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Original Research Article

Trends in caesarean section rates in a rural block of southern India

Divya Elizabeth Muliyl, Manjunath K.*, Jasmin Helan, Shantidani Minz, Kuryan George,
Vinod Joseph Abraham, Anuradha Bose, Anne George Cherian

Department of Community Health, Christian Medical College, Vellore, Tamil Nadu, India

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***Correspondence:**

Dr. Manjunath K.,

E-mail: drmanjunathk@gmail.com

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ABSTRACT

Background: Over the last decade many programmes have been implemented to improve the health of pregnant women and neonates. This study aims to look at the changes in modes of delivery and perinatal mortality rates in a rural block of Tamil Nadu between 2006 and 2015.

Methods: Data on all the births that have occurred in this rural block of Tamil Nadu that has been prospectively collected between 2006 and 2015 was analysed. A longitudinal analysis was done to calculate the primary and overall caesarean section rate and the average annual rate of increase. The perinatal mortality rate was also calculated.

Results: The primary LSCS rate has increased from 9.08% in 2005 to 16.1% in 2015. The overall caesarean section rate has increased from 11.7% to 19.2% in the same time with an average annual rate of increase of 5.1%. During this period the perinatal mortality has decreased from 33 per 1000 live births to 17 per 1000 live births.

Conclusions: Though the overall caesarean section rate is higher than the 15% prescribed by WHO the rates are lower than the rest of the country and rural Tamil Nadu.

Keywords: Caesarean section rates, Intrapartum care, Modes of delivery

INTRODUCTION

Safe pregnancy and motherhood is one of the key issues in any Reproductive and Child Health programme. The WHO has asserted that improving availability, accessibility, quality and use of healthcare services is important in reducing maternal mortality during pregnancy and childbirth.¹ This requires universal access to comprehensive emergency Obstetric care. Caesarean Section is one of the most common surgeries performed in obstetric practice.

The rates of caesarean section have been increasing globally with an almost 150% increase in caesarean section rates over the past 25 years and is presently at 18.6%.² Is there an appropriate level of Caesarean sections in the community? The WHO recommended

15%, pending evidence that a higher level benefitted the mothers or their offspring.³ In a recent study, of the more than 60 medium and high-income countries, 62% had Caesarean section rates more than 15%.²

Certain studies have suggested that the high caesarean section rates are driven in part by the private sector especially in South Asia and that prevalence may be higher among those with a higher educational status.⁴ What are the consequences of these high caesarean section rates on the health of the mothers and the babies? If not medically indicated, it exposes both the mother and the baby to consequences that are not fully understood.

This study was conducted with the objective of studying the trends in modes of delivery and the place of delivery between 2006 and 2015. The second objective was to

study the concomitant change in perinatal mortality rate of this rural community. The third objective was to study, among a subset of women who have delivered in the charitable secondary hospital, the change in indications of caesarean sections over the decade.

METHODS

This study was done in Kaniyambadi block which is a rural block in Vellore district in Tamil Nadu. Spread over 127 km², it is made of 85 villages. The occupation of the people living here is mainly agriculture and animal husbandry. The department of Community health of Christian Medical College, Vellore has been operating a community health programme in this area since the 1960s.⁵

All pregnant women residing in the area are registered by the primary health care team and antenatal care is provided to the registered women every month and thus the team tracks the pregnant woman till delivery. At the base hospital, routine antenatal care and care for women with specific high-risk factors is provided.

Obstetric ultrasonography and laboratory services are available at the base hospital. Basic and Comprehensive Emergency obstetric and Neonatal care (BEMONC and CEMONC) are both available at this facility 24 × 7. Women with risk factors such as severe pre-eclampsia, heart disease and preterm labour (less than 32 weeks of gestation) are referred to the nearby tertiary care centre for a safe delivery.

In April 2005, with the inception of the National Rural Health Mission, the public health sector of the entire state was strengthened. Two primary health care centres, one block primary health care centre and a tertiary care medical college and hospital were made available to those residing in the area. Apart from this, the national ambulance services were also made available free of cost. The Janani Suraksha Yojana was also implemented and available in all hospitals of the public sector, to decrease maternal and neonatal mortality by integrating cash assistance with every stage of pregnancy and delivery.⁶

Surveillance system and data collection

The block is divided into regions and has a 4-tier monitoring system created by the department of community health. One part time community health worker (PTCHW) is available in every village, one health aide for every 5000 population, one public health nurse for every 15000 population and one doctor for every 30,000-population. Data on the pregnancies, births and deaths are collected by the health aide with the help of the PTCHW, weekly.^{5,7}

All antenatal women are registered and provided with a unique identification number. A standard tool is used to screen for high risk factors. The team provides monthly

antenatal care, visits the family immediately after delivery and 7 days after delivery to record the outcome of the delivery and the condition of the baby at birth. Data collected by the health aides is confirmed by the remaining team, computerised and reviewed monthly by all members of the faculty.⁵ Data collected between January 1st, 2006 and December 31st, 2015 was analysed using SPSS version 23.

