An evaluation of the indications for caesarean sections at Chris Hani Baragwanath Academic Hospital

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Background. A systematic review concluded that a caesarean section (CS) performed for medical indications will save lives; however, it is associated with short- and long-term complications. The CS rate at Chris Hani Baragwanath Academic Hospital (CHBAH) was 39.78% in 2015.
Objectives. To evaluate the indications for CSs at CHBAH.
Methods. This was a cross-sectional study conducted on the data collected in the week of 23 June to 29 June 2015. Each file was evaluated for the correctness of the decision by at least two researchers. Each reviewer could state that he/she absolutely agreed, partially agreed, did not agree or could not make an assessment.
Results. The mean (standard deviation (SD)) age of the women was 27.01 (6.35) (range 15 - 44) years. The median (interquartile range (IQR)) parity was 1 (0 - 2) (range 0 - 4). No co-morbidities were found in 13.6% (*n*=20) of the reviewed cases. Complications were found to have occurred in 17% (*n*=25) of women who gave birth over the week reviewed. The median (IQR) gestational age at delivery was 38.14 (36.39 - 40.14) (range 28.0 - 42.4) weeks. The median (IQR) Apgar (5 minutes) was 10 (9 - 10) (range 0 - 10). The median (IQR) birth weight was 3 040 (2 530 - 3 440) (range 825 - 4 575) g. The most common indications were fetal distress (*n*=73; 49.66%) and dystocia (*n*=42; 28.57%). There was absolute agreement between the two reviewers in the following: retained second twin, antepartum haemorrhage (APH) of unknown origin, placenta previa, severe intrauterine growth restriction, multiple pregnancy, abnormal presentation, eclampsia and two previous CSs. When the indication was fetal distress, dystocia, second-stage CS, or one previous CS, the absolute agreement was between 73.85% and 90.24%.
Conclusion. There were few absolute disagreements with the indication cited. Methods used to diagnose fetal distress and dystocia must be evaluated.

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In 2015, the World Health Organization (WHO) statement on caesarean section (CS) rates stated that 'Every effort should be made to provide a caesarean section to women in need, rather than striving to achieve a specific rate'.[1] A CS should be undertaken when it is medically necessary and efforts should focus on providing a CS to all women in need. However, defining a woman 'in need' can only be ascertained by the healthcare providers caring for the woman on a case-by-case basis.

While the need for a CS is important in addressing the care for every individual woman, every CS contributes to an increase in the CS rate. WHO used country-level data to show that, at a population level, maternal and neonatal mortality is not reduced any further when the CS rate increases above 10%.[1] Delivery by CS in South Africa (SA) is associated with severe complications and maternal deaths. In the Saving Mothers Report (2011 - 2013), the institutional maternal mortality ratio (iMMR) was 66.6/100 000 live births for vaginal delivery v. an iMMR of 185.8/100 000 live births for delivery by CS in SA.[2] While it is difficult to separate the risk associated with indications for the CSs, the continued increase in the CS rate in SA is what prompted the study on indications.[3]

A study in the United States of America (USA) noted that subjective indications such as arrest of dilation and non-reassuring fetal heart tracings are documented with more frequency, while more objectively defined medical indications, such as maternal, fetal or obstetric conditions, have remained stable.[4] Other reasons which are thought to contribute to the increasing rate is the increase in obstetric malpractice claims.[5]

The Robson Ten Group Classification System (RTGC) is a classification system that may assist with the main determinants of the CS rate.[6] This classification is based on four obstetric concepts which classify women into 10 groups. These groups are mutually exclusive, totally inclusive, clinically relevant and prospectively identifiable. The RTGC is useful in that it may assist in allocating resources; moreover, it is useful for public health purposes, but it will not assist with determining the correctness of the indication for CS.

The CS rate at Chris Hani Baragwanath Academic Hospital (CHBAH) has increased from 27.12% in 2008 to 39.80% in 2015 (departmental statistics). In the week of 23 June to 29 June 2015, the rate was 49%. This week was chosen arbitrarily to investigate the indications and correctness of CSs in any given week.

Methods

CHBAH is a secondary/tertiary hospital which serves pregnant

women in southern Gauteng. Women are referred from four midwife obstetrics units (MOUs), one district hospital and three regional hospitals according to criteria defined in the Maternity Care Guidelines.[7] Thus, there is a case mix which includes low-, intermediate- and high-risk women. Risk assessment is determined in the antenatal period, in labour or postpartum. Women who are classified as 'low risk' will have their antenatal care administered by a midwife and deliver at a MOU. Women who are classified as 'intermediate risk' will have their antenatal care administered by a midwife and will deliver in a hospital. Women who are classified as 'high risk' will have their antenatal care and delivery in a hospital.

