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CLINICAL & BASIC RESEARCH

Decisions to Perform Emergency Caesarean Sections at a University Hospital

Do obstetricians agree?

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قرارات إجراء عمليات قيصرية طارئة في مستشفى جامعي

هل أخصائيو التوليد متفقون؟

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abstract: ***Objectives:*** This study was undertaken to assess the degree of agreement amongst obstetricians regarding decisions to perform emergency Caesarean section (CS) procedures at a university hospital. ***Methods:*** This retrospective clinical audit was carried out on 50 consecutive emergency CS procedures performed between November 2012 and March 2013 on women with singleton pregnancies at the Sultan Qaboos University Hospital in Muscat, Oman. Data on each procedure were collected from electronic patient records and independently reviewed by six senior obstetricians to determine agreement with the decision. ***Results:*** Of the 50 women who underwent CS procedures, the mean age was 28.9 ± 5.1 years and 48% were *primigravidae*. A total of 65% of the CS procedures were category I. The most common indications for a CS was a non-reassuring fetal heart trace (40%) and dystocia (32%). There was complete agreement on the decision to perform 62% of the CS procedures. Five and four obstetricians agreed on 80% and 95% of the procedures, respectively. The range of disagreement was 4–20%. Disagreement occurred primarily with category II and III procedures compared to category I. Additionally, disagreement occurred in cases where the fetal heart trace pattern was interpreted as an indication for a category II CS. ***Conclusion:*** The majority of obstetricians agreed on the decisions to perform 94% of the emergency CS procedures. Obstetric decision-making could be improved with the implementation of fetal scalp pH testing facilities, fetal heart trace interpretation training and cardiotocography review meetings.

Keywords: Caesarean Section; Emergency; Decision Making; Consensus; Clinical Audit; Cardiotocography; Fetal Monitoring; Oman.

الملخص: الهدف: تم إجراء هذه الدراسة لتقييم درجة الاتفاق بين أخصائي التوليد فيما يتعلق بقرار إجراء عمليات قيصرية طارئة في مستشفى الجامعة. **الطريقة:** أجريت هذه الدراسة السريرية المرجعية على 50 عملية قيصرية طارئة متوالية لحوامل بجنين واحد فيالفترة نوفمبر 2012 إلى مارس 2013 بمستشفى جامعة السلطان قابوس في مسقط، سلطنة عمان. تم جمع البيانات لكل حالة من سجلات المريض الإلكترونية وتمت مراجعتها بشكل مستقل من قبل ستة من أخصائيي التوليد لتحديد موافقتهم على القرار المتخذ بإجراء العمليات القيصرية. **النتائج:** من النساء الخمسين اللواتي أجرين العملية القيصرية واللواتي كان متوسط أعمارهن 5.1 ± 28.9 سنة. 48% من السيدات كن في حملهن الأول. ما مجمله 65% من هذه العمليات القيصرية كان من الفئة الأولى. أكثر دواعي إجراء العملية القيصرية كان عدم الاطمئنان إلى تخطيط قلب الجنين أثناء الولادة بنسبة (40%) يتبعه تعثر تقدم الولادة بنسبة (32%). الأخصائيون الستة وافقوا على إجراء العملية في 62% من الحالات. خمسة أخصائيين وافقوا على اجراء العملية القيصرية في 80% من الحالات وأربعة في 95% من الحالات. مدى الاختلاف كان 4–20%. أكثر الاختلاف كان في العمليات القيصرية من الفئة الثانية والثالثة مقارنة بالفئة الاولى. إضافة إلى ذلك فإن الاختلاف في المقام الأول حدث في العمليات التي اجريت بداعي اضطرابات في تخطيط ضربات قلب الجنين وهي عمليات قيصرية من الفئة الثانية. **الخلاصة:** وافق غالبية الأطباء المشاركون في هذه الدراسة على قرار إجراء عملية قيصرية في 94% من الحالات. يمكن تحسين عملية اتخاذ القرار بوجود معدات لقياس معدل حموضة فروة رأس الجنين، عمل دورات منتظمة في كيفية قراءة وتحليل نتائج جهاز قياس تأثر نبضات قلب الجنين واجتماعات لمراجعة تخطيط قلب الجنين.

مفتاح الكلمات: ولادة قيصرية؛ الطوارئ؛ اتخاذ القرار؛ الآراء؛ مراجعة سريرية؛ تخطيط قلب الجنين؛ مراقبة الجنين؛ عمان.

