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International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo



CLINICAL ARTICLE

Cesarean delivery surveillance system at a maternity hospital in Kabul, Afghanistan

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ARTICLE INFO

Article history:

Received 9 June 2008

Received in revised form 22 August 2008

Accepted 22 August 2008

Keywords:

Afghanistan

Birth weight

Cesarean delivery

Perinatal outcome

Quality assurance

Surveillance system

ABSTRACT

Objective: To use an active facility-based maternal and newborn surveillance system to describe cesarean delivery practices and outcomes in a resource-poor setting. **Methods:** Using data from operating room logbooks, 392 cesarean deliveries were evaluated between April 1 and June 30 2006 at a large public maternity hospital in Kabul, Afghanistan. **Results:** The perinatal mortality rate was 89 per 1000 births: 57% antepartum and 37% intrapartum stillbirths. Fetuses with normal birth weight comprised 85% of intrapartum stillbirths. Obstructed labor, uterine rupture, and malpresentation accounted for more than 50% of perinatal deaths. The cesarean delivery rate was 10.2% and there were 2 maternal deaths. **Conclusion:** The high percentage of intrapartum stillbirths among normal birth weight fetuses suggests a need for improved labor monitoring and surgical obstetric practices. The use of a facility-based perinatal surveillance system is critical in guiding such quality assurance initiatives.

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1. Introduction

The maternal mortality rate in Afghanistan is among the highest in the world, and recent estimates indicate that it ranges from 400 per 100 000 live births in Kabul, the urban centre, to 6500 per 100 000 in the remote provinces [1]. The overall perinatal mortality rate, which parallels the magnitude of the maternal mortality figures, is 96 per 1000 births of which approximately 56% are stillbirths [2]. In response to these shocking indicators, Afghanistan's Ministry of Public Health (MoPH) has prioritized the expansion of maternal health services, with a particular focus on addressing the lack of availability and under-use of cesarean delivery [3–6].

The relationship between delivery by cesarean and maternal and perinatal health outcomes is unclear, and the optimal rate of delivery in any region by cesarean remains controversial [7–10]. A recent survey of 80 000 deliveries from 8 Latin American countries suggested that increased rates of cesarean delivery do not necessarily indicate improved quality of maternal health services [11]. The survey showed that increased cesarean rates in these countries were associated

with higher maternal morbidity and mortality, and independently associated with increased stillbirth rates. These findings suggest that rigorous evaluation of surgical practices and quality of care currently active in facilities performing cesarean deliveries is warranted to ensure that they positively impact maternal and perinatal health [11,12].

In Afghanistan, as in other low resource settings, the lack of basic health information systems and accurate medical records is a frequent obstacle to conducting meaningful monitoring and evaluation of practices, leading to difficulties in improving the quality of care at the institutional level [5,11,12]. To address this situation and improve the health information systems related to reproductive health in Afghanistan, the MoPH, with assistance from WHO and the Collaborating Centre in Reproductive Health at the Centers for Disease Control (CDC) in Atlanta, USA, developed a facility-based maternal and newborn surveillance system for use in maternity hospitals in Kabul [5]. The present paper uses data from this surveillance system to describe cesarean delivery practices, determine the association between risk factors and maternal and perinatal mortality, and identify potentially modifiable health practices, including the surgical management of risk factors in a large public maternity hospital in Kabul. It is hoped that the findings will be used to improve the quality of obstetric care including cesarean delivery in Afghanistan, as well as providing a method of monitoring and improvement that will be useful in other resource-poor settings.

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2. Materials and methods

The MoPH and CDC maternal and perinatal outcomes surveillance initiative was implemented in 2006 in Rabia Balki Hospital (RBH), a referral government maternity hospital in Kabul that delivers approximately 15 500 women per year and functions as a training site for residents in obstetrics and gynecology [5,12,13]. RBH delivers approximately 30% of the hospital deliveries in Kabul. Emergency obstetric care at RBH is divided into 2 main shifts: the day shift from 8 am until 4 pm, and the night shift from 4 pm to 8 am.

Data used for the present study were extracted from RBH's operating room logbooks which contain clinical information on all cesarean deliveries that occur in the hospital. These logbooks were specifically designed as a key tool of the surveillance system and were maintained by local healthcare workers trained in data entry procedures, including the International Classification of Diseases (ICD-10; www.who.int/classifications/icd/en/) to code indications for cesarean delivery. An onsite national coordinator trained the local healthcare workers in data collection procedures and supervised the data collection process to ensure quality and completeness of logbook records.

