

# Caesarean Rate and Uterine Rupture: A 15-year Hospital-Based Observational Retrospective Study in Rural Tanzania

## Sectionrate und Uterusruptur: eine Krankenhaus-basierte retrospektive Verlaufsbeobachtung über 15 Jahre im ländlichen Tansania

### Authors

W. Stein<sup>1</sup>, I. Katundo<sup>2</sup>, B. Byengonzi<sup>1</sup>

### Affiliations

<sup>1</sup> Department of Gynecology and Obstetrics, Georg-August-University, Göttingen, Germany

<sup>2</sup> Nyakahanga Hospital, Karagwe via Bukoba, Tanzania

### Key words

- Caesarean section
- maternal mortality
- stillbirth
- uterine rupture

### Schlüsselwörter

- maternale Mortalität
- Sectio caesarea
- Todgeburt
- Uterusruptur

### Bibliography

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### Correspondence

Dr. Werner Stein

Department of Gynecology  
and Obstetrics

Georg-August-University

Robert-Koch-Straße 40

37075 Göttingen

Germany

Tel.: +49/551/396510

werner.stein@med.uni-

goettingen.de

### Abstract



**Background:** The population-based Caesarean rate in sub-Saharan Africa is very low. The lack of necessary Caesarean sections is an important cause of the high maternal mortality and morbidity in sub-Saharan Africa. The Nyakahanga District Hospital in Western Tanzania showed a persistent and massive increase in the Caesarean rate which was induced by the Rwandan refugee crisis of 1994–1996. We thus examined the question: Is the doubling of the hospital-based Caesarean rate in a rural district hospital in sub-Saharan Africa associated with a change of maternal mortality and morbidity?

**Material and Methods:** All deliveries at the Nyakahanga District Hospital from 1985 to 1999 were included. The study period was divided into the period before and that after the refugee crisis. Caesarean rate, overall uterine rupture, uterine rupture after Caesarean section, maternal death, and stillbirth of both periods were compared.

**Results:** The mean Caesarean rate increased from 9.4% in the pre-refugee period to 20.3% in the post-refugee period. The doubling of the Caesarean rate has been associated with an increase of the rate of uterine rupture from 4.4 to 13.5 per 1000 deliveries [odds ratio 3.08 (95% CI 1.97–4.81)]. Uterine rupture associated with previous Caesarean section increased even more [OR 6.3 (1.77–22.42)]. Maternal mortality [OR 1.17 (0.83–1.66)] and stillbirth [OR 0.96 (0.77–1.19)] rates did not change.

**Discussion:** The increasing Caesarean rates in rural sub-Saharan Africa might impose an additional hazard of increasing rates of uterine rupture without reducing the rates of maternal mortality and stillbirths.

### Zusammenfassung



**Hintergrund und Fragestellung:** Die bevölkerungsbasierte Sectiorate im subsaharischen Afrika ist sehr niedrig. Die fehlende Durchführung von notwendigen Sektionen ist eine wichtige Ursache für die hohe maternale Mortalität und Morbidität im subsaharischen Afrika. Am Nyakahanga-Distriktkrankenhaus in West-Tansania kam es zu einem anhaltenden und deutlichen Anstieg der Sectiorate – ausgelöst durch die Flüchtlingskrise aus Ruanda 1994–1996. Geht eine Verdopplung der Sectiorate an einem ländlichen Distriktkrankenhaus im subsaharischen Afrika mit einer Veränderung von maternaler Mortalität und Morbidität einher?

**Material und Methoden:** Alle Entbindungen am Distriktkrankenhaus von 1985–1999 wurden eingeschlossen. Der Untersuchungszeitraum wurde eingeteilt in die Periode vor und nach der Flüchtlingskrise. Diese wurden miteinander verglichen im Hinblick auf Sectiorate, Uterusruptur, maternale Mortalität und Todgeburt.

