

Rate of Caesarean Section as a Process Indicator of Safe-motherhood Programmes: The Case of Kenya

P. Gichangi^{1,2}, L. Apers^{1,2}, and M. Temmerman²

¹Kenyatta National Hospital, Department of Obstetrics and Gynaecology, University of Nairobi, and ²International Centre for Reproductive Health, Ghent University, Ghent, Belgium

ABSTRACT

The study assessed the value of currently-available data on the rates of caesarean section as an indicator of safe-motherhood programmes. Data, collected through the routine health information system of the Ministry of Health, Kenya, were used for analyzing the available process indicators. The methodology of this study illustrates both usefulness and limitations of readily-available healthcare information. The rate of hospital-based caesarean section was 6.3% of all births (range 0.3-37%), whereas the rate of population-based caesarean section was 0.95% (range 0.1%-4%). The rate of population-based caesarean section indicates a significant unmet need for obstetric care in the rural areas and may be a useful tool for monitoring progress on safe-motherhood initiatives in poor settings. Rates of population-based caesarean section are low in Kenya, especially in the rural areas. The rate of caesarean section may be a valuable process indicator for identifying the gaps in obstetric care and may be used for advocating improvements for healthcare to the relevant authorities.

Key words: Obstetric care; Safe motherhood; Caesarean section; Process indicators; Kenya

INTRODUCTION

More than 10 years after the launching of the Safe-motherhood Initiative in Nairobi, Kenya, the country still experiences high levels of maternal mortality. Most stakeholders in the field of reproductive health recognize this silent tragedy. Despite this, exact figure of the burden of this maternal health problem is not available. Besides, the magnitude of maternal mortality is still unknown in Kenya, but estimates vary between 67 and 771 per

100,000 births (1-5). Although the maternal mortality rates are used as indicators of quality of maternal care, they are often unreliable, costly to obtain, or not suitable for monitoring the quality of mother-child healthcare. Moreover, the range of maternal mortality ratios depends on the measuring methods used, such as vital statistics, or population-based surveys (1,6-11).

In the past, the maternal mortality figures played an important role in creating awareness about the tragedy of maternal deaths in the 19th century's industrialized countries. This awareness, together with the technical evolution of science, led to the gradual decline of maternal mortality in most industrialized countries (2,12). But this stage has not yet been reached in many developing countries, at least not at the national level. There is obviously no magic bullet to reduce the burden

Correspondence and reprint requests should be addressed to: Dr. Marleen Temmerman
International Centre for Reproductive Health
Ghent University
De Pintelaan 185 P3
B-9000 Ghent
Belgium
Fax: 32 9 2403867
Email: marleen.temmerman@rug.ac.be

of maternal mortality, but sectorwide approaches may be the key to the solution (13).

Maternal mortality is a sensitive issue all over the world, and exact figures relating to maternal deaths are difficult to obtain. Researchers and policy-makers have pointed the need for adequate indicators, and alternative options, such as use and quality of healthcare indicators, have been proposed (14). Other indicators of access and quality of reproductive healthcare have to be validated to assess progress in safe motherhood. Next to impact indicators, such as maternal mortality ratio, process indicators might serve the purpose of measuring progress in reducing maternal mortality (12,16). Process indicators may provide alternative approaches consisting of measurable steps of the 'process' of providing obstetric care to pregnant women.

Process indicators consist of: (1) Coverage indicators, including the number of facilities providing basic essential obstetric care¹, and/or comprehensive essential obstetric care² for every 500,000 population as well as their geographical distribution; (2) Use indicators, including the proportion of all births in basic and comprehensive essential obstetric care facilities and the proportion of women with complications reaching these units; (3) Performance indicators, including rates of caesarean sections as a percentage of all births and the case-fatality rate of complicated and uncomplicated cases. [¹These are peripheral health centres that are able to provide services, including: medical treatment for sepsis, shock, eclampsia, and anaemia; removal of placenta; repair of episiotomies and perineal tears; vacuum extraction; labour monitoring; management of severe anaemia, diabetes, and other indirect complications, and neonatal resuscitation. ²These are district hospitals or health facilities which provide basic essential obstetric care (EOC) as well as surgery, anaesthesia, and blood replacement.]

The advantage is that these indicators can be generated from facility-based records and can be analyzed at the facility level. Theoretically, rates of caesarean section can be assessed reliably, since the number of caesarean sections performed can be counted, and the expected number of deliveries can be estimated accurately from the demographic health surveys. Rates of caesarean section can be used as a coverage indicator of obstetric needs (2,17) and as a proxy of the use of health facilities (18). This study was undertaken to determine whether data on caesarean section routinely

gathered through the health information system are an useful indicator for monitoring the quality of maternal healthcare in Kenya.