We reviewed the daily operating room logbook records for the 3 months between April 1 and June 30, 2006. All cesarean deliveries performed during the study period were included. The variables extracted from the logbook records were: shift (day or night); indications for cesarean delivery; type of surgery (elective or emergency); type of anesthesia (regional or general); birth weight; and perinatal and maternal mortality. Extracted data were entered into Excel (Microsoft, Redmond, WA, USA) spreadsheets for analysis.

In the logbooks, complications that led to cesarean delivery were coded into 46 categories according to the ICD-10. For our analysis, the surgical codes assigned to each cesarean delivery were collapsed into 12 major indication categories (Table 1) [14]. The ICD-10 diagnostic codes were independently grouped into these 12 categories by 2 authors (TK, RG). Differences in categorization were resolved through discussion and the input of a third author (MM) until consensus was reached.

Maternal and perinatal mortality were defined as the death of the mother and fetus/neonate between the time of arrival of the woman at hospital to the time of discharge. Deaths after discharge (which could be around 3 days after cesarean delivery) are not captured here. Furthermore, pregnant women dying in the community who did not reach the facility were not counted in this surveillance system.

For stillbirths, the condition of the fetus was used to classify the time of death. When the skin of the stillbirth was not intact the fetus was

Table 1

Frequency distribution of indications for cesarean delivery according to birth weight in grams^a

Indication for cesarean delivery	Birth weight, g			Total ^c
	<1500 (n=12)	1500–2499 (n=55)	≥2500 (n=317)	
Malpresentation (including breech)	2 (16.7)	10 (18.2)	75 (23.7)	87 (22.2)
Obstructed labor ^b	1 (8.3)	3 (5.5)	54 (17.0)	58 (14.8)
Premature rupture of membranes	0	10 (18.2)	37 (11.7)	48 (12.2)
Fetal distress	0	7 (12.7)	39 (12.3)	46 (11.7)
Previous cesarean delivery	0	1 (1.8)	36 (11.4)	37 (9.4)
Pre-eclampsia or eclampsia	2 (16.7)	7 (12.7)	12 (3.8)	21 (5.4)
Antepartum hemorrhage	1 (8.3)	5 (9.1)	12 (3.8)	19 (4.8)
Placenta previa	3 (25)	6 (11.0)	8 (2.5)	18 (3.8)
Other maternal conditions	1 (8.3)	1 (1.8)	9 (2.8)	13 (3.3)
Other fetal conditions	1 (8.3)	2 (3.6)	7 (2.2)	10 (2.6)
Multiple pregnancy	0	2 (3.6)	6 (1.9)	10 (2.6)
Suspected or imminent uterine rupture	1 (8.3)	1 (1.8)	6 (1.9)	9 (2.3)
Unknown	0	0	16 (5.0)	16 (4.1)

^a Values are given as number (percentage).

^b Includes cephalopelvic disproportion, dystocia, and failure to progress.

^c Includes 8 neonates without birth weight data.

Table 2

Perinatal fatality rate and timing of death by perinatal cesarean delivery risk factor

Perinatal risk factor for cesarean delivery	Timing of perinatal death				Perinatal risk factor specific fatality rate (%)
	Ante partum (n=20)	Intra partum (n=13)	Pre discharge (n=2)	Total perinatal deaths (n=35)	
Malpresentation (including breech)	5	4	1	10	12 (10/87)
Suspected or imminent uterine rupture	1	4	0	5	56 (5/9)
Obstructed labor ^a	1	3	0	4	7 (4/58)
Placenta previa	2	0	1	3	17 (3/18)
Antepartum hemorrhage	2	1	0	3	16 (3/19)
Pre-eclampsia or eclampsia	3	0	0	3	15 (3/21)
Previous cesarean delivery	2	0	0	2	5 (2/37)

^a Includes cephalopelvic disproportion, dystocia, and failure to progress.

considered a macerated stillbirth and these cases were categorized as antepartum. Stillbirths that were fresh (no sign of maceration) were classified as intrapartum. Live births followed by death before discharge from hospital were categorized as pre-discharge deaths. For our analysis, birth weights were divided into 3 groups: less than 1500 g, 1500–2499 g, and 2500 g or greater [15].

3. Results

Of the 3850 deliveries between April and June 2006 at RBH, 392 (10.2%) were delivered by cesarean. This rate is consistent with the approximately 10% cesarean delivery rate found in a review of more than 50 000 births in 4 main hospitals in Kabul [12]. Approximately 98% (384) of the births had recorded information for neonatal birth weight. The proportion of low birth weight neonates (<2500 g) among the cesarean deliveries was 17.5%.

Table 1 presents data, stratified by birth weight, on the indications for the 392 cesarean deliveries. The 3 most common indications or labor complications leading to cesarean delivery were 22.2% with malpresentation (n=87), 14.8% with obstructed labor (n=58), and 12.2% with premature rupture of the membranes (PROM) (n=48). Malpresentation was also the most common indication at 23.7% (n=75) for cesarean delivery among normal birth weight infants (≥2500 g); while placenta previa was the leading indication at 25% (n=3) for birth weights less than 1500 g.

