

Cesarean section deliveries in Fiji, 1986 to 1996

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Abstract

Cesarean section rates and outcomes in Fiji have not been previously reported in the literature. Between 1986 and 1996, Fiji's cesarean section rates rose 2.5%, from 9.4% to 11.9%. Labor dystocia (33%), repeat cesarean (18%), and "fetal distress" (17%) were the most common indications for performing c-sections. A retrospective case-control study covering the period 1986 - 1996 in Fiji's three referral hospitals found that cesarean deliveries were three times more likely to involve child mortality (O.R. = 3.01, 95% c.i. = 1.19 < OR < 8.08), 26 times more likely to involve maternal morbidity (O.R. = 26.53, 95% c.i. = 8.10 < OR < 105.38), and 13 times more likely to require blood transfusion (OR = 13.17, 95% c.i. = 7.09 < OR < 25.05). Cesarean deliveries also required an average of 6 days spent in the hospital, compared to two days for vaginal deliveries. Children delivered by cesarean in the study population were 6 times more likely to have a 5-minute Apgar score below 7 and 4 times more likely to have an Apgar score below 5. Fourteen percent (14%) of cesareans followed an attempted induction of labor, while 1 in 11 women delivering vaginally underwent an attempted induction of labor for "Social reasons". The study found scope to potentially reduce the number of first and repeat cesareans through active labor monitoring, development of uniform clinical guidelines and indications for cesarean intervention and labor induction, and increased trial of labor for women with a history of a previous cesarean.

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Introduction

Cesarean section is a surgical intervention intended to reduce maternal and child morbidity and mortality during childbirth and in the perinatal period. Despite the long history of the procedure (dating back the early 19th century), there is a lack of demonstrated benefit of its use in the literature stemming primarily from the ethical barriers to doing randomized clinical trials¹. Cesarean delivery has increased worldwide over the last 20 years amid controversy, driven more often than not by non-medical considerations, such as liability and cost incentives^{1,2,3,4,5}.

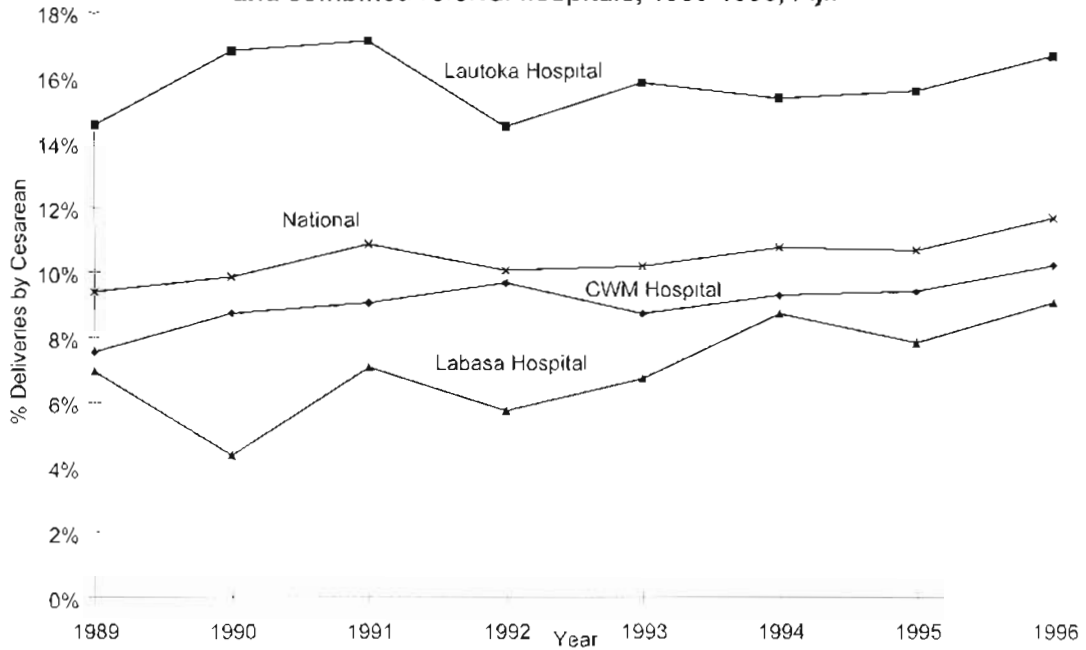
Data on cesarean section rates and outcomes in Fiji have not been previously reported in the literature. This data is compiled here for the period 1986 to 1996. A retrospective case control study was undertaken comparing cesarean and vaginal deliveries between 1986 and 1996 at Fiji's three major referral hospitals in order to determine the relative risks of the procedure as it is practiced in Fiji.