Advances in Knowledge

- *This study is the first formal audit to assess peer agreement on the indications for performing emergency Caesarean section (CS) procedures at a university hospital in Oman.*
- *A high degree of agreement among peer obstetricians was noted for the majority of emergency CS decisions carried out during the study period.*
- *The findings of this study may serve to educate peers, junior colleagues and medical students on evidence-based indications for performing CS procedures.*

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Application to Patient Care

- *The results of this study may help to reduce the CS rate and its associated morbidity in Oman, which will subsequently reduce future costs within the healthcare sector.*

Over the past two decades, there has been an increase in the Caesarean section (CS) rate in the USA.[1] This increase was noted among all women regardless of age, race, risk of complications, history of prior CS deliveries and among both preterm and full-term pregnancies.[1] In 2010, the CS rate levelled off at 32.8% after steeply increasing for more than a decade.[2] Currently, approximately one in three mothers gives birth by CS delivery.[2] An increase in CS rates is not necessarily beneficial to either the mother or fetus; in fact, the surgery may have harmful effects.[3–5] According to Althabe *et al*., CS rates of over 15% may increase maternal and neonatal morbidity.[6] The findings of a report by a national non-profit organisation in the USA overwhelmingly support vaginal birth, particularly spontaneous vaginal birth, in the absence of compelling reasons to utilise other delivery methods.[7] Nevertheless, CS procedures have become more widely accepted due to advances in anaesthesia, newborn care and blood transfusions as well as in order to avoid litigation.[8] The most common indications for a CS procedure include a non-reassuring fetal heart trace, labour dystocia, previous uterine scarring and fetal malpresentation.[9]

In Oman, the CS rate gradually increased from 9.7% in 2000 to 15.7% in 2009.[10,11] At the Sultan Qaboos University Hospital (SQUH), a tertiary care university hospital in Muscat, Oman, the annual delivery rate was approximately 3,800 in 2013, with a CS rate of 18%.[12] The CS rate is a key performance indicator for the Department of Obstetrics & Gynaecology at SQUH; the aim is to keep the rate at 15%, if possible. This study aimed to assess the degree of agreement among six senior peer obstetricians regarding emergency CS decisions at SQUH.

Methods

This retrospective clinical audit was conducted in SQUH between November 2012 and March 2013. A total of 50 consecutive emergency CS procedures performed in SQUH during the study period for women with singleton pregnancies were reviewed by six senior obstetricians to determine agreement with the decision to perform the procedure. Women with multiple pregnancies and those who underwent elective CS procedures or emergency CS procedures due to malpresentation were excluded from the study. Informed consent for the CS procedure was obtained from all patients prior to the surgery.

All of the patients included in the study were monitored using continuous cardiotocography (CTG) at a speed of 1 cm/minute during the active phase of labour. Fetal heart rate traces were categorised as normal, suspicious or pathological by the delivery ward team according to the Royal College of Obstetricians and Gynaecologists (RCOG) guidelines on intrapartum fetal monitoring.[13] The CS procedures were categorised by urgency as per RCOG guidelines as follows: category I (immediately life-threatening to mother or fetus), category II (no immediate threat to mother or fetus) or category III (requiring early delivery).[14] The decision to perform a category I CS was made with a pathological trace, while a decision for a category II CS was made by the senior registrar/consultant on call following suspicious traces which did not respond to conservative measures. Category III procedures were performed when early delivery was indicated, as per the availability of resources. Nonprogress of labour was defined as a failure to achieve progressive cervical dilatation and descent despite four hours of adequate uterine activity or six hours of oxytocin administration with inadequate uterine activity.[15]

Electronic patient records were reviewed by four consultants and two senior registrars from the Department of Obstetrics & Gynaecology at SQUH. Each individual assessor collected and analysed information from each case, including maternal age, parity, body mass index (BMI), umbilical artery pH and past obstetric history as well as the CTG tracings, gestational age at delivery and Apgar scores of the fetus. Maternal and fetal outcomes and data on the CS indications and category were also reviewed. Following their analysis, each of the six peer obstetricians were asked to answer either "yes" or "no" to the following question: "Do you agree with the decision for performing the CS?" The range of agreement was calculated by a simple count of how many agreed or disagreed on the indications for each CS procedure. The obstetricians were not blinded and had full access to the hospital records. Analysis of the data was performed using descriptive statistics.

This study was approved by the Medical Research & Ethics Committee of the College of Medicine & Health Sciences at Sultan Qaboos University (MREC #991).