MATERIALS AND METHODS

The Government mostly provides healthcare in Kenya through a network of health facilities ranging from dispensaries serving 5,000 people to health centres serving 50,000 people, district hospitals serving 500,000 people, provincial hospitals serving 3-5 million inhabitants, and two national referral hospitals. The other major facilities are mission hospitals that principally run health facilities in the rural areas and are designed to serve economically poor members of the society. There are a few urban private health facilities characterized by high levels of technical interventions, e.g. caesarean sections. All health facilities are required to report all health statistics to the Ministry of Health.

Countrywide, routinely-collected data on caesarean section of various government hospitals include raw data through the health information system of the Ministry of Health, computerized since 1994. Data were also obtained from health reports of various districts, the administrative units in Kenya.

For this study, district-population data were obtained from the published census reports of the Government and projections provided by the Central Bureau of Statistics (19), and from publications, including the WHO/UNICEF manual on estimates of maternal mortality (20), World Bank publications, and the Kenya demographic and health survey reports (11). The methodology was hampered by the fact that Kenya is in a continuing process of creating new districts from the existing ones, which is reflected by changes in the number of districts reporting to the health information system of the Ministry of Health. As a result, it was not possible to get a population estimate for some newly-created districts.

In Nairobi, data were obtained from the hospital records of Pumwani Maternity Hospital, the largest maternity hospital in Kenya, and from the Kenyatta National Hospital, the teaching and national referral hospital, representing 60% and 10% of all deliveries in Nairobi city respectively. Data from the Nairobi Hospital, a private institution catering to the need of women of high socioeconomic status, were obtained from a paper published in the hospital proceedings (10). Private institutions cater to 10% of institutional

deliveries, whereas 20% of all deliveries in Nairobi city take place at home.

The Pumwani Maternity Hospital serves as the major referral centre for obstetric cases from Nairobi city and its surroundings. The hospital caters mainly to the need of women from lower socioeconomic status, with an average of 60 deliveries per day. The next level for referral is the Kenyatta National Hospital, the university hospital. Information on the rates of caesarean section from Marakwet and Laikipia districts was obtained from hospital theatre logbooks to validate the data of the health information system of the Ministry of Health.

Rates of hospital-based caesarean section were calculated based on the data of the health information system of the Ministry of Health. Rates of population-based caesarean section were derived from hospital data of the health information system of the Ministry of Health and from population estimates. Data from the private hospitals were not always reported to the Ministry, which could have resulted in an underestimate of the caesarean sections, yet private facilities account for less than 10% of all healthcare in the country.

RESULTS

Overall, no significant changes in the rates of caesarean section were observed between 1994 and 1998 in the district hospitals, varying between 1.5% and 8%, depending on the location and type of the hospital. A few district hospitals, however, showed significant increases in the rates of caesarean section from 2% in 1994 to 9% in 1998. These observations are difficult to explain just by examining the records of the health information system, but may be due to variations in health provision and in healthcare-seeking or referral behaviour, or due to perceived changes in the quality of care.

Table 1 shows a detailed analysis of the 1997 data, with an average reporting period of eight months. The overall rate of hospital-based caesarean section was 6.3%, varying between 37.7% in Nairobi, a cosmopolitan city, and 0.3% in Isiolo, a sparsely-populated remote district with mainly a nomadic population.

The overall rate of population-based caesarean section was 0.95%, varying between 0.1% in Mandera, Marsabit, Samburu, Siaya, Wajir, and Isiolo and 4% in Embu district. The districts with a rate of 0.1% population-based caesarean section are the most

economically-disadvantaged areas of Kenya, i.e. located in arid or semi-arid areas with little economic or agricultural activities.

In-depth analysis was done for two districts where the data of the Ministry of Health were compared with that of the hospital theatre logbooks. The rate of population-based caesarean section was 1% in Laikipia district to 2.3% in Marakwet district, closely correlating with the data obtained from the health information system of the Ministry of Health.

Table 2 shows the trends over time for three randomly-selected hospitals in Nairobi. Data from the Pumwani Maternity Hospital showed a significant rise in the rate of caesarean section from 4% (95% confidence interval [CI] 4.05-4.56) in 1983 to 9% (95% CI 8.92-9.59) in 1997 ($p < 0.0001$), while neither the number of deliveries nor the referral patterns changed over time. The rates of caesarean section in Kenyatta National Hospital and Nairobi Hospital were already high in 1983 and remained constant over the years.

DISCUSSION

The maternal mortality ratio is generally considered the most powerful health-outcome indicator for safe-motherhood programmes. Yet, its usefulness for Kenya is limited as illustrated by selected Kenyan studies (1-5). The main limitations are that hospital-based statistics are under-reported as they only count patients within the hospital setting. Population-based surveys are expensive to carry out because of the relatively rare event of a maternal death and because the surveys produce retrospective estimates which are not useful for monitoring purposes. In addition, maternal mortality is a sensitive issue with frequent under-reporting.

