MEDDOCS Open Access Publisher

ISSN 2641-6522

Annals of Obstetrics and Gynecology

Open Access | Research Article

Quality of Caesarean Delivery and its Determinants in Lubumbashi, Democratic Republic of Congo

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Received: May 13, 2020

Accepted: Jun 26, 2020

Published Online: Jun 30, 2020

Journal: Annals of Obstetrics and Gynecology

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Keywords: Caesarean section; Quality; Determinants; Lubumbashi.

Abstract

Introduction: Cesarean Section (CS) is a major obstetric surgery, widely recognized as an effective means that contributes to the reduction of maternal and perinatal mortality, when its indication is appropriate. CS has been the subject of numerous publications regarding its rate but very little regarding its quality. The present study aims to determine the frequency of caesarean delivery in Lubumbashi, to assess its quality as well as to identify determinants of its poor quality.

Methods: An analytical cross-sectional study, based on the "quality of caesarean delivery" model of Dujardin *et al.*, focused on women who delivered by CS from October 1st, 2017 to March 31st, 2018 in 6 hospitals selected in Lubumbashi. The data were collected by using clinical records and a questionnaire survey, and then analyzed using the STATA 12 software. A multiple regression was made with a significance threshold of $p < 0.05$.

Results: A total of 350 (16.8%) CS was performed on 2,086 registered deliveries. The mean delay in performing CS deliveries was 44.6 minutes. Quality of CS delivery was good in 14.3%, fairly good in 74.3%, medium in 10.8% and poor in 0.6%. Low attendance at antenatal care (AOR = 3.3 [1.4 – 7.8]), night as the time of performing CS (AOR = 3.2 [1.3 – 7.4]) and public nature of maternity (AOR = 13.4 [4.8 – 37.8]) were very significantly associated with poor quality of CS deliveries.

Conclusion: Good quality of CS deliveries is not yet a reality in some maternities in Lubumbashi. This study on CS deliveries would analyze dysfunctions based on these poor quality determinants in order to initiate a program to improve the quality of CS.

Cite this article: Kasongo SK, Mukuku O, Kinenkinda X, Kakoma JB. Quality of Caesarean Delivery and its Determinants in Lubumbashi, Democratic Republic of Congo. Ann Obstet Gynecol. 2020; 3(1): 1014.

Introduction

Caesarean Section (CS) is one of the means recommended in the strategy for safe motherhood [1,2]. When used appropriately, it is widely recognized as an effective means of reducing maternal and perinatal mortality [3,4]. This major obstetric intervention has become a banal operation as much by the ease with which it is practiced as by the insignificant morbidity and mortality on the mother-child couple in developed countries [5]. Its upsurge in these countries has been accompanied, in fact, by a proportional benefit for the mother-child couple. In developing countries, such as Peru and Brazil, studies have reported that CS delivery is indexed with a high risk of maternal death [6,7] and in sub-Saharan Africa, the various statistics reported show that CS delivery remains an operation burdened with high morbidity and mortality for the mother-child couple [8,13].

Around 830 women around the world die every day from preventable causes related to pregnancy and childbirth. The majority of these deaths occurred in low-income countries and most could have been avoided [14,15]. In the Democratic Republic of Congo (DRC), according to recent estimates, the maternal mortality ratio stands at 846 deaths per 100,000 live births and the neonatal mortality rate at 28 ‰ [16]. Since resources are limited and maternal and perinatal deaths remain among the highest in the world, quality care before childbirth and postpartum could help reduce the high death rate.

In order for a CS delivery to be beneficial for the mother-child couple, it should be done correctly and on time, but also be accessible and of optimal technical quality. It must be of better quality, centered on the mother-child couple; it must benefit all pregnant women who really need it, with a minimum risk for the future of the mother-child couple and an affordable cost for the patient and for the health system. This is what Dujardin and Delvaux [17] call a "quality of caesarean section delivery" and propose a conceptual model for improving the quality of CS delivery which seems to be better suited to the healthcare system in developing countries. This concept of "quality of caesarean section delivery" goes beyond the simple technical quality of the surgical procedure. Skilled birth assistance is defined as the process by which a woman receives adequate care during labor, delivery and early postpartum. It is one of the pillars of current strategies to fight maternal mortality [18]. It implies the presence of qualified personnel and an adequate environment (sufficient drugs, equipment and infrastructure, effective referral systems towards a higher level of care). This is how "skilled delivery assistance" and "access to the hospital technical platform for emergencies" become two inseparable strategies [19].

