

## Trends in Cesarean Delivery at a Tertiary Care Hospital

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### DOI

[10.59779/jiomnepal.1297](https://doi.org/10.59779/jiomnepal.1297)

### Submitted

Jan 4, 2025

### Accepted

Mar 19, 2025

## ABSTRACT

### Introduction

Cesarean delivery is on the rise globally, and many government bodies and clinicians have expressed concern about the rising rate of cesarean delivery. The study aims to assess the trend in cesarean delivery rate and the type of cesarean delivery at five-year intervals during the study period.

### Methods

This descriptive cross-sectional study was conducted at TU Teaching Hospital by a chart review of cesarean delivery (CD) during the years 2014, 2019, and 2024 AD. Basic data including age, parity, ethnicity, gestational age, and multiple pregnancy was obtained. The collected data were entered and analyzed in SPSS 26.

### Results

The annual CD rate was 39.0%, 52.7%, and 56.0% among the total livebirth delivery during the years 2014, 2019, and 2024, respectively. The proportion of primary CD increased from 2014 to 2019 but remained static in 2024 (31%, 41%, and 39.4%), however for repeat CD, it increased steadily. Mothers undergoing CD in the age  $\geq 35$  years increased from 106 (6.1%) in 2014 to 241 (13.5%) in 2024. The emergency CD were three times more common than elective CD in all the years interval. The most common indications for the primary and repeat CD were fetal distress and refused trial of labor respectively.

### Conclusion

This study shows an increasing trend in the cesarean delivery rate. Primary CD constituted more than repeat CD, however the rate of increase was more in the repeat than in the primary CD. It is important to reduce primary CD if we want to decrease the overall CD rate.

### Keywords

*Cesarean delivery; primary cesarean delivery; repeat cesarean delivery; trend*

## INTRODUCTION

Cesarean delivery (CD) is typically performed when vaginal birth poses a greater risk to the mother or baby, such as when complications arise during labor in an otherwise planned vaginal delivery or when a condition prevents a vaginal delivery.<sup>1</sup> Although medically indicated cesarean sections (CS) can reduce the risk of maternal and newborn complications or death, there is no proven benefit for women or babies when the procedure is performed without medical necessity. Since 1985, the World Health Organization (WHO) has recommended an optimal CD rate of 10% to 15%.<sup>2</sup>

The nationally representative data on the CD rate from 154 different countries of the world from 1990 to 2018 showed that 21.1% of the women gave birth by CD. Cesarean delivery has risen in all regions since 1990; however, the highest increase is seen in our part of the world, that is, in Eastern and Western Asia, with a 44.9 and 34.7 percentage point increase.<sup>3</sup> Various studies done in India and Nepal have shown a similar rise in CD rate.<sup>4-8</sup> The rates of both primary and repeat cesarean delivery have been on the rise.<sup>9</sup> Understanding these trends is crucial for developing strategies to balance the benefits of cesarean deliveries with the potential risks associated with unnecessary interventions. This increase is attributed to various factors, including fetal distress, previous cesarean deliveries, and non-reassuring cardiotocography.<sup>4</sup>

Globally, as the rate of CD is increasing, there is a need to explore the underlying causes of this rising trend, its patterns, demographics, and its correlation with other associated factors. Thus, this study aims to find out the trend in cesarean delivery at five-year intervals during the years 2014, 2019, and 2024 AD at a tertiary care hospital.

## METHODS

This was a descriptive cross-sectional study, which was carried out in the Department of Obstetrics and Gynecology at Tribhuvan University Teaching Hospital in Kathmandu, to analyze the trend in cesarean delivery. Ethical clearance for the study was obtained from the Institutional Review Board of the Institute of Medicine, Tribhuvan University. The information was obtained from the hospital record/registry book.

All the women who had undergone CD during the year 2014, 2019, and 2024 were taken for the study. Women who were  $\geq 18$  years and had cesarean delivery with live birth at  $\geq 28$  weeks were taken for the study. Records with incomplete or missing information were excluded from the study. Detailed information regarding the patient's demographic profile: age, parity, ethnicity, gestational age, and multiple pregnancy were noted. Also, information regarding the type of CD and indications were noted.