Methods

Routine data collected at Fiji's three major hospitals and the Ministry of Health was compiled by the authors and analyzed to calculate rates of cesarean section for the period 1986 to 1996. A retrospective review of hospital records from 1986 to 1996 in the three major hospitals was conducted. An unmatched case - control study design was used, consisting of 1,260 randomly selected case (cesarean delivery) records and 654 randomly selected controls (vaginal delivery). The medical records for cases and controls were selected by computer-generated random numbers to select the first record from the hospital birth registers beginning in 1986. Every tenth record was then selected in sequence from 1986 to 1996 to yield a 10% sample of cesarean deliveries over the 11-year period. Statistical power analysis of Chi-square tables using Epi Info version 3.04b indicated that statistically significant results ($\alpha = 0.05$) could be obtained by comparison with a control sample of 650. The methodology, while not ideal, was chosen as a cost-

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Figure 1. Percentage of deliveries by Cesarean Section, individual and combined referral hospitals, 1989-1996, Fiji.



effective way to perform an analysis on non-computerized medical records for the purpose of rapid data analysis.

For cesarean deliveries, random samples totaling 10% of all c-section records from 1986 to 1996 were taken from CWM, Lautoka and Labasa Hospitals using birth registers. There were 12,956 C-Sections performed at the three major hospitals during this period. The breakdown of sampling was as follows:

Colonial War Memorial Hospital: 556 Cases/301 Controls
Lautoka Hospital: 514 Cases/257 Controls
Labasa Hospital: 190 Cases/96 Controls

Data was collected on demographic characteristics of mothers, primary indications for cesarean section and induction, maternal and child outcomes including mortality, post-operative complications, the need for blood transfusion, and infant APCAR scores. Nurses were trained as data collectors, and the data collection forms were pre-tested before the survey was conducted. Data were entered by Health Information Unit staff at the Ministry of Health and analyzed using Epi Info version 3.04b and Microsoft Excel version 5.0.

The samples were compared in tabular form to examine potential differences in demographic characteristics between the two study samples. Outcomes were compared using Chi-square analysis, Odds Ratio calculations and comparison of means for continuous variables.

Results

Figure 1 compares the rates of cesarean section per 100 live births at Fiji's three referral hospitals with the national average from 1989 to 1996. The national cesarean rate appears to have risen slightly over the period from 9.5% of all deliveries to nearly 12%, with the highest rate observed at Lautoka Hospital (between 14 and 17%).

Cesarean and vaginal deliveries were compared to determine outcome variables. Pertinent demographic characteristics of the two samples are listed in Table 1. Thirty six percent (36%) of women from the cesarean sample of the case-control study had a history of previous cesarean, while 64% were first-time cesareans ($n = 1260$). In the control group of women delivering vaginally ($n = 654$), 2% had a history of previous cesarean, but delivered vaginally.

Primary indications for delivery by cesarean section are shown in Table 2. "Labor dystocia", including such indications as "failure to progress", "cephalo-pelvic disproportion", and "arrested labor", accounted for 1 in 3 cesarean deliveries. Repeat cesarean was next at 18%, with "fetal distress" ranking third at 17%. Indication-specific cesarean section rates per 100 live births were extrapolated based on 1986 and 1996 rates (columns 2 and 3).