The precarious conditions and extremely urgent situations in which CS deliveries are generally performed in low-resource countries lead to high maternal and perinatal morbidity. Poor quality of care in referral hospitals reduces the potential of emergency obstetric services to reduce maternal and perinatal mortality [20].

CS has been the subject of numerous publications regarding its rate but very little regarding its quality in the DRC. It is in this order of ideas that this work falls, which aims to determine CS delivery rate, to list CS deliveries' indications, to determine the quality level of CS deliveries and to identify its determinants of poor quality.

Methodology

Study settings

Our study took place in six reference maternities in Lubumbashi: University Clinics of Lubumbashi, General Reference Hospital Sendwe, SNCC Hospital, General Reference Hospital of Katuba, Gécamines-Sud Hospital and Afia Don Bosco Polyclinic.

Study design and population

This was an analytical cross-sectional study carried out from October 1st, 2017 to March 31st, 2018 (six months).

The study focused on women who underwent a CS in the six health facilities mentioned above during the study period. The sampling was exhaustive and involved 350 CS deliveries.

Data collection

Data were collected by using obstetric files, stock cards for drugs and consumables, and operating, anesthesia and delivery registers; and by using a questionnaire survey of women who underwent CS and hospital managers.

A pre-established survey sheet with the variables studied was completed by two midwives and two final-year medical students by maternity unit. These investigators were trained for two days on the subject of this research and how to collect the data. Daily supervision was carried out by the principal investigator.

Quality assessment

For assessment of the quality of CS delivery, we used following indicators drawn from the list proposed by Dujardin *et al.* [4,17] accessibility to the CS, performance of the CS, outcomes of the CS and post-operative follow-up. Each indicator is made up of 5 to 6 criteria. The sum of scores applied to the evaluation scale will allow assessing quality level of CS delivery. The quality score was the sum of all criteria and the maximum score that can be recorded for these indicators is 20. The quality assessment scale is as follows: good quality (score of 19 to 20), fairly good quality (score of 16 to 18), medium quality (score of 13 to 15) and low quality (score <13) [21,22].

Indications for caesarean section were classified into 5 groups as follows:

- Absolute emergency CS deliveries: when the life of the mother and / or the child is in immediate danger if the CS is not performed.
- Mandatory CS deliveries: concern situations where delivery cannot be done other than by CS. The lack of intervention exposing to maternal death or very serious maternal sequelae.
- CS deliveries of necessity: are performed for pathologies generally accessible to preventive treatment, but in the absence of supervision or care during pregnancy or childbirth, can have an unfavorable evolution leading to a surgical intervention often carried out in emergency for maternal rescue.
- Cautionary CS deliveries: Correspond to circumstances for which an intervention is not essential, vaginal delivery is theoretically possible, but the intervention can in some cases bring a better vital or functional prognosis to the mother, but above all to the newborn.

- Abusive CS deliveries: Concern all indications of excess cesarean or which could have been avoided.

Data Analysis

The analysis of data was carried out using the STATA 12 software. The quality of CS deliveries was considered here as a dependent variable and parameters related to the type of maternity and parameters related to the mother and the CS constitute independent variables. The χ2 test or Fisher's exact test were used to compare frequencies. A bivariate analysis was done followed by a multivariate analysis. The adjusted odds ratio (AOR) was calculated and presented with its limits in the 95% confidence interval (95% CI) and the significance level was set at $p < 0.05$.

Ethical considerations

Data collection and analysis was done anonymously. We have obtained the approval of the Medical Ethics Committee of the University of Lubumbashi. We obtained the authorization of the heads of different maternities for data collection.