**Ergebnisse:** Die mittlere Sectiorate stieg von 9,4% in der Periode vor der Flüchtlingskrise auf 20,3% in der Periode nach der Flüchtlingskrise an. Die Verdopplung der Sectiorate war assoziiert mit einer Zunahme der Gesamtrate an Uterusrupturen von 4,4 auf 13,5 auf 1000 Geburten [Odds Ratio 3,08 (95% CI 1,97–4,81)]. Die Rate an Uterusrupturen bei Zustand nach Sectio erhöhte sich noch stärker [OR 6,3 (1,77–22,42)]. Maternale Mortalität [OR 1,17 (0,83–1,66)] und die Rate an Todgeburten [OR 0,96 (0,77–1,19)] veränderten sich nicht.

**Diskussion:** Ein Anstieg der Sectiorate in ländlichen subsaharischen Afrika ist nicht per se mit einer verbesserten maternalen und neonatalen Situation verbunden. Vielmehr könnte der Anstieg der Sectiorate eine zusätzliche maternale Gefährdung bedeuten.

## Introduction

▼ The Caesarean rate in industrialized countries is high. It was about 22.7% in the UK in 2004 ([www.doh.gov.uk](http://www.doh.gov.uk)). In contrast, the population-based Caesarean rate in rural sub-Saharan Africa is very low at about 1%. In this area, however, the majority of deliveries takes place outside hospitals and the hospital-based Caesarean rates have been reported to range between 5 and 22% [1]. Maternal morbidity and mortality have remained high in many developing countries and the estimated maternal mortality in Eastern Africa is one of the highest in the world with 1300 per 100 000 live births with a lifetime risk of maternal death of 1:11. Compared with industrialized countries, this means a 108-fold and 371-fold increase, respectively [2]. As an effective means of reducing maternal mortality the provision of Caesarean sections for all women who need them has been considered [3].

The effect of an increase in Caesarean rates on the incidence of uterine rupture, maternal, and perinatal mortality in a resource-poor environment such as rural sub-Saharan Africa is not known.

A longitudinal study with a steep and persistent increase in the Caesarean rate within a short time would be ideal to evaluate the impact of such an increase in maternal and neonatal mortality and morbidity.

The Nyakahanga District Hospital – disrupted by the Rwandan refugee crisis from 1994–1996 – has shown a period with a relatively low Caesarean rate of less than 10% before the refugee crisis. During and after the refugee crisis the Caesarean rate doubled.

We had the objective to examine whether an increased Caesarean rate would be associated with changes in maternal death, uterine rupture, and stillbirth.

## Material and Methods

▼ This retrospective study was carried out at Nyakahanga District Hospital in Kagera Region in Western Tanzania. It is the main hospital in Karagwe District with about 400 000 inhabitants. The district covers an area of 6700 km<sup>2</sup>. The population is mainly occupied with subsistence farming. The road system, consisting mainly of dirt roads, is quite good. Public transport, in the form of minibuses, is available during the daytime. The hospital is a referral centre for the district and has basic facilities for major surgery and blood transfusion. The management in hospital obstetric care includes the use of a partograph, routine active management of the third stage of labour and control of sepsis through aseptic techniques and the use of antibiotics.

In conformity with local practice a Caesarean section was defined as any operation to deliver the baby (live or dead) through the abdomen after 28 weeks of gestation, including surgery for a ruptured uterus. The uterine ruptures identified by this study were primarily diagnosed on clinical grounds and confirmed by a Caesarean section. From 1985 onward all deliveries including maternal and fetal outcomes were routinely recorded.

The major event during the study period from 1985–1999 was the refugee crisis which started in April 1994 when around 160 000 refugees from Rwanda arrived in Karagwe District and ended in December 1996 with their repatriation. The refugee crisis was characterized by shortages in equipment and supply as well as an additional workload due to refugees and staff losses.

The increased workload, including obstetric emergencies and major surgery, had to be covered by a smaller number of staff. By the end of the refugee crisis the number of employed doctors and midwives returned to pre-refugee crisis numbers and the workload normalized.