Table 3 lists the outcomes of pregnancies for both groups. The early neonatal death rate was 11 per 1000 (1.1%) for cesarean deliveries, compared to 3 per 1000 for the vaginal delivery group (0.3%). The still birth rate was

Table 1. Demographic characteristics of cesarean and vaginal delivery samples, 1986 to 1996, Fiji

Demographic	Characteristic	Caesarian delivery	Vaginal delivery
Hospital	CWM	556 (44%)	301 (46%)
	Lautoka	514 (41)	257 (39)
	Labasa	190 (15)	96 (15)
Ward	Private	79 (6)	30 (5)
	Public	1181 (94)	624 (95)
Race (3 missing)	Fijian	600 (48)	345 (53)
	Indian	584 (46)	274 (42)
	Other	74 (6)	34 (5)
Age group	10 to 14	1 (0.1)	0
	15 to 19	73 (6)	85 (13)
	20 to 24	358 (28)	228 (35)
	25 to 29	368 (29)	193 (30)
	30 to 34	280 (22)	108 (17)
	35 to 39	135 (11)	30 (5)
	40 to 44	41 (3)	10 (2)
	45 to 49	4 (0.3)	0
Marital Status	Single	171 (14)	111 (17)
	Married	1089 (86)	543 (83)
Parity (6 missing)	Para 1	171 (14)	85 (13)
	Para 2 - 4	878 (70)	459 (70)
	Para 5+	205 (16)	110 (17)
Total		1260	654

16 per 1000 for cesarean deliveries compared to 6 per 1000 for vaginal deliveries. Cesarean deliveries were 3 times more likely to result in perinatal mortality than vaginal deliveries (Odds Ratio = 3.01, 95% c.i. for OR = 1.19 < OR < 8.08).

Children delivered by cesarean were 6 times more likely than normal deliveries to have a 5 minute Apgar score below 7 (OR = 5.90, 95% c.i. for OR = 2.72 < OR < 13.39), and nearly 4 times more likely to score below 5 (OR = 3.71,

95% c.i. for OR = 1.03 < OR < 15.97). Nearly one out of every five cesarean deliveries (19.6%) required a blood transfusion, compared with only 2% of normal deliveries. a 13-fold greater likelihood (OR = 13.17, 95% c.i. = 7.09 < OR < 25.05). Hemorrhage (43%), failed induction (31%) and prolapsed cord (30%) were the indications requiring the highest proportion of blood transfusions. Difference in mean length of stay in hospital was highly significant at 6.3 days for cesarean, compared with only 1.9 days for vaginal deliveries (Student's t = 32.3, p < 0.0001), while

Table 2. Indications for cesarean section, Fiji, 1986 to 1996

Primary indication for Cesarean	Total	CS rate per 100 live births - 1986	CS rate per 100 live births - 1996
1. Labor Dystocia	418 (33%)	3.1	4.0
2. Repeat Cesarean	231 (18)	1.7	2.1
3. Fetal Distress	215 (17)	1.6	2.1
4. Abnormal Presentation	160 (13)	1.3	1.5
5. Pre-eclamptic toxemia	89 (7)	0.7	0.8
6. Hemorrhage	68 (5)	0.5	0.7
7. Failed Induction	35 (3)	0.3	0.4
8. Prolapsed Cord	27 (2)	0.2	0.2
Indication not in record	17 (1)	0.1	0.1
Total	1260 (100)	9.5	11.9

Table 3. Comparison of outcomes of pregnancy between cesarean and vaginal delivery

Outcome	Cesarean delivery	Vaginal delivery	Total
Live birth	1221 (96.9%)	648 (99.1%)	1869 (97.6%)
Early neonatal death	14 (1.1)	2 (0.3)	16 (0.8)
Still birth	20 (1.6)	4 (0.6)	24 (1.3)
Missing data	5 (0.4)	0 (0)	5 (0.3)
Total	1260 (100)	654 (100)	1914 (100)

mean length of stay for complicated cesarean deliveries was more than 8 days.

Table 4 shows post-partum complications for cesarean deliveries by primary indication. Nearly one in five cesareans (17%) resulted in post-partum complications, with 7% resulting in surgical wound infections, and an additional 7% resulting in other post-partum infections. The data indicate much higher rates of complication in the cesarean sample (18%) than among normal deliveries (0.5%). However, due to a printing error on some of the data collection forms, data on complications was not collected for a large proportion of the control sample (43.1%). Extrapolation of the data at the same observed level of complications among the control group to the missing control group data produced nearly the same odds ratio, with a narrower 95% confidence level (OR = 27.84, 95% c.i. = 11.02 < OR < 76.89). Even if the missing data had a 20% rate of complications (comparable to the rate observed in cesarean deliveries - a highly unlikely scenario!), extrapolation of the data would still indicate twice the risk of complications for cesarean deliveries as compared to normal deliveries.