Results

Out of a total of 2,087 deliveries recorded during the study period, 350 caesarean sections had been performed, representing a CS rate of 16.8%. Analysis therefore focused on 350 women aged 28.7 ± 6.4 years, of whom 94.29% were married. Other characteristics of women are summarized in Table 1.

Among the 38.29% of women referred from other maternities, 4.29% were transported by motorcycle and 95.71% by private car or taxi. The indications for cesarean section presented in Table 1 were mandatory in 51.14% and emergency in 34.86%. Main indications for CS deliveries were: fetal distress (18.57%), cephalopelvic disproportion (14.00%), placenta praevia hemorrhagic (9.43%), vicious presentation (9.14%), eclampsia (7, 14%).

The mean intra-hospital CS rate was 16.8% with a change from 6.4% to 21.0%. The delay in performing CS deliveries (time between decision and performing) ranged from 5 to 210 minutes with a mean of 44.6 minutes.

The mean length of hospital stay was 10.3 ± 4.2 days; 53(15.14%) complications were recorded, sometimes in combination, the main ones being: hemorrhage (66.04%), suppuration of the operating wound (20.75%) and endometritis (13.20%).

Maternal mortality was 2.0% (7 deaths out of 350 CS) and perinatal mortality was 15.43% (n = 54).The quality score ranged from 12 (in a public maternity) to 20 points (in a private maternity) for all 350 CS deliveries with a mean of 17.16 points.

Applying the quality criteria, we found that the quality of CS deliverywas good in 14.3% (n = 50), fairly good in 74.3%, medium in 10.8% and poor in 0.6%.

The various quality indicators for CS deliveries are presented in Table 2. Concerning the quality in terms of care conditions, the delay in performing CS deliverieswas poor in 6.57% and the availability of the nursing staff was poor in 2.29% of cases. Regarding the quality of performance and outcomes of the CS deliveries, 83.17% of CSwere performed by non-obstetricians and the Apgar score was poor in 53.14% of cases.Regarding the quality of post-operative follow-up, the mean length of hospital stay was poor in 80.86% and post-operative complications were present in 15.14% of cases (Table 2).

Looking for determinants of the CS deliveries' quality, Table 3 shows that low attendance at antenatal care (AOR = 3.3 [1.4 – 7.8]), night as the time of performing CS (AOR = 3.2 [1.3 – 7.4]) and public nature of maternity (AOR = 13.4 [4.8 – 37.8]) were very significantly associated with poor quality of CS deliveries.

Table 1: Characteristics of the women.

Variable	Number (n=350)	Percentage
Age		
<20 years	26	7.42
20-35 years	246	70.29
>35 years	78	22.29
Education level		
None	19	5.43
Primary	24	6.86
Secondary	205	58.57
University	102	29.14
Means of transport		
Private car or taxi	335	95.71
Motorcycle	15	4.29
Parity		
0	112	32.00
1 or more	238	68.00
Number of antenatal care visits		
0	29	8.29
1-3	113	32.29
≥4	208	59.42
History of caesarean section		
No	273	78.00
Yes	77	22.00
Method of admission		
Notreferred	216	61.71
Referred	134	38.29
Type of caesarean section		
Emergency	318	90.86
Planned	32	9.14
Type of indications		
Mandatory CS	179	51.14
Absolute emergency CS	122	34.86
CS of necessity	33	9.43
Cautionary CS	13	3.71
Abusive CS	3	0.86

Table 2:

Indicator	CS deliveries' quality	
	Good	Poor
Accessibility to the CS		
Delay of performing CS	327 (93.43%)	23 (6.57%)
Availability of operativepackage	336 (96.0%)	14 (4.00%)
Availabilityof medical staff	342 (97.71%)	8 (2.29%)
Availabilityof operating theater	350 (100%)	0 (0.00%)
Availabilityof blood	349 (99.71%)	1 (0.29%)
Performance andoutcomes of CS		
Qualityofoperator	57 (16.29%)	293 (83.17%)
Qualityof anesthaesia	333 (95.14%)	17 (4.86%)
Relevance of operating indications	347 (99.14%)	3 (0.86%)
Peroperative complications	336 (96.0%)	14 (4.00%)
Maternaloutcome	293 (98.00%)	57 (2.00%)
Perinataloutcome	293 (84.57%)	57 (15.43%)
Apgar score of newborn in the 1st minute	164 (46.86%)	186 (53.14%)
Post-operativefollow-up		
Compliance with post-operative protocol	335 (95.71%)	15 (4.29%)
Immediate post-operative monitoring	337 (96.29%)	13 (3.71%)
Immediate execution of the post-operative prescription	289 (82.57%)	61 (17.43%)
Postoperative complications	297 (84.86%)	53 (15.14%)
Mean length of hospital stay	67 (19.14%)	283 (80.86%)
Re-hospitalization	341 (97.43%)	9 (2.57%)

Table 3: Determinants of poor quality of caesarean section deliveries.

CS deliveries' quality									
Variable	Total (n=350)	Poor (n=300)		Good (n=50)		CrudeOR [95% CI]	p-value	AdjustedOR [95% CI]	p-value
	N	n	%	n	%				
Type of maternity									
Private	22	7	31.8	15	68.2	1.0		1.0	
Public	328	293	89.3	35	10.7	17.9 [6.8-47.0]	**<0.00001**	13.4 [4.8-37.8]	**<0.00001**
Education level									
Elevé	307	260	84.7	47	15.3	1.0			
Faible	43	40	93.0	3	7.0	2.4 [0.7-8.1]	0.2187		
History ofCS									
No	273	238	80.5	35	19.5	1.0		1.0	
Yes	77	62	87.2	15	12.8	1.6 [0.8-3.2]	0.1968	0.8 [0.4-1.9]	0.691
Method of admission									
Not referred	216	176	81.5	40	18.5	1.0		1.0	
Referred	134	124	92.5	10	7.5	2.8 [1.4-5.8]	**0.0066**	1.4 [0.6-3.1]	0.424

Moyen de transport									
Motorcycle	15	15	100.0	0	0.0	Undefined	0.1417		
Private car or taxi	335	285	85.1	50	14.9	1.0			
Number of antenatal care visits									
<4	142	134	94.4	8	5.6	4.2 [1.9-9.3]	**0.0002**	3.3 [1.4-7.8]	**0.007**
≥4	208	166	79.8	42	20.2	1.0		1.0	
Type ofCS									
Planned	32	22	68.8	10	31.2	1.0		1.0	
Emergency	318	278	87.4	40	12.6	3.1 [1.4-7.1]	**0.0089**	1.9 [0.7-5.0]	0.214
Moment of performing CS									
Day	210	169	80.5	41	19.5	1.0		1.0	
Night	140	131	93.6	9	6.4	3.5 [1.6-7.5]	**0.0010**	3.2 [1.3-7.4]	**0.008**

Discussion

Caesarean section rate

Our study reports a CS rate of 16.8%. Faced with data from the literature, our rate is higher than the rates obtained in the DRC in Lubumbashi, as evidenced by the work of Kinenkinda*et al.* [11] (10.65%) and Kakudji *et al.* [23] (8.3%), but lower than the rates obtained by: Akilimali *et al.* [24] (24% in Matadi) and M bungu*et al.* [25] (31.2% in Kinshasa). In African countries, some authors have reported higher rates than ours: Foumane *et al.* [26] (19.7% in Yaoundé in Cameroon), Gutema and Shimye [27] (21.1% in Mizam in Ethiopia), Ouédraogo *et al.* [28] (30.3% in Ouagadougou in Burkina Faso). Referring to the results obtained by Moini*et al.* [29] in Tehran (Iran), we find that our rate is far lower than what he had found (40.4%).

The rate of CS varies enormously from one country to another and in the same environment, from one medical institution to another [11]. According to Cavallaro *et al.* [30], after analyzing data from 22 countries in sub-Saharan Africa, the rates of CS deliveries had increased over time in each country studied and rural areas had lower rates than urban areas. According to the World Health Organization, rates of CS deliveries in health care facilities vary considerably depending on the composition of the obstetric populations they care for, their capacities and their resources as well as their clinical management protocols [31]. Referring to the rate of CS deliveries which have been found by Kakudji *et al.* (8.3%) [23], Kinenkinda *et al.* (10.65%) [11], and ours (16.8%), we found that the rate of CS deliveries in Lubumbashi was clearly increasing.