Trends over time analyses

The primary and overall caesarean section rate for each year from 2006 to 2015 was calculated using the formula of number of caesarean section per 100 births. A subset of women who had delivered in our hospital were studied further to analyse the change in the trends of indications for caesarean sections.

The Average annual rate of increase is a geometric progression ratio that provides a constant rate of change during a given period. It was calculated using the formula,

$$AARI = [(a_n/a_m)^{(1/n-m)}] - 1,$$

where a_n is the rate of LSCS at the end of the period of study, a_m is the LSCS rate at the beginning of the study period, n is the year of completion of the study and m is the year of initiation of the study.² The annual perinatal mortality rate was calculated per 1000 live births.

RESULTS

Maternal characteristics

Between 2006 and 2015 there were 20,829 deliveries. The number of deliveries that occurred in this rural block was 1904 in 2006, increased gradually and peaked at 2212 in 2011 and gradually decreased to 1889 in 2015. The average age of the primi gravida women has changed only marginally.

The proportion of teenage deliveries has decreased from 14.8% in 2006 to 7% in 2015. The proportion of women with higher order of pregnancies has decreased from 6.7% to 4% and the proportion of women with high risk factors have remained steady (Table 1).

Intrapartum care

In 2006, only a small proportion of women (6%) had delivered at home and this has become negligible over the last 10 years (Table 2). The proportion of women delivering in the primary health care centres increased from 9% in 2006 to 30% in 2010 and then subsequently declined to 17% by 2015. Also, the proportion of women delivering in tertiary care centres have steadily increased from 9.4% in 2006 to 26% in 2015. The proportion of women delivering in the public health sector increased from 12.4% to 35.9% (Table 3).

Table 1: Characteristics of the antenatal women.

Year	No. of deliveries	Average age of Primi gravida in years	Proportion of teenage pregnancies (%)	Proportion of women with short stature (%)	Proportion with previous still births/ENDs (%)	Proportion of women with higher order of births (i.e. women who have 2 or more living children (%)
2006	1904	23.16	14.8	data not available	4	6.7
2007	2181	23.32	14.3	4.9	4.4	6.1
2008	2080	23.28	14.2	4.0	3.9	4.2
2009	2210	23.34	12.8	4.0	3.2	5.1
2010	2106	23.27	11.2	2.9	3.0	2.8
2011	2212	23.51	11.1	2.9	2.7	4.3
2012	2142	23.67	8.7	2.7	4.1	4.7
2013	2085	23.95	7.2	2.7	3.0	5.6
2014	2020	24.43	8.4	3.4	3.0	4.1
2015	1889	24.62	7	3.3	3.4	4.3

Table 2: Place of delivery.

	Total no. of deliveries	Proportion of women who delivered at home (%)	Proportion of women who delivered in the public sector (%)	Proportion of women who delivered in the private sector (%)
2006	1904	6.1	12.4	81.4
2007	2181	5.2	20.6	74.2
2008	2080	1.8	34.4	63.9
2009	2210	1.3	32.4	66.3
2010	2106	0.8	34.5	64.7
2011	2212	0.7	34.4	64.9
2012	2142	0.6	36.7	62.7
2013	2085	0.5	33.1	66.4
2014	2020	0.3	35.9	63.8
2015	1889	0.2	33.6	66.2

Table 3: Level of care required.

Year	Total number of deliveries	Proportion of home deliveries (%)	Proportion of deliveries that occurred in primary health care centres (%)	Proportion of deliveries in secondary level hospitals (%)	Proportion of deliveries in tertiary level hospitals (%)
2006	1904	6.1	9.1	75.3	9.4
2007	2181	5.2	17.2	66.4	11.2
2008	2080	1.8	29.8	55.9	12.4
2009	2210	1.3	29.1	57.4	12.2
2010	2106	0.8	31.6	54.9	13.7
2011	2212	0.7	28.8	55.3	14.6
2012	2142	0.6	25.9	54.1	19.4
2013	2085	0.5	22	57.9	19.6
2014	2020	0.3	22.4	55.4	21.9
2015	1889	0.2	16.9	56.8	26.1

Rates of LSCS

The mode of delivery has been predominantly normal vaginal delivery, but the proportion of caesarean sections has increased from 11.7% (95% CI 9.9% to 13.5%) to 19.2% (95% CI 17.4% to 20.9%).

The primary caesarean section rate increased from 9.08 to 16.1% (Table 4).

The average annual rate of increase

The average annual rate of increase (AARI) in the rate of LSCS during this period was 5.1%.

The AARI for women with short stature was 5.1%, advanced maternal age (≥ 35) was 5.4%, women with bad obstetric history was 9.6%. (Table 5).

Table 4: Trends in mode of deliveries.