All women who had a CS in the specified week had their medical notes retrieved. This was a retrospective cross-sectional study. Demographic information, co-morbidities, indication for CS (as recorded in the file), Robson's classification, intra-operative findings, immediate neonatal outcomes and immediate maternal outcomes were recorded on a datasheet by one of the researchers.

At least two of the researchers reviewed the indication for correctness according to the departmental protocol. The reviewers had been specialists from between 3 to 20 years. They were all attached to an academic hospital and actively involved in post-graduate teaching. One reviewer (EN) is a maternal fetal sub-specialist. Each reviewer could absolutely agree, absolutely disagree, partially agree, or state that it was not possible to assess the correctness of the indication. 'Partially agree' was when there was more than one indication and where the reviewer only agreed with one of the indications recorded. The reviewer also reviewed the quality of notes. This was an overall subjective assessment of between 0% (incomplete) and 100% (complete). This assessment was not validated.

The information was exported to a database (REDCap Software version 6.11.5, Vanderbilt University) hosted at the University of the Witwatersrand and then exported to STATA 14.2 (StataCorp, USA) for analysis. Categorical variables were described using frequencies and percentages and continuous variables using means (SD) and medians (IQR).

Ethics approval for the study was obtained from the Human Research Ethics Committee at the University of the Witwatersrand (ref. no. M150869) and permission to conduct the study was also obtained from the CEO of the hospital.

Results

CHBAH delivered 20 324 women in 2015. A total of 147 CSs were performed in the week of 23 to 29 June 2015. The mean (SD) age of the women was 27.01 (6.35) (range 15 - 44) years. The median (IQR) parity was 1 (0 - 2) (range 0 - 4). The median (IQR) gravidity was 2 (1 - 3) (range 1 - 6). The median (IQR) BMI was 27.30 (22.67 - 32.350) (range 17.88 - 50.50). The median (IQR) gestational age at booking was 20 (16 - 23) (range 5.0 - 35) weeks. There was a wide range of haemoglobin measured at the booking visit of between 5.1 - 15.5 g/dL, with a mean (SD) of 11.34 (1.92) g/dL.

Only 20 (13.61%) of the women had no co-morbidities during the antenatal period. The co-morbidities were HIV infection (*n*=33; 22.45%), hypertension (*n*=26; 17.69%), any previous CS (*n*=34; 20.56%), anaemia (*n*=25; 17.01%), pre-eclampsia/eclampsia (*n*=20; 13.61%), referral for postdates (*n*=14; 9.52%), previous abdominal surgery (*n*=4; 2.72%), multiple pregnancy (*n*=3; 2.04%), poor obstetric history (*n*=3; 2.04%), diabetes (*n*=2; 1.36%) and intrauterine growth restriction (IUGR) (*n*=1; 0.68%). Of those who were HIV-infected, the median (IQR) CD4 cell count was 309 (72 - 422) (range 53 - 952) cells/μL and 30 (90.91%) were on antiretroviral therapy.

The decision to perform a CS was made by a consultant in 29 (19.73%) cases, by a registrar in 87 (59.18%) cases, by an intern in 5 (3.40%) cases and it was unknown who made the decision in 26 (17.69%) cases. The quality of notes scored out of 10 was assessed by at least two reviewers and the mean (SD) scores were 6.55 (1.73) (range 3 - 9) and 6.63 (1.61) (range 3 - 9). None of the prescription charts noted the number of doses of antibiotics to be given and the fluid charts were incomplete from a nursing perspective.

A spinal anaesthetic was performed in 119 (82.99%) women, a general anaesthetic in 21 (14.29%) women, an epidural in 2 (1.36%) women, and the spinal anaesthetic was converted to a general anaesthetic in 5 (3.40%) women.

In 2 (1.36%) women a classical CS was performed, and the rest had transverse lower uterine segment CSs. The median (IQR) blood loss recorded by the surgeon was 500 (450 - 800) (range 200 - 2 000) mL. The median (IQR) blood loss recorded by the anaesthetist was 500 (400 - 750) (range 200 - 2 780) mL. The blood loss was recorded in only 51 (34.69%) cases by the anaesthetist and in 135 (91.84%) cases by the attending obstetrician.

There were 25 (17.01%) women who had one or more complications at CS. Postpartum haemorrhage (>1 000 mL) occurred in 12 (8.16%) women, 2 (1.36%) needed a substantial blood transfusion and 4 (2.72%) needed a B-Lynch suture. Three (2.04%) required ventilation not for anaesthetic purposes, 1 (0.68%) had an anaesthetic-related complication (spinal headache) and 11 (7.48%) were admitted to the maternity high care unit. There were no women who required a hysterectomy or who were admitted to the intensive care unit.