During the study period there were 35 perinatal deaths in women who underwent a cesarean at RBH (perinatal mortality rate 89.2 per 1000). There were 33 stillbirths, resulting in a stillbirth rate of 84.1 per 1000 births; of these, 20 (60.6%) were antepartum and 13 (39.4%) were intrapartum stillbirths, with rates of 51 and 33.2 per 1000 births, respectively (Table 2).

Perinatal fatality rates (proportion of cesarean deliveries that ended in perinatal death for each risk factor associated with cesarean) are

Table 3

Type of surgery according to shift and type of anesthesia^a

Variable	Emergency (n=237)	Elective (n=151)
Shift		
Day Shift (8:00–16:00)	60 (25.3)	43 (28.5)
Night Shift (16:00–8:00)	177 (74.7)	108 (71.5)
Anesthesia		
General	114 (48.1)	144 (95.4)
Spinal	5 (2.1)	4 (2.6)
Unknown	118 (49.8)	3 (2.0)

^a Values are given as number (percentage).

Table 4
Perinatal mortality by type of surgery, shift, and anesthesia^a

Variable	Antepartum	Intrapartum	Predischarge
<i>Type of surgery</i>			
Emergency (n=23)	13 (57)	9 (39)	1 (4)
Elective (n=12)	7 (58)	4 (33)	1 (8)
<i>Shift</i>			
Day (n=11)	5 (45)	5 (45)	1 (10)
Night (n=24)	15 (63)	8 (33)	1 (4)
<i>Type of anesthesia</i>			
General (n=24)	15 (63)	8 (33)	1 (4)
Spinal (n=1)	0 (0)	0 (0)	1 (100)
Unknown (n=10)	5 (50)	5 (50)	0 (0)

^a Values are given as (number) or number (percentage).

presented in Table 2. The surgical risk factors linked with the largest percentage of deaths (stillbirths and predischarge deaths) included suspected or imminent uterine rupture (56% of all uterine rupture cases), placenta previa (17% of all placenta previa cases), and antepartum hemorrhage (16% of all antepartum hemorrhage cases). Malpresentation and obstructed labor, the two most common risk factors for cesarean delivery resulted in perinatal death in 12% and 7% of these cases, respectively.

The two most commonly cited risk factors for cesarean delivery associated with antepartum stillbirth were 25% with malpresentation (n=5) and 15% with pre-eclampsia (n=3). For intrapartum stillbirths, almost all cases were associated with 3 risk factors: 30.8% with uterine rupture (n=4); 30.8% with malpresentation (n=4), and 23% with obstructed labor (n=3). Out of the 9 cases of suspected/imminent uterine rupture, 5 (55.6%) resulted in perinatal death: 1 antepartum and 4 intrapartum.

Table 3 shows the type of surgery performed (emergency or elective) according to shift and type of anesthesia used. Type of surgery was recorded in 99% (388) of cases; and the type of anesthesia was recorded in 69% (276). Approximately 61% of cesarean deliveries were performed on an emergency basis, with the majority performed during the night shift (74.7%) and under general anesthesia (48.1%). Of the 151 elective cesarean deliveries, 108 (71.5%) were performed during the night shift and 144 (95.4%) under general anesthesia.

Perinatal mortality according to type of surgery, shift, and type of anesthesia is presented in Table 4. For both emergency and elective cesarean deliveries the majority of deaths (57% of emergency and 58% of elective) were antepartum stillbirths. For cesarean deliveries performed during the day there was no difference in the proportion of antepartum (45%) and intrapartum (45%) stillbirths. For both cesarean deliveries performed during the night shift and those under general anesthesia, intrapartum stillbirths accounted for approximately 33% of the perinatal mortality, 63% were antepartum, and 4% predischarge.

Analysis of perinatal outcomes by type of cesarean (elective or emergency) and timing (day or night shift) shows that perinatal mortality was similar for elective 7.9% (12/151) and emergency 9.7% (23/237) procedures. Perinatal mortality was highest at 11.7% for emergency cesareans performed during the day shift (7/60); and lowest at 7.4% for elective cesarean performed during the night shift (8/108). Although antepartum mortality did not differ across these variations in surgical practice, intrapartum mortality was highest for emergency cesarean deliveries performed during the day shift (6.7%; 4/60).

There were 2 maternal deaths out of 392 cesarean deliveries. One death was associated with obstructed labor and the other with antepartum hemorrhage. The timing of these deaths, whether intrapartum or postpartum, is not known. Both cases were emergency cesareans performed under general anesthesia that also resulted in intrapartum death of the fetus. There was no associated maternal mortality for the 9 cases of suspected uterine rupture (Table 1).