Several authors have highlighted the need for alternative indicators (13,14,21-24). Ronsmans *et al.* (14) suggested that the use of various indicators of the utilization of EOC facilities might prove to be a more powerful stimulus for changes than the widely-reported but inaccurate accounts of maternal mortality figures.

What about the rates of caesarean section as an indicator of maternal healthcare? In the mid- to late 1980s, rates of caesarean section showed wide variations, with the highest documented rates in the USA (12) and Brazil (15) where, respectively, almost one quarter and one-third of the births took place abdominally. Nowadays, rates of caesarean section have begun to

Table 1. Caesarean sections: district routine data (1997)									
District	No. of months reported*	Population [†]	Observed no. of deliveries	Expected no. of deliveries [‡]	Observed no. of caesarean sections	Extrapolated no. of caesarean sections [¶]	Hospital-based caesarean section rate (%) [§]	Maternal mortality per 100,000 deliveries	Population-based caesarean section rate (%) ^{**}
Baringo	6	397000	944	14816	39	78	4.1	318	0.5
Bungoma	12	1045000	2475	38999	122	122	4.9	404	0.3
Embu	3	480000	1310	17914	177	708	13.5	534	4.0
Isiolo	12	101000	866	3769	3	3	0.3	0	0.1
Kajiado	6	381000	303	14219	15	30	4.9	0	0.2
Kakamega	9	1935000	3798	72214	179	239	4.7	342	0.3
Keiyo	12	293000	1569	10935	97	97	6.2	8087	0.9
Kiambu	12	1234000	6636	46053	190	190	2.9	211	0.4
Kilifi	8	784000	1277	29259	58	87	4.5	1175	0.3
Kisii	6	1753000	2826	65422	112	224	4.0	708	0.3
Kisumu	12/11/9	939000	5885	35043	498	543	8.5	181	1.5
Kitui	12	859000	1476	32058	141	141	9.5	271	0.4
Kwale	11/8/9/12	501000	1398	18697	38	46	2.7	1216	0.2
Laikipia	10	325000	1816	12129	96	115	5.3	110	0.9
Lamu	3	78000	146	2911	13	52	9.0	685	1.8
Machakos	9		1298		177	236	13.6	534	
Makueni	10/11	815000	1512	30416	91	109	6.0	397	0.3
Malindi	10		1013		64	77	6.3	296	
Mandera	12	248000	423	9255	7	7	1.6	0	0.1
Marsabit	7	167000	156	6232	4	7	2.6	0	0.1
Mbere	10		427		0	0	0	0	
Mombasa	5/12/7	612000	9234	22840	486	729	5.3	434	3.2
Moyale	6		201		5	10	2.5	995	
Mt. Elgon	10		159		0	0	0	1258	
Murang'a	11	1038000	4714	38738	181	197	3.8	403	0.5
Nairobi	6/5/11/10/2	2086000	1802	77849	680	1166	37.7	0	1.5
Nakuru	8/12/12/11/11	1240000	11044	46277	774	844	7.0	6483	1.8
Nandi	3	613000	448	22877	21	84	4.7	223	0.4
Narok	10	602000	774	22467	53	64	6.8	388	0.3
Nyamira	6		953		32	64	3.3	210	
Nyandarua	9/1/11	426000	3813	15898	191	327	5.0	132	2.0
Nyeri	4/6	744000	1081	27766	76	182	7.0	0	0.6
Samburu	6	148000	165	5523	3	6	1.8	3030	0.1
Siaya	4	771000	532	28774	7	21	1.3	1128	0.1
Taita Tave	8/11/9	249000	1582	9293	81	108	5.1	190	1.2
Thika	7/11		7655		603	804	7.9	484	
Trans Nzoia	7	569000	2134	21235	66	113	3.1	515	0.5
Turkana	7/3	205000	356	7650	16	38	4.5	0	0.5
Wajir	3	224000	104	8360	3	12	2.9	0	0.1
Total/average	8.4	21862000	86105	815890	5399	7752	6.3		0.95

* When more than one figure is given, more than one hospital is reporting within the district. The average number of months for the district was used for calculating the other parameters.