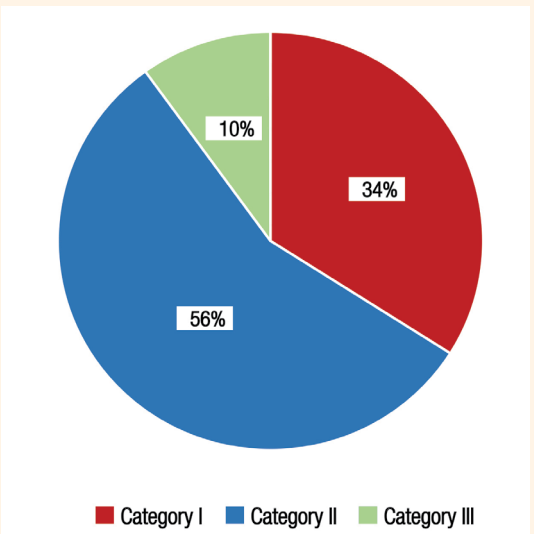

Figure 1: Categorisation by urgency* of consecutive emergency Caesarean sections carried out at the Sultan Qaboos University Hospital in Muscat, Oman, during the study period (N = 50).

**Category I procedures were performed due to immediate life-threatening indications to the mother or fetus, category II procedures were performed when there was no immediate threat and category III procedures were performed when early delivery was indicated.[14]*

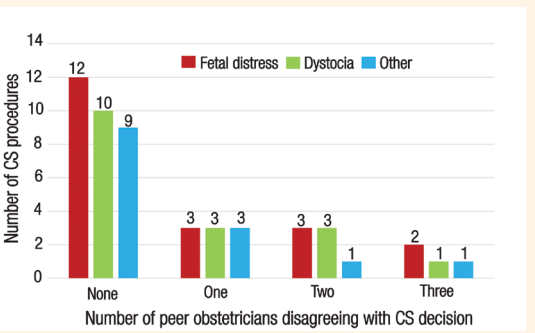

Figure 2: Disagreement among peer obstetricians according to the indication for a Caesarean section (CS) among consecutive emergency CS procedures carried out at the Sultan Qaboos University Hospital in Muscat, Oman, during the study period (N = 50).

CS = Caesarean section.

Results

Of the 50 women included in the study, 48% were *primigravidae* and the rest were *multiparae*. The majority (66%) of the women were 21–30 years old (mean age: 28.9 ± 5.1 years). Only one of the women was over 40 years old. Most of the women (92%) delivered at full-term, while 8% had preterm deliveries. Labour occurred spontaneously in 62% of the women; the remaining women either underwent induced labour (24%) or did not go into labour at all (14%). The birth weight of the neonates ranged from 1,500–4,200 g (mean: 2,990 ± 700 g). One of the neonates had an umbilical artery pH of <7 and required a short period of observation after birth, although they recovered without any sequelae. The majority of the women (90%) had an uneventful postoperative period and were discharged on the third postoperative day. The most common morbidity was postpartum haemorrhage (10%). A blood transfusion was required for three women who were operated on for placenta *praevia*. There were two cases of postoperative pyrexia and one case each of pneumonic consolidation and wound infection.

The categorisation of CS procedures based on urgency is shown in Figure 1. The most common indications for emergency CS procedures were fetal distress as evidenced by a non-reassuring fetal heart trace (40%) and dystocia (32%). Other indications included antepartum haemorrhage (8%), severe pre-eclampsia (6%) and fetal macrosomia (2%). Of the 20 cases of fetal distress, 60% had pathological traces and 40% had suspicious traces. For cases of labour dystocia, 63% were operated on during the active phase of the first stage of labour while the remaining women underwent the CS procedure at full dilation. Out of the 16 cases of labour dystocia, 15 women received oxytocin prior to the CS procedure. The mean time interval between the decision to perform the CS procedure and the delivery was 40.7 minutes for cases with non-reassuring fetal heart traces and 47.4 minutes for those with dystocia.

Complete agreement with the decision to perform CS procedures was reported by all six obstetricians for 62% of cases. Five obstetricians agreed with 80% and four agreed with 95% of the decisions. There was a higher degree of agreement for category I CS procedures compared to categories II and III. The majority of the disagreements amongst peer obstetricians occurred when the indication for the CS procedure was a non-reassuring fetal heart trace (one obstetrician disagreed in three cases, two in three cases and three in one case), dystocia (one obstetrician disagreed in three cases and two in three cases) or fetal macrosomia (three obstetricians disagreed in one case). Figure 2 shows the number of peer obstetricians who disagreed with the decision to perform a CS procedure according to selected CS indications. The frequency of disagreement with indications to perform CS procedures for each peer obstetrician is shown in Figure 3.