For the matter of evaluation the whole study period has been divided by the event of the refugee crisis into three phases: the refugee crisis, the period before and that afterwards. In order to assess the impact of an increased Caesarean rate the periods before and after the refugee crisis have been compared. Both periods have been fairly stable and were characterized by similar numbers of staff and equipment. The period of the refugee crisis has therefore not been considered for the further evaluation.

The sudden increase in Caesarean rates from a relatively low level to a persistent doubling within a comparatively short time warrants an evaluation of the impact of these increasing rates.

Odds ratios with 95% confidence intervals were calculated. Statistical analyses were carried out with SPSS for Windows 11.0 software (SPSS, Inc., Chicago, IL, USA).

## Results

▼ During the study period of 15 years 16504 women gave birth in the study hospital to 15850 live children. The details are listed in

► **Table 1.**

► **Table 2** describes the distribution of deliveries, Caesarean sections, uterine rupture, maternal death, and stillbirth according to the periods before, during and after the refugee crisis.

The doubling of the Caesarean rate has been associated with a marked increase in the rate of uterine rupture [OR 3.03 (1.94–4.73)], especially in women with a previous Caesarean section [OR 6.30 (1.77–22.42)] (► **Table 3**). In-hospital maternal death and stillbirth rates have not been changed.

The rates of assisted vaginal deliveries before and after the refugee crisis were similar (4 vs. 3%). Trial of scar was done in 52% with 67% resulting in vaginal delivery. Uterine rupture due to trial of scar has not been observed.

The indication for Caesarean section had broadened after the refugee crisis. Elective Caesarean sections which were offered only rarely before the refugee crisis made up 18% of all Caesarean sections, mainly due to suspected cephalopelvic disproportion or a history of previous scar in combination with cephalopelvic disproportion.

Caesarean sections due to fetal asphyxia were not performed before the refugee crisis and accounted for 12.9% of all Caesarean sections during the post-refugee period.

## Discussion

▼ This longitudinal analysis of a rural hospital in sub-Saharan Africa over a period of 15 years reports a sharp increase in the Caesarean rate from 9.4 to 20.3% within a period of 3 years. The doubling in Caesareans has been followed by a tripling of the rate of uterine rupture from 4.4 to 13.5 per 1000 deliveries. Prospective population-based studies have reported a rate of uterine rupture of 1–1.2 per 1000 deliveries in sub-Saharan Africa [3, 4]. Nevertheless, retrospective hospital-based surveys have reported rates ranging from 11–23 uterine ruptures per 1000 deliveries [5–8]. The incidence of uterine rupture in women with a previous uterine scar is known to be considerably higher than

year	deliveries	Caesarean section	uterine rupture	maternal death	stillbirth
1985	788	65	4	17	42
1986	782	104	5	15	38
1987	907	80	4	17	30
1988	1 202	93	6	13	57
1989	1 108	82	4	18	32
1990	1 211	109	4	9	42
1991	1 057	133	3	10	41
1992	1 255	115	5	10	49
1993	1 110	105	4	8	46
1994	1 124	89	8	28	20
1995	1 633	255	6	32	72
1996	1 440	288	9	11	30
1997	1 016	226	11	14	32
1998	824	175	14	16	36
1999	1 024	179	12	14	40

**Table 1** Number of deliveries, Caesarean section, uterine rupture, maternal death and stillbirth per year at the Nyakahanga District Hospital 1985–1999.

**Table 2** Deliveries, caesarean section, uterine rupture, maternal death and stillbirth at the Nyakahanga Hospital according to periods before during and after the refugee crisis.

	deliveries		Caesarean section		uterine rupture		maternal death		stillbirth	
	n		n	%	n	%	n	%	n	%
before refugee crisis 1 / 1985–4 / 1994	9690		911	9.4	41	0.4	127	1.3	381	3.9
refugee crisis 5 / 1994–12 / 1996	3927		618	15.7	22	0.6	60	1.5	118	3
after refugee crisis 1 / 1997–12 / 1999	2 864		580	20.3	37	1.3	44	1.5	108	3.8