The collected data were entered and analyzed in SPSS (Statistical Programme for Social Sciences) 26. Descriptive statistics were used, and the categorical variables were interpreted by frequencies and percentages.

## RESULTS

During the study period, a total of 4435, 4609, and 3179 live birth deliveries occurred in the year 2014, 2019, and 2024, respectively. The annual CD rate was 39.0% (n=1729), 52.7% (n=2427), and 56.0% (n=1797) in the years 2014, 2019, and 2024, respectively among the total live birth deliveries. The primary CD rates were 31%, 41%, and 39.4%, while those of repeat CD were 8%, 11.7%, and 16.5% during the years 2014, 2019, and 2024, respectively (Figure 1).

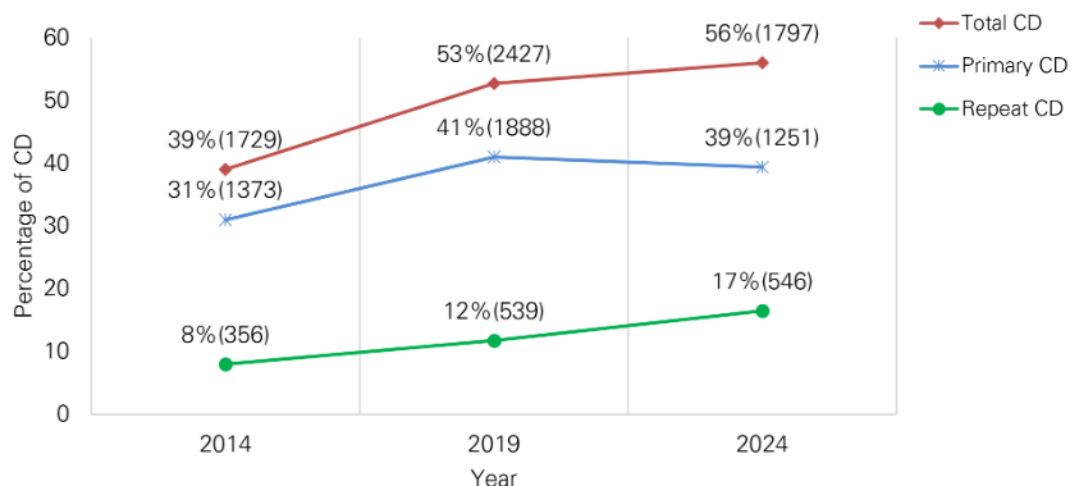


Figure 1. Trend in Cesarean Delivery over the time period

Table 1. Maternal and Obstetrics characteristics

Characteristics		2014 n=1729	2019 n=2427	2024 n=1797
Age (years)	≤ 19	36 (2.1)	40 (1.6)	13 (0.7)
	20-34	1585 (91.7)	2210 (91.1)	1542 (85.8)
	≥35	106 (6.1)	177 (7.3)	241 (13.5)
Ethnicity	Brahmin/Chhetri	977 (56.6)	1372 (56.6)	961 (53.5)
	Janjati	443 (25.6)	357 (14.7)	376 (21.0)
	Newar	207 (12.0)	347 (14.3)	256 (14.3)
	Dalit	48 (2.8)	87 (3.6)	84 (4.5)
	Others	50 (2.9)	335 (13.8)	120 (6.6)
Multipara		666 (38.5)	963 (39.7)	870 (48.4)
Preterm birth		164 (9.5)	281 (11.6)	304 (16.9)
Multiple gestation		38 (2.2)	72 (3.0)	59 (3.3)
Type of CD	Emergency	1362 (78.8)	1859 (76.6)	1416 (78.8)
	Elective	167 (21.2)	568 (23.4)	381 (21.2)

The proportion of mothers undergoing CD in the age group  $\geq 35$  years increased from 106 (6.1%) in the year 2014 to 241 (13.5%) in 2024. Regarding ethnicity, Brahmin/Chhetri were the majority group in all the years. The proportion of preterm birth and multiple gestation group increased in each of the subsequent five-year intervals. The emergency CD were three times more common than elective CD in all the years interval (Table 1).