It should be noted that these figures do not reflect the overall rate of CS deliveries in the population due to concentration of pathologies in reference hospitals. The increase in peripheral health facilities in our settings reduces the number of vaginal deliveries while it increases the number of caesarean deliveries in referral hospitals following transfers.

Caesarean section deliveries' quality

In our series, in almost 81% of CS deliveries, the incision was made in less than an hour after the decision to perform a CS. This proportion seems high compared to those found in other environments. In Afghanistan, Kim *et al.* [3] found that only 30% of CS deliveries were performed in less than an hour. The authors reported longer delays ranging from 3 hours to more than 24 hours in 16% of cases [3]. In Ouagadougou (Burkina Faso), in their series of 478 CS deliveries, Ouédraogo *et al.* [32] reported that only 78 (26.5%) of them were completed in less than an hour. In the same town, Richard *et al.* [18] found a median time to perform a CS of 64 minutes in 2004 and 55 minutes in 2005. In Benin, Mongbo *et al.* [33] noted a mean time of 124 minutes (or 2 hours 4 minutes) and raised a problem of availability of resources and organization of services. To explain this long delay in CS deliveries' performance, these authors mentioned an incomplete operating team (absence of the doctor on call), a lack of an emergency operating kit or an incomplete kit when it existed [32]. Kim et al. [3] emphasize the reluctance of providers to carry out a risky procedure, mainly due to a lack of confidence in their skills, but also due to potential legal repercussions if outcomes are poor. Add to these the fact that most establishments only have a single operating theater and a single operating table common to general surgery and obstetric departments [3]. Although clinical guidelines recommend a 30-minute delay between CS delivery's decision and CS delivery's performance [34], several authors have questioned the knowledge base of this recommendation. Audits of this criterion in British maternities have shown that this delay is practically impossible to reach [35,36] and that it is possible to exceed 30 minutes without consequences for the newborn [18]. In addition, it should be remembered that the decision to perform a CS delivery is complex and depends on factors other than the woman's condition, such as the experience of the medical team, forensic pressures, the different practices between public and private establishments, the patient's financial capacity, etc. [37,38]. Furthermore, we found that in 83.17% of CS deliveries performed, quality of the operator was lacking; only 57 (16.29%) CS were performed by obstetrician-gynecologists who are often found in private hospitals and in university hospitals where they are often accessible during the day. Indeed, we note a deficit in qualified personnel with surgical competence in our public maternities. The availability of competent, motivated and dedicated staff can significantly reduce maternal mortality by reducing evacuation times and delays in care. In Benin, Mongbo *et al.* [33] reported a staff of at least two doctors with surgical skills per hospital ensuring availability 24 hours a day and 7 days a week (effective presence of on-call staff). The vast majority (90.86%) of CS deliver-

ies were performed in emergency, which leads to a higher risk of maternal complications than planned CS deliveries [39]. We found that 53 (15.14%) CS deliveries presented post-operative complications dominated by anemia and infection. Richard *et al.* [18] observed 10% of postoperative complications (infections, hemorrhage) in their study.

Good quality of antenatal care, including prompt diagnosis of complications, can prevent CS deliveries from becoming emergencies. For example, clinical signs can alert healthcare workers to the possibility of placenta praevia (which was one of the main indications for CS in this study) towards the middle or end of pregnancy. If the condition is confirmed by ultrasound, a CS delivery may be indicated in time. According to Foumane*et al.* [26], emergency CS deliveries exposed to a significant risk of general anesthesia, non-availability of the preoperative assessment during surgery and maternal infection, as well as to a longer hospital stay.