Discussion

Several studies have shown an inverse association between CS rates and maternal and perinatal mortality at the population level in low-income countries where

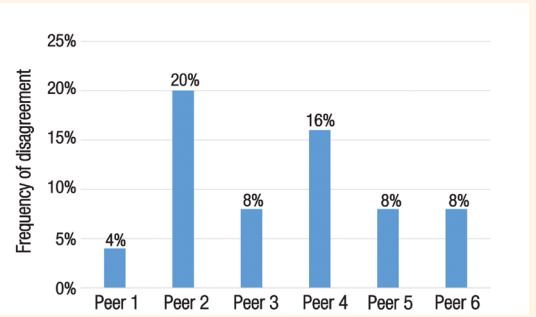

Figure 3: Frequency of disagreement among individual peer obstetricians regarding decisions to perform emergency Caesarean sections carried out at the Sultan Qaboos University Hospital in Muscat, Oman, during the study period (N = 50).

large sectors of the population lack access to basic obstetric care.[3,4,16,17] The World Health Organization (WHO) estimated the average cost of a CS procedure to be approximately USD $373 in countries with an excessive CS rate and USD $135 in countries with an optimal CS rate.[18] As a result, CS procedures are approximately 2.8 times more expensive in countries which utilise the procedure excessively.[18] The current CS rate at SQUH exceeds the recommended CS rate advocated by the WHO.[19] This may be a result of the referral of high-risk patients to SQUH from primary and secondary care hospitals in Oman. The current study was therefore undertaken as a measure of quality and to assess the scope for reducing the CS rate at SQUH, consequently reducing the morbidity and costs associated with this procedure.

In the current study, CS procedures were classified into three categories according to the degree of urgency.[14] The majority of the disagreements amongst peer obstetricians regarding decisions to perform emergency CS procedures occurred when the indication for the CS was a non-reassuring fetal heart trace or dystocia. This often occurred in cases where the fetal heart trace pattern was interpreted as an indication for a category II CS. Unnecessary CS procedures performed due to suspicious fetal heart traces generally occur because of limited knowledge regarding the CTG patterns that predict neonatal outcomes or due to the fear of medicolegal liability.[20] Review meetings designed to correctly interpret CTG traces may help to reduce the CS rate. In cases with non-reassuring fetal heart traces, resuscitative measures like maternal positioning, oxygen supplementation, correction of maternal hypotension and uterine hyperstimulation should be tried before the decision to perform a CS procedure is made. Fetal heart rate acceleration in response to scalp stimulation is a recommended procedure to confirm that the fetus does not have acidosis.[13,14] Some evidence exists to indicate that fetal scalp sampling reduces the CS rate when the fetal heart trace is suspicious.[21] However, fetal scalp pH testing is not favoured in certain institutions.[15,20] Additionally, scalp pH test kits are not easily available and many hospitals do not have the facilities to perform scalp pH estimations. Although scalp pH estimation was previously performed at SQUH, it was stopped due to difficulties in obtaining the test kits.

The American Congress of Obstetricians and Gynecologists recommends that CS procedures performed due to active-phase labour arrest during the first stage of labour should be reserved for women with ruptured membranes who are at least 6 cm dilated and "who fail to progress despite 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change".[15] In the current study, 94% of the labour dystocia cases received a trial of oxytocin before the CS procedure was performed. According to delivery ward protocol at SQUH, partograms are maintained for all women in labour. Four hours' delay from the alert line of the partogram with good uterine contractions is considered to indicate arrest of labour in the active phase. However, this policy may not have been followed for all cases in the current study, as fetal heart tracing was perceived to be non-reassuring for some cases with dystocia.

Some of the other indications for CS observed in the current study included placenta *praevia*, severe pre-eclampsia and fetal macrosomia. Fetal macrosomia was the third most common indication for a CS decision where the assessors had disagreement. The difficulties in estimating fetal weight clinically or by ultrasound are well-known. Ultrasonography performed late in pregnancy to estimate fetal weight is associated with an increase in CS deliveries with no evidence of neonatal benefit.[22] At SQUH, CS deliveries based on late-pregnancy ultrasonography are mostly performed to avoid medicolegal issues like shoulder dystocia and Erb's palsy in cases of suspected macrosomia. Although a CS is indicated in cases where the estimated birth weight is ≥5,000 g or 4,500 g for babies born to non-diabetic and diabetic women, respectively, an accurate estimation of fetal weight is difficult, particularly in late gestation.[22] Patients should be made aware that shoulder dystocia can also occur with much smaller babies—especially among diabetic women—and that this may subsequently affect the decision to perform a CS for women with pregestational or gestational diabetes.[22] As the number of cases in this audit was small, it was not possible to reach a clinically significant result. Further studies with larger samples are recommended.

Conclusion

This audit was carried out to analyse emergency CS procedures performed at a university hospital in Oman and to assess the degree of agreement among peer obstetricians with the decisions to perform these procedures. Notably, disagreement mostly occurred with decisions to perform category II CS procedures due to non-reassuring fetal heart traces. Accordingly, fetal scalp pH testing facilities, cardiotocography review meetings and staff education and training sessions on the correct interpretation of fetal heart rate traces in labour are recommended to reduce CS rates.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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