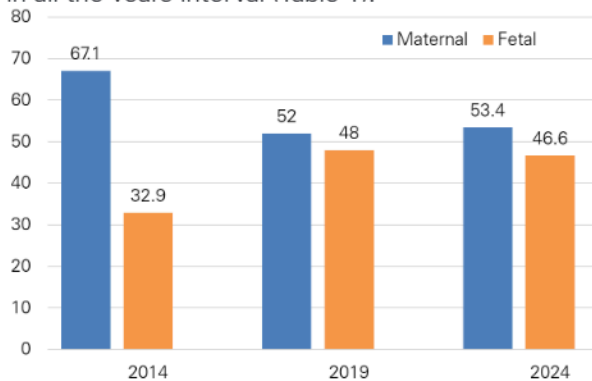


Figure 2. Trend in CD according to maternal and fetal indications

Figure 2 shows the trend in CD according to maternal and fetal indications. The CD for the maternal indications were more than that for the fetal indications in all the years. However, in the year 2014, CD for maternal indications (67.1%) were two times more than for the fetal indications (32.9%).

Fetal distress was the most common indication among the primary CD, however, its highest proportion, 688 (50.1%) was seen in the year 2014.

The second most common indication was labor dystocia in the year 2014 and 2019, but in 2024, it was failed induction. CD for maternal request was present only in 2024, with five cases (Table 2).

Table 3 shows the indications for repeat CD. Refused trial of labor after cesarean (TOLAC) was the most common indication for repeat CD, which constituted more than 50% in all years. The second indication was postdated previous CD in 2014 and 2019; however, it was scar tenderness and a thin scar in 2024.

## DISCUSSION

This research was conducted in the Department of Obstetrics and Gynecology of Tribhuvan University Teaching Hospital. The information was obtained from the hospital record/registry book. All women who had CD during the year 2014, 2019, and 2024 were taken for the study. The rate of cesarean delivery was 39.0%, 52.7%, and 56.0% during the year 2014, 2019, and 2024, respectively according to the findings of the present study, which shows a rising trend in the rate of CD. This is seen in most of the other studies.<sup>4,8</sup>

According to data from India's National Family Health Survey, the overall rate of cesarean sections increased from 16.7% (2,312 out of 13,829 births) in 1998–99 to 21.5% (49,634 out of 230,870 births) in 2019–21.<sup>7</sup> In a study done by Mittal, in Western India, the overall cesarean delivery rate increased from 17.15% in 2001 to 28.93% in 2011.<sup>6</sup> There has been a steady increase over time in the proportion of live birth delivery via cesarean section, this increase

**Table 2.** Indications for primary cesarean delivery over the time period

Indications for primary CD	2014 n=1729	2019 n=2427	2024 n=1797
Fetal distress	688(50.1)	702 (37.2)	520 (41.6)
Labor dystocia	177(12.9)	181(9.6)	104(8.3)
Oligohydramnios	134(9.8)	140(7.4)	80(6.4)
Malpresentation	133(9.7)	117(6.2)	55(4.4)
Failed induction	74(5.4)	164(8.7)	185(14.8)
Antepartum hemorrhage	41(3.0)	49(2.6)	45(3.6)
Bad obstetric history	31(2.3)	21(1.1)	7(0.6)
Severe pre-eclampsia	30(2.2)	16(0.8)	14(1.1)
Heart disease	11(0.8)	28(1.5)	19(1.5)
Subfertility treatment	5(0.4)	20(1.1)	29(2.3)
Maternal request	0	0	5(0.4)