As in Benin [33], Burkina Faso [18], Mali and Senegal [40], improving the quality of CS deliveries in maternities in Lubumbashi requires a package of interventions on the different determinants of CS deliveries. A more rigorous application of the free policy and a better reduction in the cost of CS delivery through the creation of a mutual health insurance or another cost-sharing system [41] would improve financial accessibility to CS delivery.To improve the indicators of performance, it is necessary to provide hospitals with sufficient staff, to strengthen their capacity, to equip them but above all to introduce or reinforce the practice of clinical audit of maternal and perinatal death [40].

Poor quality of CS delivery is not specific to hospitals in Lubumbashi. In fact, several authors who evaluated CS delivery by using obstetric records also concluded that the quality was poor [32,42]. Kim *et al.* [3] and Some Der *et al.* [42] focused on CS delivery's performance, completeness of records, and maternal and perinatal outcomes of the CS.Ouédraogo *et al.* [32] and Mongbo *et al.* [33] discussed on outcomes and determinants of CS deliveries, accessibility to postoperative care. They described and analyzed the various determinants without, however, expressing a quality score for the CS delivery [32,33]. Richard *et al.* [18] used the model of Dujardin and Delvaux [17], without expressing a quality score. In their study, Pirkle *et al.* [40] observed an improvement in the quality of obstetric care in hospitals following a quality improvement program including, among other things, capacity building and clinical audits.

Determinants of CS deliveries' poor quality

By looking at variables that influenced the quality of CS deliveries, multivariate analysis showed that low attendance of ANC, night as a time of performance and public nature of maternity were the determinants of poor quality of CS in our study. Several authors had noted that in women who had not undergone any follow-up of pregnancy, CS delivery was indicated in an emergency context [43,45], which has a considerable impact on maternal and perinatal morbidity and mortality. According to Amani *et al.* [45], women not followed during pregnancy see the prognosis of their delivery in the labor room and among them, those who had a pathological pelvis did not benefit from the appreciation of the pelvis at antenatal care visits. The assessment of the pelvis at the last antenatal care visits makes it possible to assess the prognosis for vaginal delivery and to indicate a much safer elective CS delivery [45]. Foumane *et al.* [26] reported that poor quality antenatal care exposed to emergency CS delivery. For Kim *et al.* [3], the supply and demand for antenatal care and qualified medical care, as well as its quality, must be strengthened in order to detect conditions requiring a CS delivery as soon as possible. Emergency CS during labor should be avoided as much as possible, as it carries the greatest risk of maternal morbidity and mortality [39]. Kinenkinda *et al.* [10] found that the urgent nature of CS delivery was one of risk factors for maternal and perinatal mortality. Thus, poor monitoring of pregnancy contributes to significantly increasing the rate of poor-quality of CS deliveries, and this requires high rates of emergency CS deliveries which in turn increase maternal and perinatal mortality.

We found that cesarean sections performed at night were 3 times more likely to have a poor quality compared to those performed during the day (AOR = 3.2 [1.3 – 7.4]). The same is true for caesarean sections performed in public hospitals which are indexed by more than 13.4 times the risk of having a poor quality compared to those performed in private hospitals (AOR = 13.4 [4.8 – 37.8]). This could be explained by the fact that only 57 (16.29%) CS were performed by gynecologists-obstetricians who often are found in private hospitals and in university hospitals where they are often accessible during the day. Indeed, we note a deficit in qualified personnel with surgical competence in our public maternities.

As with any research method, chart review also has limitations. The limits which may affect generalization of our results relate to choice of hospitals, selection of subjects, technique of data collection or inaccuracies in data sources. However, our sample of hospitals was random and diverse due to the characteristics of hospitals (public and private) in our environment.

Conclusion

Good quality of CS deliveries is not yet a reality in some maternities in Lubumbashi. This study on CS deliveries would analyze dysfunctions based on these poor quality determinants in order to initiate a program to improve the quality of CS.

Indeed, if we managed to refer pregnancies at risk early, we perceive the high risk of mortality when these parturients arrive in referral facilities who are unable to provide emergency obstetric care 24 hours a day, for lack of materials, equipment, personnel and consumables. Availability of a good technical platform, and availability of competent, motivated and dedicated staff can significantly reduce maternal mortality by reducing evacuation times and delays in care.

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