The median (IQR) gestational age at delivery was 38.14 (36.39 - 40.14) weeks. There was 1 (0.68%) stillbirth. The median (IQR) Apgar at 5 minutes was 10 (9 - 10) (range 0 - 10); the mean (SD) was 9.47 (1.33). The median (IQR) birth weight was 3 040 (2 530 - 3 440) (range 825 - 4 575) g.

The frequency of indications (Fig. 1) illustrate that some women had more than one indication. Transverse lie (*n*=1), oblique lie

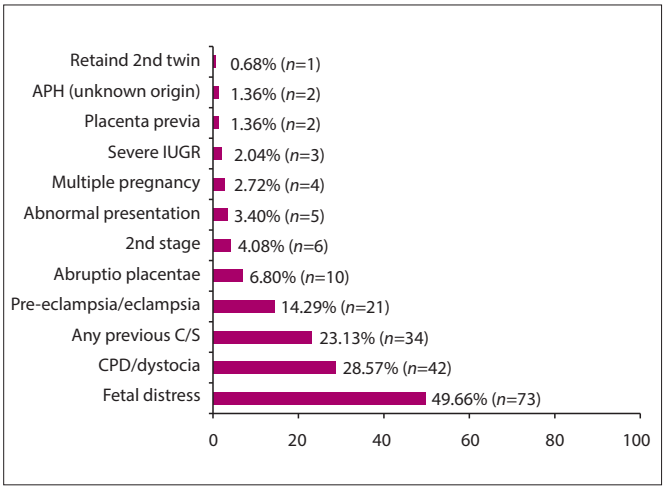

Fig. 1. A description of the indications for caesarean section. (APH = antepartum haemorrhage; IUGR = intrauterine growth restriction; C/S = caesarean section; CPD = cephalopelvic disproportion.)

(*n*=1), and breech (*n*=3) were grouped into abnormal presentation. There were 3 women with eclampsia and 18 with pre-eclampsia. Women who had 1 previous CS (*n*=27) were grouped with women who had 2 previous CSs (*n*=9).

There was absolute agreement between the 2 reviewers that a CS was indicated in the following indications (Table 1): retained second twin, APH of unknown origin, placenta previa, severe IUGR, multiple pregnancy, oblique lie, transverse lie, breech presentation, eclampsia and 2 previous CSs. There was absolute agreement with the recorded indication in 73.85% to 90.24% for the other indications. The primary reasons for disagreement were that the notes recorded were inadequate

Table 1. An explanation of the agreement with indications for CS

Indication (*n* (%)	Explanation
CS in second stage (*n*=6; 4.08%)	0 - absolute disagreement* 2 - cannot assess† (no note of level of engagement, and no repeat examination before the CS)
Abruptio placentae (*n*=10; 6.80%)	1 - absolute disagreement (3 reviewers); 6 - partially agree;‡ had other indications as well (1 of these was a ruptured uterus)
Pre-eclampsia (*n*=18; 12.24%)	1 - absolute disagreement (1 reviewer) 1 - partially agree
CPD/dystocia (*n*=42; 28.57%)	2 - absolute disagreement (2 reviewers); 8 - partially agree 4 - cannot assess insufficient information
One previous CS (*n*=27;18.37%)	0 - absolute disagreements 6 - partially agree
Fetal distress (*n*=73; 49.66%)	2 - absolute disagreement (2 reviewers) 15 - partially agree 4 - cannot assess

CS = caesarean section; CPD = cephalopelvic disproportion
*Absolute disagreement - agree with the indication completely.
†Cannot assess - insufficient notes (mainly no cardiotocograph).
‡Partially agree - do not agree with the recorded indication, but with a second indication.

Using Robson's classification, the following concepts are reflected: (*i*) category of pregnancy (singleton v. multiple); (*ii*) past obstetric history; (*iii*) course of pregnancy (spontaneous, pre-labour CS or induction of labour); and (*iv*) gestational age at delivery. The CSs were then related to the various categories (Table 2).

Discussion

A CS for fetal distress was the most common indication, followed by dystocia and then previous CS. These three indications also appear to be important drivers responsible for increasing the CS rate in both developed and developing countries.[4,8,9] There were no women where the indication was 'maternal request' in this group.