Year	Total no. of deliveries	Normal vaginal deliveries (%)	Instrumental deliveries (%)	Assisted breech extraction (%)	Caesarean sections (%)
2006	1904	82.2	4.7	1.4	11.7
2007	2181	81.5	4.1	0.8	13.5
2008	2080	79.9	4.3	0.8	15.0
2009	2210	78.6	4.8	0.6	16.0
2010	2106	78.8	4.6	0.4	16.2
2011	2212	79.7	4.2	0.4	15.6
2012	2142	75.6	5.6	0.5	18.3
2013	2085	74.8	8.2	0.4	16.6
2014	2020	76.1	6.6	0.4	16.9
2015	1889	72.2	8.3	0.3	19.2

Perinatal outcomes

Perinatal mortality rate was 33 per 1000 live births in 2005 and has decreased to 17 per 1000 live births in 2015. The mean birth weight of the babies increased minimally from 2.84 kg (SD 0.45) in 2006 to 2.91kg (SD 0.47) in 2015.

Analysis of indications of delivery

Indications for LSCS were available for all the women who delivered in the secondary hospital run by the Department of Community Health. The proportion of women undergoing caesarean sections in view of the previous LSCS has been increasing. External cephalic version has been offered to more antenatal women since 2012 and malpresentations have contributed to a smaller

proportion of the overall number of caesarean sections and the proportion of assisted breech extractions has decreased too. (Table 6).

Table 5: Rate of caesarean sections in subgroups of women.

Subgroups	Rate of LSCS in 2006	Rate of LSCS in 2015	AARI
women with short stature	23.1%*	36.5%	5.1%
age >=35 years	25.9%	43.8%	5.4%
Women with previous still birth or early neonatal deaths	13%	32.8%	9.6%

*Rate of LSCS in 2007

Table 6: Change in indications for caesarean sections.

Year	Total number of deliveries in the rural secondary hospital	No. of caesarean sections that were conducted in the rural secondary hospital	Previous LSCS (%)	Mal-presentation (%)	Failed induction (%)	Arrest of descent or dilatation (%)	Non-reassuring fetal status (%)	Others (%)
2006	1318	142	38	10.5	0	19.1	31	1.4
2007	1286	186	34.4	13.4	1.1	21	29	1
2008	1042	211	39.8	13.2	0.9	12.8	29.9	3.3
2009	1138	224	37.1	12.9	0.9	17.4	28.9	2.6
2010	1021	205	47.3	8.8	0	15.1	25.3	3.5
2011	1095	208	49.5	13.6	2.9	13.4	16.8	3.9
2012	1035	288	51.5	8.4	1.6	18.6	17.6	2.6
2013	1082	289	45.5	8	2.6	13.8	24.9	5.3
2014	979	138	47.1	15.1	1.4	13.8	21	1.4
2015	960	151	51	6.7	4.6	11.2	19.9	6.7

DISCUSSION

Caesarean sections are becoming an increasingly used mode of delivery and as per NFHS 4 data the caesarean section rate in India is 17.2%. The NFHS 4 found that in Tamil Nadu the overall caesarean section rate is 34.1% with a rate of 32.3% in the rural area and 36.1% in the urban area. The caesarean section rates in the rural and urban areas of Tamil Nadu are similar and was attributed to an almost equal access to health care services.⁸

Pai et al reported that 45% (95% CI 39.1-51.3%) of all deliveries in Chennai were caesarean sections.⁹ Another population-based study done in 2003, in Chennai, reported that the rates of caesarean sections were 32.6% (95% CI 27%-38%).¹⁰

The rate reported in this rural block of 19.2% is much lower than those reported in Chennai more than a decade ago and lower than the current state average. The AARI of this area is 5.1% which is only slightly higher than the global average of 4.4%.² A larger proportion of the caesarean sections conducted currently are repeat caesarean sections as vaginal births after caesarean sections are not routinely offered.

The AARI in this population is higher among the subgroup of women who have had a bad obstetric history. This is in contrast to the finding by Khan et al in Bangladesh where the AARI was higher among women from more affluent families and those with higher levels of education, where utilization of caesarean sections was higher.¹¹

Utilization of health care services in this population is good with an institutional delivery rate of 99.8% in this population and 99% in Tamil Nadu. The WHO statement on caesarean sections suggest that as the caesarean section rises above 15% there is no concomitant decrease in mortality.

However, in this population there has been a steady decline in the perinatal mortality rate from 46 per 1000 births in 1993 to 17 per 1000 births in 2015.⁷ The current perinatal mortality in this population is less than that reported for rural India (28 per 1000 in 2013) and for rural Tamil Nadu (23 per 1000 in 2013).¹² The trends of caesarean section rates and perinatal mortality rates for this rural block of Tamil Nadu are positive as they are much closer to the WHO prescribed rate of 15%.

CONCLUSION

The overall caesarean section rate in this population has changed from 11.7% to 19.2% with an AARI of 5.1% and is higher than the WHO recommended rate of 15%. However, these rates are much lower than the national and state average reported during NFHS 4.

Along with an increase in the rates of LSCS there has been a steady decline in the perinatal mortality rate. A regular audit of caesarean sections and their indications is needed to monitor the reasons for changing caesarean section rates.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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