term maternal and neonatal outcome.

Previous C/S scar or not in our study did not affect the outcome (Fig. 7 and Tables 8,17,19) (Neither DDI nor neonatal and maternal out come) ($P < 0.05$).

Being educated or not also had no influence on DDI ($P > 0.05$) in our study (Fig. 6), the seniority of the operator (consultant and registrar) did not affecting the DDI, neonatal or maternal outcome (Tables 9, 16) ($P>0.05$), ($P>0.05$) respectively.

With regard to the neonatal outcome in our study from 273 babies delivered by EMC/S we lost one baby and the DDI was 95 minute (early neonatal death), other 272 with Apgar score at 5 min > 7 =272 (84%), with 15(4.6%) admitted to NICU and discharged in good

clinical condition (Tables 2, 3 and Fig. 5), average was weight was 2.8 kg (Table 4) (P>0.05).

With regard to maternal outcome (Fig. 4 and Tabie7, 10,13,15), day three Hb% average was 71.1% (maternal outcome was not evaluated in all the previous studies). Maternal recovery from anesthesia was smooth in all patients. The need for blood transfusion was 3.3% of all the non ELC/S (P>0.05), (P>0.05), (P>0.05), (P>0,05), (P>0.05) respectively.

Our results can be compared to the standard DDI of 30 minutes, and relative neonatal and maternal outcome were favourable.

CONCLUSION

- Three hundred twenty three (323) non ELC/S were done in the main capital hospital, 273 were EmC/S, 29 crash C/S, 21 urgent C/S, with relative DDI 46 min, 20.5 minutes and 66.5 respectively.
- Forty-eight percent (48%) of EMC/S were done in < 30 minutes which is comparable with international standards.
- In hospitals where the DDI was prolonged, the cause was known (KTH, KNTH, SUH).
- The extent of urgency of the situation is well-evaluated (crash C/S 20 minutes, urgent C/S 66.5 minutes for DDI respectively).
- In non ELC/S when done under GA the DDI reduced by half.
- Our neonatal outcome is comparable to the neonatal outcome in the literature review.
- Maternal short term outcome was measured for the first time and it is not found in the literature reviewed and in our study it was favourable outcome in numerical data.

RECOMMENDATIONS

- Decision-to-delivery interval (DDI) should be annually checked to keep the obstetrical services at the required level.
- The labour room should be close to the theatre, which should be a pure obstetric theater (not shared with any specialty).
- Requirements for C/S (I.V fluids, antibiotics, plaster, catheter and urine bag) must be available and free for the first 24 hours.
- Blood Banks cooperation must be checked and to raise their level of co-operation, and should be involved in the activities of the obstetrical units.
- Introduction of a time sheet on which it is written when the decision for non EIC/S made, anaesthesia start when and the cause of delay if DDI found to be > 3o minutes and this sheet should be kept in the file.
- Strict definition of foetal distress and proper use of partographs for accurate diagnosis of failure to progress.
- Involvement of a senior in case of top emergency.

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Questionnaire

Decision to delivery interval in non-elective caesarean section: Is it optimal in our hospitals

1. Name: ..... **2. Age:**.....

3. Residence: **a**) Urban [ ] b) Rural [ ]

4. Husband's education : .....

5. Wife's education : .....

6. Husband's occupation: a) Labourer [ ] b) Employee [ ]
c) Merchant [ ] d) Others [ ]

7. Parity: .....

8. Past obstetric history of C/S: **a**) Yes [ ] b) No [ ]

9. If "Yes" the abdominal incision:
a) Up and down infraumbilical [ ] b) Pfannenstiel [ ]

10. Past history of abdominal gynaecological operation:
a) Yes [ ] b) No [ ]

11. Past medical history: **a**) diabetes mellitus [ ] b) Hypertension [ ]
c) Bronchial asthma [ ]

12. Past history of abdominal surgical operation: **a**) Yes [ ] b) No [ ]

13. Presentation: **a**) Patient in the ward [ ] b) Brought in labour [ ]
c) Others [ ]

14. Indication for non elective C/S: .....

Decision delivery interval (DDI):

15. Decision made by: **a**) Consultant [ ] b) Registrar [ ] **c**) Other [ ]

16. Time of decision: Day..... Hour .....Minute .....

17. Time of arrival at the theatre: Day..... Hour .....Minute ....

18. Time of start of anaesthesia: Day..... Hour .....Minute ....

19. Time of delivery of the baby: Day..... Hour .....Minute ....

20. Type of anaesthesia: a) GA [ ] b) Spinal A [ ] **c**) Local [ ]

21. Operation done by: a) Consultant [ ] b) Registrar [ ] **c**) House-officer [ ]

Early neonatal outcome:

22. Apgar score: a) One minute [ ] b) Five minutes [ ]

c) Weight of the baby .....kg.

23. Baby admitted to the nursery: a) Yes [ ] b) No [ ]

24. If the baby was admitted: a) Discharge in a good conditiont [ ] b) Died [ ]

Early maternal outcome:

25. Maternal recovery from anaesthesia: a) Smooth [ ] b) Delayed [ ]

26. Maternal blood transfusion: a) Yes [ ] b) No [ ]

27. Day three maternal Hb%: .....

28. Patient discharged: a) Well [ ] b) Unwell [ ] **c**) Died