Fetal distress is diagnosed using cardiotocography (CTG) at CHBAH. Several studies have shown that the sensitivity of CTG for fetal hypoxia is high, but that the specificity is low. Inter-observer interpretation of fetal distress has been shown to be moderate[10] at best, and the sensitivity and specificity are also affected by the guideline that is used. In the present study we used the NICE guideline to categorise CTGs.[10] Agreement between treating doctor and the reviewer was good. The 'absolute disagreements' in the diagnosis of fetal distress were very few. Among women where there was 'partial agreement', it was thought that the CS was still indicated because of the second indication. Another study on evaluation of indications has shown that the most common disagreement was in interpreting fetal heart rate tracings.[8]

All women at CHBAH are monitored in labour using a partogram. Dystocia is diagnosed when the labour does not progress for 4 hours in the active phase of labour. At this stage, a decision is made to either initiate a syntocinon infusion or perform a CS. There were two absolute disagreements where the reviewers were of the opinion that the woman should have had a trial of syntocinon. The South African Maternity Guidelines now advocate a 2-hour gap between the alert line and the action line.[7] This may increase the proportion of women in whom labour intervention is instituted. The diagnosis of dystocia has

Table 2. The percentage of caesarean sections grouped according to Robson's Classification

Group 1 (21.71%) Nulliparous Single cephalic pregnancy ≥37 weeks gestation Spontaneous labour	**Group 6 (0.78%)** Nulliparous Single breech pregnancy
Group 2 (9.30%) Nulliparous Single cephalic pregnancy ≥37 weeks' gestation Labour induced or delivery by CS before labour	**Group 7 (3.10%)** Multiparous Single breech pregnancy Including women with previous uterine scars
Group 3 (10.08%) Multiparous No previous uterine scar Singleton cephalic pregnancy ≥37 weeks' gestation Spontaneous labour	**Group 8 (3.88%)** All women with multiple pregnancies Including women with previous uterine scars
Group 4 (6.98%) Multiparous No previous uterine scar Singleton cephalic pregnancy ≥37 weeks' gestation Labour induced or delivered by CS before labour	**Group 9 (1.55%)** All women with a singleton pregnancy Transverse or oblique lie Including women with previous uterine scars
Group 5 (20.16%) Multiparous At least one previous uterine scar Singleton cephalic pregnancy ≥37 weeks' gestation	**Group 10 (22.48%)** All women with a singleton cephalic pregnancy ≤36 weeks' gestation Including women with previous scars

also been shown to be one of the drivers of the primary CS.[4,10] Recent data provide a better understanding of the active phase of labour where they infer that the active phase of labour only begins when the cervix is 6 cm dilated.[11-13] This concept of individualising labour management would have to be discussed nationally in SA, rather than be instituted at one facility.

One-quarter of the previous CSs were because of having had two CSs previously, which is an indication for a repeat CS at CHBAH. One previous CS was shown to be an important contributor in this study and will probably continue to impact the CS rate until the rate for the primary CS is addressed.

We did not look at indications within each of the Robson's classes, but Group 1 and Group 3 reflect primary CS that is mainly driven by non-reassuring fetal heart rate patterns and dystocia. Women in Group 3 were those who had had a singleton pregnancy, with a cephalic presentation and in spontaneous labour, and who had not had a previous CS – these women should contribute the least to the number of CSs. This category contributed 1% to Robson's classes in the National Maternity Hospital in Dublin in 2006[14] and 3.7% in the Royal Women's Hospital in Melbourne in 2005.[15] In the present study, Robson's Group 1 contributed to 10.8% of the CSs.

The CS rate has increased over the last 50 years,[16] with a dramatic rise in the last decade. The CS rate has also increased steadily at CHBAH, with a rate of 28.4% (2005), 34.4% (2010) and 39.8% (2015) (departmental statistics). The rate at CHBAH is much higher than the overall rate in SA which was reported as 23.2% for 2011 - 2013 in the Saving Mothers Report.[2] The rate is expected to be higher in this high-risk population with only 13.61% with no antenatal co-morbidities. The rate reported in the USA in 2013 was 16.2% for low-risk women v. 76.1% for non-low-risk women.[4] We did not look at the rates separately for different risk categories. Rates are important for healthcare planning and allocation of funds, but the indications for every CS are important in making institutional changes regarding protocols and training.

Clinical recommendations in this institution would be to obtain a senior opinion on CTGs that are deemed to have non-reassuring heart rate tracings (NRHRTs). The use of fetal blood sampling may be another possibility in women who are not HIV-infected. Introducing a ST segment analysis monitoring programme which has its own guidelines may be of assistance, but whether it will assist in better selection of women for operative delivery in this setting will have to be tested. We suggest ongoing audit of indications in conjunction with categorisation using Robson's criteria.

The limitations of the study are its retrospective nature and the problem of not having clear notes. The method of assessment of 'agreement' and the 'completion' of notes was not validated. An ongoing random audit over the year may produce more generalisable results. An audit over a week looks at practice by a small group of healthcare practitioners as this setting has a rapid turnover of staff.

Conclusion

It is reassuring that the indications for CS were assessed as correct in more than two-thirds of the reviewed cases. Fetal blood sampling could assist in better management of women with fetal heart rate abnormalities and selecting those that require a caesarean delivery.

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