**Table 3.** Indications for repeat cesarean delivery over the time period

Indications for repeat CD	2014 n=1729	2019 n=2427	2024 n=1797
Refused TOLAC	204(57.3)	376(69.8)	307(56.3)
Previous CD-post dated	65(18.3)	46(8.5)	32(5.9)
Fetal distress	33(9.3)	27(5.1)	33(6.1)
Oligohydramnios	20(5.6)	8(1.4)	11(2.0)
Malpresentation	9(2.5)	11(2.0)	14(2.6)
PROM/PPROM	5(1.4)	18(3.4)	14(2.6)
Severe preeclampsia	4(1.1)	3(0.6)	1(0.2)
BOH	4(1.1)	5(0.9)	8(1.4)
Scar tenderness	3(0.8)	18(3.4)	45(8.3)
Thin scar	2(1.1)	8(1.4)	46(8.5)
Antepartum hemorrhage	2(1.1)	3(0.6)	7(1.2)
Short spacing	0	11(2.0)	9(1.6)
Heart disease	0	2(0.3)	4(0.8)

has been from 1% in 1996 to 10% in 2016 and 18% in 2022.<sup>10</sup> In the global scenario the rate of cesarean section has increased significantly from around 7% in 1990 to 21% in 2021.<sup>11</sup> More recent studies done in urban areas show a higher cesarean delivery rate. The other factors which are to be considered is the availability of institutional delivery facilities.

The Nepal Demographic Health Survey reports a significant rise in institutional deliveries, increasing from 8% in 1996 to 79% by 2022.<sup>10</sup> The studies from India and Bangladesh showed higher CD rate among urban, higher educated and wealthier women.<sup>7,12</sup> Deliveries via cesarean section has been seen to increase with increasing wealth, with 6% in the

lowest quintile to 38% in the highest quintile.<sup>10</sup> The rate of CD is varied according to the geographical distribution. In one of the largest maternity hospitals of Nepal, the CD rate was 31.1%, while in the rural hospital from remote Nepal it was only 9.5%.<sup>13,14</sup> The study from Vietnam showed the CD rate of 49.6% which shows that its rate is above the WHO recommendation.<sup>15</sup>

There is an increase in the group of mothers delivering after the age of 35 years which has also led to the increased proportion of older women undergoing CD and the present study shows the same trend. According to the Nepal demographic health survey, among mothers 20 to 34 years the

CD rate was 20.1% while among those more than 35 years it was 22.9%.<sup>10</sup> Prevalence of CD was higher among those who were older than 25 years (70.1%).<sup>7</sup> A retrospective cohort study conducted among women in Ontario found that cesarean section rates rose with increasing maternal age—26.2% for those aged 20 to 34, 35.9% for ages 35 to 40, and 43.1% for women over 40.<sup>16</sup> Other studies also support similar findings.<sup>15,17</sup> In the present study, multiple gestation has increased from 2.2% in 2014 to 3.3% in 2024, which is supported by other studies as well, with twin pregnancy CD increased from 1.4 to 2.6%.<sup>6</sup> The preterm birth by CD has increased from 9.5% to 16.5% from 2014 to 2024 in the present study. This could be due to an increase in early termination of pregnancy for medically indicated conditions. Same trend is seen in other studies.<sup>6</sup> Preterm delivery rate was similar in other studies 15.1%.<sup>17</sup> In line with the findings of the current study, cesarean delivery rates were higher among the Brahmin/Chhetri (22%) and Janajati (21%) ethnic groups compared to the Dalit group, where the rate was 10%.<sup>10</sup> It has been seen that the maternal race and ethnicity have effects on CD rate in the United States as well.<sup>18</sup>

In the present study, emergency CD constitutes three fourth of total CD and the trend remains same through 2014, 2019, and 2024. Similarly, other study shows the same trend. The proportion of emergency CD was more than that of the elective CD, and there was increase in trend in both elective and emergency CD over the period in 2001, 2006, and 2011 respectively.<sup>6</sup> Similarly, various studies from Nepal showed emergency CS accounted for three-quarters or more ranging from 75% to 88% of the total delivery.<sup>8,13,14</sup> On the contrary, according to a large-scale health survey from India during 2019-21, 12.35% were elective CD, whereas 9.15% were emergency CD.<sup>7</sup> However, in most of the studies, the increased burden of CD is mainly due to increase in the emergency CD, thus the focus should be more on the indications of emergency CD, if we want to reduce the rate of CD. In the present study, among the total CD, the primary CD increased from 31% in 2014 to 39.4% in 2024 among the total livebirth, as well as, there is also increase in the repeat CD. The increased rate of primary CD would lead to increase in the repeat CD in future. The primary CD is more than two third in comparison to the repeat CD.<sup>8</sup> A similar trend can be seen in the other study, with increased trend in repeat cesarean delivery over the time period.<sup>6</sup>