Table 5 shows the indications for and method of induction for those women who underwent attempted induction of labor. Fourteen percent of patients in both groups underwent an attempted induction of labor (172 of the cesarean and 86 of the vaginal deliveries). While 172 patients in the cesarean group underwent an at-

tempted induction of labor, only 35 of the ensuing cesarean deliveries were actually recorded as "failed induction" (see Table 2). Pre-eclamptic toxemia, post maturity and growth retardation of the fetus made up 62% of the indications in the cesarean sample, while nearly 30% of inductions were for non-medical indications (social or other reasons), and 8% had no indication recorded. Further, for induction indicated on the basis of post maturity, only 45% (31 out of 69) met the clinical definition of > 42 weeks gestation. More strikingly, of those women who were induced but delivered vaginally, 64% had induction performed for "Social" (non-medical) reasons. Generalized to the wider population of child bearing women, this would mean that nearly 1 in 10 (9%) undergo an attempted induction of labor primarily for convenience during any given delivery.

Of those women who had an attempted induction performed, 80% of women in both groups underwent surgical induction, while 20% underwent medical induction. It is of note that the proportion of medical induction was significantly higher in the cesarean sample (22%) than in the control group (7%) (OR = 4.06, 95% c.i. = 1.54 < OR < 11.30).

Discussion

Cesarean deliveries were three times more likely to involve child mortality, 26 times more likely to result in

Table 4. Obstetric complications of cesarean delivery by primary indication for cesarean

Primary indication for cesarean	Post-partum infection	Post-partum hemorrhage	Surgical wound infection	Other	None	Total*
Labor dystocia	34 (8%)	13 (3%)	27 (7%)	7 (2%)	335 (81%)	416
Previous Cesarean	4 (2)	5 (2)	11 (5)	2 (1)	208 (90)	230
Fetal Distress	16 (7)	3 (1)	16 (7)	4 (2)	178 (82)	217
Abnormal Presentation	14 (9)	3 (2)	8 (5)	1 (1)	135 (84)	161
Pre-eclamptic toxemia	7 (8)	3 (3)	10 (11)	3 (3)	66 (74)	89
Hemorrhage	9 (13)	1 (1)	4 (6)	1 (1)	53 (78)	68
Failed Induction	1 (3)	0 (0)	7 (20)	0 (0)	27 (77)	35
Prolapsed Cord	0 (0)	0 (0)	2 (7)	0 (0)	25 (93)	27
Missing	0 (0)	0 (0)	1 (9)	0 (0)	10 (91)	11
Total	85 (7)	28 (2)	86 (7)	18 (1)	1037 (83)	1254

* n = 1254. Data on complications missing from 6 records.

Table 5. Indications for attempted induction of labor and methods of induction by study group

	Cesarean delivery	Vaginal delivery	Total
Indication for Induction			
Social reasons	51 (30%)	55 (64%)	106 (41%)
Post maturity (> 42 weeks)	58 (34)	11 (13)	69 (27)
Pre-eclamptic toxemia	48 (28)	14 (16)	62 (24)
Missing indication	14 (8)	1 (1)	15 (6)
Growth retardation	1 (1)	5 (6)	6 (2)
Methods of Induction			
Surgical	128 (74)	78 (91)	206 (80)
Medical	38 (22)	6 (7)	44 (17)
Missing method	6 (3)	2 (2)	8 (3)
Total	172 (100)	86 (100)	258 (100)

maternal morbidity, and 13 times more likely to require maternal blood transfusion. Cesarean deliveries also resulted in an average of 6 days spent in the hospital, compared to two days for normal deliveries. Children delivered by cesarean in the study population were 6 times more likely to have a 5-minute Apgar score below 7 and 4 times more likely to have an Apgar score below 5. Fourteen percent of cesareans followed an attempted induction of labor, while 1 in 11 women delivering vaginally underwent an attempted induction of labor for "Social reasons". This study indicates that cesarean deliveries in Fiji may pose not only additional risks for mother and child, but may also place additional burdens on Fiji's national health care system due to increased length of hospital stay. Additionally, there appear to be a substantial number of attempted inductions of labor preceding cesarean sections, many of which are performed for primarily social rather than medical reasons.