	OR	CI 95 %
uterine rupture	3.08	1.97–4.81
uterine rupture in previous Caesarean section	6.3	1.77–22.4
Caesarean section	2.45	2.18–2.74
maternal death	1.17	0.83–1.66
stillbirth	0.96	0.77–1.19

**Table 3** OR calculated on the basis of pre- and post-refugee period. The pre-refugee period serves as reference category.

among women without a previous scar. This study demonstrates an OR of 6.3 (1.77–22.42) for the occurrence of uterine rupture in women with a previous scar. A meta-analysis of sub-Saharan African studies found the rate of uterine rupture among women with prior Caesareans to be 21 per 1000 deliveries [9]. This finding of an increased incidence rate of uterine rupture among women with a previous Caesarean section was also confirmed by a prospective population-based survey, although on a lower level of 14.3 cases per 1000 deliveries [4].

Considering that women who have experienced a Caesarean section are less likely to return to the hospital for the next delivery, the absolute impact of the increased Caesarean rate on uterine ruptures could be underestimated since women with a uterine scar may suffer a uterine rupture at home but not present at the hospital.

The sharp increase in Caesarean section rate at the Nykahanga Hospital was due to the Rwandan refugee crisis 1994–1996. Neighbouring hospitals that were not affected by the refugee crisis did not show a massive change in the Caesarean section rate.

A minimum 5% population-based Caesarean rate has been suggested [10] and endorsed by a prospective study [4]. The Caesarean rates in rural hospitals in sub-Saharan Africa depend on a

variety of widely differing and partly interdependent factors like acceptance by the population, transport facilities, and the quality of obstetric care.

At a first glance, any increase in Caesarean rates could be welcomed as a means of a better covering the need, because the current number of Caesarean sections in sub-Saharan Africa is by far not meeting the demand. Nevertheless, the Caesarean rate itself should not be assumed to be an indicator of improvement. An increase in Caesarean rates would only lead to an improvement in cases where the women who need a Caesarean section would receive one. Women receiving a Caesarean section without necessity would face an increased risk during the current delivery and in future deliveries without getting any benefit. Furthermore, the hospital acceptance could be lowered and weaken an existing health system.

To meet the demand for necessary Caesarean sections the barriers preventing women from reaching the hospital in time, characterized by limited resources and heterogeneous quality of care [11] should be removed. The distance to the facility frequently counts as a real barrier for people living in rural regions [12].

It seems to be important to focus on the quality of obstetrical care; i.e., where there is no need for a Caesarean section it should not be performed. Unnecessary Caesarean sections are

more likely performed when the full spectrum of options to achieve a safe vaginal delivery including augmentation of contractions, symphysiotomy and vaginal operative methods, are not fully utilized. In cases of a stillbirth the application of destructive methods should be considered. Suspected fetal asphyxia as an indication for Caesarean section should be carefully evaluated. In this study Caesarean sections due to impending fetal asphyxia diagnosed by abnormal heart rate pattern account for 2.5% of total hospital deliveries and for 11.9% of Caesarean sections. Caesarean sections on the basis of abnormal fetal heart rate pattern were not performed before the refugee crisis. The data structure of this study lacks sufficient differentiation of the etiology of neonatal mortality and morbidity, therefore it does not allow an estimation of the impact of Caesarean sections on fetal asphyxia. In this observational study the doubling of the Caesarean rate has been mainly due to elective Caesarean sections, fetal asphyxia and a more lax definition of obstructed labour.

A reduction in maternal mortality and stillbirth rates has not been observed as one might have expected. On one hand women giving birth arrived often in a late stage of labour at the hospital and on the other hand the time interval from decision making and performing a Caesarean section could exceed one hour. Bearing this in mind the appropriate intervention for fetal asphyxia could easily be missed. As a main cause for maternal mortality, septicemia due to long-standing obstructed labour should be considered.

In cases of women who do not need a Caesarean section, but receive one, the consequences should be carefully considered. Even if the short-term outcome would be similar, the loss of eco-

nomical resources should be taken into consideration. The long-term consequences of a uterine rupture at the next delivery are even more important.

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