In the present study, the most common indication for the primary CD was fetal distress, which contributed to more than a quarter of the indications for CD. Other studies show the similar findings where the majority of the increase was mainly due to an increase in fetal distress, arrest of descent, and fetal indications.<sup>6,17</sup> Previous

studies have shown the most common indication being cephalopelvic disproportion (19.9%) and previous cesarean section (16.5%).<sup>4</sup> Studies have also shown that the most common indication and increase in rate for primary CD was mainly seen for fetal distress, malpresentation and labor dystocia.<sup>6</sup> Other studies have shown CPD an fetal distress as most common indication.<sup>4,18</sup> Previous CD constituted 16.5% and 20%, becoming the second most common indication of total delivery in the other studies done in Nepal.<sup>4,13</sup>

In the present study, the most common indication for repeat CD was refused trial of labor (TOLAC) in the years 2014, 2019, and 2024. While, post-dated previous CD was the second most common indication, in 2014, constituting 18.3% in 2014, in 2024, scar tenderness and thin scars were the second most common indication in the present study. In an observational study from India, among the total CD, indications such as scar tenderness/not fit for VBAC constituted 24.7%.<sup>17</sup> Higher trend for an increase in repeat CD over the decade was seen mainly for scar tenderness and refusal of vaginal birth.<sup>6</sup>

Cesarean sections play a crucial role in lowering maternal and neonatal mortality and managing labor-related complications when medically justified. However, performing CS without a valid medical reason can expose women to both immediate and long-term health risks. The WHO emphasizes that CD should be reserved for medically necessary cases and does not endorse a universal target rate for countries.<sup>2</sup> Notably, 15% of births in public healthcare facilities were conducted via CS, compared to a significantly higher rate of 51% in private healthcare settings.<sup>10</sup>

A qualitative study conducted in Indonesia explored the factors influencing women's choice of delivery method. While the majority of women expressed a preference for vaginal birth, many were influenced by the advertisements promoting Enhanced Recovery After Cesarean Section (ERACS) as an advanced technique. These advertisements portrayed CS as a more comfortable, painless, and quicker recovery option, leading some women to view cesarean delivery as equal to—or even better than—vaginal birth.<sup>19</sup> To a large extent, the rise in CD can be attributed to procedures performed without clear medical indications. This trend is often driven by maternal requests and, in many cases, by physicians' preferences or convenience. Contributing factors may include financial incentives, as cesarean deliveries often bring higher reimbursement compared to vaginal births.<sup>11</sup>

In modern obstetrics, the rate of CD has increased drastically globally such that government bodies and clinicians have expressed concerns about this rising rate. CD serves as a critical surgical intervention

in cases of pregnancy or labor complications, potentially saving lives. However, it also carries inherent risks and can pose serious threats to both maternal and neonatal health. Obstetricians still face challenges to reduce the rate of cesarean section.

## CONCLUSION

The rate of cesarean delivery is on the rising trend. Most of the CD are due to emergency causes than elective causes. The rise of the cesarean delivery is seen more in repeat CD than in primary CD. To decrease the rising trend in CD, we need to decrease the conditions leading to emergency CD. It is important to reduce primary CD if we want to decrease the repeat and overall CD rate.

## FINANCIAL SUPPORT

The author(s) did not receive any financial support for the research and/or publication of this article.

## CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

## AUTHOR CONTRIBUTIONS

Study concept and design: NO, BK, SP, RB. Data collection: NO, BK, SP, RB, AG, AS. Analysis and interpretation of data: NO, SP, AG. Drafting of the manuscript: NO, SP, AG. All the authors read and approved the final manuscript.

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