Fiji's national rate of delivery by cesarean section rose less than 3% over the 11 year period from 9.4 to 11.9%. This places Fiji's c-section rates roughly on par with countries such as Ethiopia -10%⁶ and Germany - 9.3% (7), and significantly lower than the range (15% to 27%) reported in the United States⁸. While Fiji appears to enjoy a relatively low rate of cesarean sections, there appears to be scope for reducing the number further by preventing unnecessary cesareans from being performed.

The study indicates scope for overall cesarean deliveries through a reduction in repeat c-sections. A large body of published studies from both industrialized and developing countries argues for the introduction of more widespread trial of labor.^{9,10,11,12,13,14,15} Such an approach seems reasonable, at least in Fiji's referral hospitals where ample resources are available to ensure safe delivery. Research to assess the VBAC rates and outcomes would be an important next step to reducing rates of cesarean delivery.

Studies in other countries have documented that a number of non-medical factors play a role in a physician's decision to deliver by caesarean section including practitioner patterns of delivery in the previous year, the day of the week (with a much higher rate of caesarean deliveries occurring on Fridays), financial incentives, and level of training¹⁶. Such factors should be further investigated in Fiji.

Case audits and peer review programs have been found to be good methods in and of themselves to reduce cesarean section rates, particularly in cases of labor dystocia^{17,18}, and should be considered by program managers where they have not been implemented already. One of the challenges in reducing rates of cesarean performed for the various indications that make up labor dystocia is defining exactly what "dystocia" means^{28,29}. In addition, improved clinical protocols which share decision making between obstetricians, nurse-midwives and clients have been found to be successful in reducing the rates of cesarean, and improving client and provider satisfaction¹⁹.

While comparisons of outcomes provide useful insights into the additional risks of women delivering by cesarean in Fiji, the design of this study prevents the determination of causality regarding outcomes. A more thorough and individualized case review would have been required to determine causes of death, the nature of complications, and the appropriateness of interventions and medical decision-making processes. Interpretation of Apgar score data generated by the study may be particularly problematic. While Apgar scores have been found by some studies to be predictors of future cognitive and motor development for the newborn^{20,21,22}, other studies have found no relationship²³ or a relationship only if the newborn also experienced neonatal seizures²⁴. Adding to the complication is the effect of anesthesia on Apgar scores, which should be minimal with modern methods^{25,26} but may be

dependent in part on the time from induction to incision²².

Concern by practitioners at the Ministry of Health in Fiji over the apparent high rate of unnecessary Cesarean sections being done prompted this study to be undertaken. Particular issues that the study attempted to address were:

1. that a lack of uniform criteria or definitions of indications for cesarean delivery exist in Fiji, and indeed in the literature, and the world,
2. that a high rate of inductions were being performed for social or non-medically necessary reasons, leading to a higher rates of cesarean deliveries,
3. that women delivering by cesarean in Fiji suffered disproportionately from maternal and child morbidity and mortality,
4. that nurse midwives play an inadequate role in patient consultation and monitoring of labor, and that strengthening this role might reduce the number of preventable cesarean deliveries,
5. that vaginal birth after cesarean (VBAC) is not widely practiced, and could further reduce the overall number of cesareans performed.

As this was the first study of its type in Fiji, it was intended to give support and a baseline for further study on issues 4. and 5. It was expected that scope would be found to reduce the number of cesarean sections, particularly first Cesareans. Rates of vaginal birth after cesarean have not been documented in Fiji, but this study did attempt to assess the percentage of women delivering vaginally with history of previous cesarean (2%).

This study serves as a baseline for further work regarding the use of cesarean delivery in Fiji. Future work should focus on defining indications for cesarean, improving communication between practitioners and clients, and attempting to more carefully understand the apparently unfavorable child mortality and maternal and child morbidity outcomes associated with cesarean in Fiji.

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A man may sympathize with a woman, though it is impossible that he should conceive himself as suffering her pains in his own proper person and character.

**Adam Smith (1723 - 1790) in
'The Theory of Moral Sentiment'**