4. Discussion

In view of Afghanistan's current emphasis on improving its cesarean delivery capacity and the broader debate concerning the pros and cons of the increasing rates of cesarean deliveries in low-resource countries, it is important to evaluate the determinants and outcomes of these practices at Afghan facilities [7,9–11]. In this descriptive analysis of cesarean delivery practices at Rabia Balki Hospital in Kabul, the overall cesarean rate was found to be 10.2%, which is in keeping with the 10% rate found in an extensive review of perinatal outcomes in 53 524 births at 4 hospitals in Kabul [12]. While the national cesarean delivery rate in Afghanistan is unknown, it is most certainly lower than the present study's calculated rate of 10.2%, given WHO estimates that nearly 86% of births in Afghanistan are not attended by a skilled health worker [16].

In contrast to the nearly universal use of regional anesthesia for cesarean delivery in high-resource countries, the majority of surgeries at RBH were performed under general anesthesia. This is not an unusual finding in low resource settings. It has been suggested that low numbers of physicians trained in regional anesthetic techniques, and limited availability of necessary medications and equipment (particularly local anesthetics and spinal needles), have prevented widespread adoption of these techniques in resource-poor settings [17,18].

In examining other cesarean delivery risk factors it was observed that the intrapartum perinatal mortality rate was highest for emergency cesarean deliveries performed during the day shift, even though the majority of emergency surgeries were performed at night when there is a reduced number of available attending staff [13]. One possible explanation for this finding could be inadequate intrapartum care provided during the night shift, resulting in delayed management of labor complications. Future studies should include data that could better clarify these findings such as timing of patient admission, intrapartum care events preceding cesarean delivery, nursing and physician coverage, operating room availability, and the type and frequency of fetal and maternal surveillance during each shift.

The observed stillbirth rate of 84.1 per 1000 births is two-fold higher than population-based values reported for Sub-Saharan Africa and parts of Asia where a large proportion of the population does not have access to emergency obstetric care [19]. Although it is not possible to draw direct comparisons between our facility-based rate with these population-based rates, it is concerning that the stillbirth rate is higher than rates observed in parts of the developing world that have no access to surgical obstetric services, particularly because approximately 37% of the stillbirths in our study were intrapartum and 85% of these occurred in normal birth weight infants. While it is plausible that the antepartum stillbirths in our study population reflect delays that took place prior to arrival at RBH, a normal birth weight fetus dying during labor or delivery is usually defined as a preventable death that could be avoided with the provision of appropriate and timely emergency obstetric care [19].

The finding that malpresentation, obstructed labor, and uterine rupture combined constituted 85% (11/13) of all intrapartum deaths also indicates the need for improvements in intrapartum care, such as partograms and timely cesarean delivery [19–21]. In low-resource country settings the most common etiologies for uterine rupture include unrecognized obstructed labor and inappropriate use and monitoring of oxytocin for labor induction [22]. In women who have had previous cesarean delivery, labor augmentation with oxytocin has been associated with a four-fold increase in risk of uterine rupture [23]. The need for improvement of labor monitoring and delivery care in Kabul is further supported by an analysis of more than 50 000 births, which revealed that the intrapartum death rate in normal birth weight fetuses undergoing cesarean delivery was 5 times greater compared with vaginal delivery [12].

The widespread inappropriate use of cesarean delivery for PROM, as well as the previously discussed use of general anesthesia rather

than regional anesthesia, is inconsistent with current evidence-based recommendations and suggests a knowledge gap that will require investment in programs to increase evidence-based obstetric practices.

Furthermore, the present study highlights the critical role of relatively simple patient data collection and surveillance tools in understanding practice and facility-level determinants of maternal and perinatal outcomes following cesarean delivery. Routine and systematic compilation of such facility-level data on cesarean deliveries in low-income countries and their outcomes can greatly contribute to the current debate regarding the optimal cesarean rate in these contexts.

In summary, although this analysis was based on a retrospective review of operating room logbooks and has limitations, including the lack of some key maternal and perinatal variables (parity, age, induction, use of oxytocics, time of admission, time of surgery, and 5-minute Apgar scores), it was felt that it met its primary goal of describing the cesarean delivery practices that require improvements at the RBH hospital; namely, training in evidence-based practices for the early detection of malpresentation, the appropriate management of PROM, and labor monitoring through routine use of the partogram to detect prolonged labor and fetal distress [24]. These, together with the provision of appropriate and timely cesarean deliveries, are crucial in averting preventable maternal and perinatal mortality in Afghanistan and other resource poor settings.

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