† Source: Bureau of Statistics, Nairobi

‡ Crude birth rate for Kenya: 37.32/1,000 (UNDP human development report, 1998)

¶ The observed number of caesarean sections extrapolated to 12 months

§ The observed number of caesarean sections weighed by the observed number of deliveries, multiplied by 100

** The extrapolated number of caesarean sections weighed by the population, multiplied by 100

Table 2. Rates of caesarean section for Pumwani, Kenyatta and Nairobi hospitals

Year	Pumwani Hospital			Kenyatta Hospital			Nairobi Hospital		
	No. of births	CS	CS rate	No. of births	CS	CS rate	No. of births	CS	CS rate
1983	24625	1059	4	–	–	–	–	–	–
1993	–	–	–	5453	16 44	30	–	–	–
1994	17648	1200	7	–	–	–	–	–	–
1995	20468	2235	11	5070	13 77	27	1165	303	26
1996	22922	1715	8	5892	17 63	30	1055	347	33
1997	21849	2031	9	6440	17 41	27	1233	320	26

CS=Caeserean section

level off at rates between 10% and 15% in most industrialized countries. It is now accepted that caesarean sections should not account for more than 15% of all deliveries (15). In 1996, the WHO and UNICEF providing population-based figures for the rates of caesarean section, with optimal figures between 5% and 15% (20), endorsed this. Rates of caesarean section below 5% are considered to be associated with higher maternal mortality rates, whereas rates beyond 15% do not seem to improve neither maternal nor infant health.

Our observations from Kenya indicate that data, routinely collected by the Ministry of Health, can provide useful information on the delivery of maternal healthcare. The figures reported by the national health information system seem to be a proper reflection of the true data, at least for the indicator under study, as illustrated by the close correlation of data of the health information system of the Ministry of Health and data from hospital theatre logbooks from two randomly-selected districts (Laikipia and Marakwet). Indeed, records of major surgical interventions, such as caesarean section, are often the most complete records in a hospital, and as such, a reliable source of information.

Based on these calculations, the most optimistic health information system-based estimation of the rate of population-based caesarean section in Kenya does not exceed 2%, which is far below 5% accepted as the minimum to meet the obstetric needs of women in the catchment areas and is far below 5.2% found in the Kenyan national demographic and health survey (11). Part of this discrepancy could be explained by the fact

that the government hospitals mainly report to the health information system of the Ministry of Health, whereas the mission and private hospitals usually have higher rates of caesarean section as illustrated by the rate of caesarean section of approximately 30% in the Nairobi Hospital. This could lead to an under-estimate of 30-40%, because the government hospitals provide 60-70% of the healthcare in Kenya (24).

The estimated rates of caesarean section in cities are higher than in rural areas, reflecting the differential use of maternity services, whereby 80% of deliveries occur in the city hospitals compared to only 20% in the rural areas. The antenatal coverage might be well over 90% in most Kenyan districts (9). The activities carried out at the antenatal consultation are now widely accepted as of limited benefit to predicting life-threatening complications (8). The low coverage of institutional deliveries further illustrates the poor transport system for women with intra- or postpartum complications.

The rates of caesarean section in Nairobi city mainly reflect the status of the hospital and its place in the healthcare system. The Pumwani Maternity Hospital, the largest institution, covering more than half of the institutional deliveries of the city, shows a relatively low rate, while the Kenyatta National Hospital, being the tertiary-level referral centre for the whole country, including Pumwani Maternity Hospital, produces high rates. The Nairobi Hospital, with a privileged clientele, shows rates comparable with private hospitals in industrialized countries. Loeffler, who reported this high rate in the Nairobi Hospital proceedings, argues that what are commonly called 'bad reasons'—monetary

incentives, convenience, defensive practice, or inexperience—may be implicated, but in addition, an unknown number of rich and well-insured mothers seem to prefer operative delivery as a convenient high-tech method of childbirth (25).

The above discussions suggest that, at the national level, it is definitely the low rate of caesarean section that is a concern in Kenya. Availability and accessibility of comprehensive obstetric care units are apparently the main reasons for the low rate of caesarean section. However, not only availability and accessibility but also the quality of obstetric care have to be addressed. Reports have shown that the case-fatality rate in caesarean section was 0.33% in Thika in 1988, which was three times the case-fatality rate (0.10%) of industrialized countries (12). Maternal mortality rates in caesarean section patients of 3% in rural areas and 1% in teaching hospitals have been reported in other African settings (26). Since efforts are being made to increase the use of caesarean section as an intervention to save mother's life, the safety in the procedure needs to be addressed as well.

An easy-to-measure indicator, such as rate of caesarean section, has been shown to be useful, but collection of data, for monitoring and evaluation at the local level, needs to be strengthened. This strategy can be successful in the management of safe-motherhood programmes as shown in Morocco where a study at the district level indicated that routine collection of data could be a valuable instrument of decision-making and evaluation (18).

In Kenya, the health information system of the Ministry of Health routinely collects data and publishes useful information on public-health issues and services. The low rates of population-based caesarean section indicate that there are huge unmet obstetric needs, especially in the rural areas. The rate of caesarean section can be assessed as a process indicator of availability and accessibility of maternal healthcare and should be studied over time.

The data presented in this study can increase the awareness of the maternal care problem among the public and policy-makers, leading to a broad basis of support for the necessary steps to improve reproductive health in Kenya.

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