

RESEARCH ARTICLE/ARAŞTIRMA MAKALESİ

TEMPORAL TRENDS IN CESAREAN SECTION INDICATIONS IN A TERTIARY REFERRAL CENTER IN TÜRKİYE: A FIVE-YEAR RETROSPECTIVE STUDY

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ABSTRACT

Aim: The rise in cesarean section (CS) rates has become a significant public health concern around the world. In this study, we aimed to determine the prevalence of cesarean deliveries over five years at a tertiary care center in Turkey and to identify trends and patterns in primary indications. **Material and Methods:** This retrospective, single-center study was conducted at the Department of Obstetrics and Gynecology of a tertiary-level university hospital in Istanbul. The medical records of 18-42-year-old women who gave birth via cesarean section between January 1, 2020, and January 1, 2025, were examined. The demographic characteristics, medical history, and surgical indications were analyzed. **Results:** A total of 12.364 births occurred during the study period, and the overall C-section rate was 51.8% (n=6,400). Previous C-section was the most common indication (56.6%), followed by fetal distress (28.0%). While the repeat cesarean section rate gradually decreased from 2023 to 2025 (from 56.9% to 51.4%), the rate of cesarean sections indicated by fetal distress showed a significant trend of increase, from 24.3% in 2020 to 32.2% in 2025 (p=0.001). The newborn intensive care unit (NICU) admission rate was 19.4%. **Conclusion:** The study primarily identified a high overall cesarean section rate due to repeat cesarean sections and fetal distress. The growing trend in indications for fetal distress and the prevalence of repeat cesarean sections highlight the need for standardized diagnostic criteria regarding fetal risk and the development of strategies to support vaginal birth after cesarean (VBAC) in eligible patients.

Keywords: cesarean section; fetal distress; vaginal birth after cesarean; tertiary care centers

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INTRODUCTION

Cesarean delivery, when performed for appropriate medical indications, has been shown to significantly reduce maternal and neonatal morbidity and mortality, particularly in situations where vaginal delivery may pose a risk to the health of the mother and/or infant; however, given the potential complications associated with the procedure, a thorough medical evaluation is essential before each cesarean delivery (1).

Cesarean section (CS) is among the most commonly performed operations across the globe, and rates of cesarean delivery have increased significantly over the past few decades. Compared to vaginal delivery, this trend has raised some concerns among obstetricians and public health officials due to the economic burden it imposes and the potential short- and long-term risks it poses to maternal health (2,3). In countries with high incomes, this increase is mainly related to advances in fetal monitoring, the improved detection of fetal distress through continuous monitoring, and rising rates of malpresentation (4). The increasing rates of cesarean sections in low- and middle-income countries seem to be the result of a complex mix of medical, institutional, and sociocultural factors, including how the health care system operates, medical and legal issues, and patient preferences (3,5).

Cesarean section is a major surgical procedure associated with many potential complications, such as bleeding, infection, thromboembolic events, and adverse outcomes in subsequent pregnancies (4,6). Therefore, careful medical evaluation is recommended before each procedure, and it should be performed only when appropriate indications are determined (6).

According to the World Health Organization (WHO), a cesarean section rate of 10-15% in the population is correlated with a decline in maternal and newborn mortality rates. Beyond this threshold, further increases in cesarean section rates have not been shown to confer additional survival benefits. Furthermore, in the absence of clear medical indications, there is no evidence that cesarean sections improve maternal or neonatal outcomes (7,8). Since 1985, cesarean section rates have increased several-fold in many countries worldwide, reflecting dramatic changes in obstetric practice (2,3). There are many reasons for these remarkable increases, including both medical and extra-medical factors (7-9).

There are three main reasons for a C-section: issues with the mother (e.g., pelvic deformities), uterine/anatomical issues (e.g., placenta previa), and issues with the fetus (e.g., macrosomia) (10). However, not all cesarean deliveries are currently performed for medical reasons, and the proportion of procedures conducted without a clear obstetric indication continues to rise. Non-medical reasons for cesarean delivery include fear of childbirth, desire for delivery on a specific

date, the doctor's preference or convenience, maternal request, and psychological trauma related to previous births (7,9).

Despite the extensive body of literature addressing cesarean delivery rates, data on institutional trends and indication patterns remain limited, particularly in tertiary care centers that manage high-risk pregnancies (2).

To understand local cesarean section patterns, determine factors that may be modifiable, and develop strategies to optimize obstetric care is critically important. Evidence on trends in cesarean section indications over time at major tertiary referral centers in Turkey continues to be limited. Therefore, this study aimed to determine the prevalence of cesarean deliveries over 5 years at a tertiary care center and to analyze the most common indications.

MATERIALS AND METHODS

Study Design and Setting

This study was designed and reported in accordance with the STROBE Statement. It was conducted as a single-center, retrospective descriptive study at the Department of Obstetrics and Gynecology of a tertiary care university hospital in Istanbul, Türkiye, which provides care for both low- and high-risk pregnancies.

Study Population and Sampling Strategy

The study population consisted of women who delivered by cesarean section between January 1, 2020, and January 1, 2025. During the study period, a total of 12,364 deliveries occurred, of which 6,400 were cesarean sections. All women aged 18–42 years who underwent cesarean delivery within the defined period and had complete medical records were included. A total of 78 cases were excluded due to not meeting the inclusion criteria and/or having incomplete data. After excluding 78 cases, 6,322 women were included in the final analysis.

Data Collection and Variables

Data were retrospectively obtained from the hospital's Electronic Health Record (EHR) system. The following variables were recorded: maternal age, body mass index (BMI), gravidity and parity, type of previous delivery, gestational age at delivery, onset of labor (spontaneous, induced, or pre-labor cesarean), fetal presentation, number of fetuses, year of delivery, and indication for cesarean section. For multiple pregnancies, neonatal outcomes were recorded for

the first-born neonate only, thereby maintaining one neonatal observation per maternal cesarean delivery. All data were anonymized before analysis.

Definition of Exposure and Outcome Measures

Cesarean section indications were identified based on the International Classification of Diseases, 10th Revision (ICD-10) diagnostic codes and operative notes recorded in the EHR system.

Outcome Definitions

When more than one indication was documented, the primary indication was defined as the main reason for surgery as stated by the responsible obstetrician in the operative record. Each cesarean delivery was assigned to only one primary indication. Indications were categorized as maternal, uterine/anatomical, and fetal.

Handling of Missing Data

Cases with incomplete or missing data (n=78) were excluded from the study.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were reported as the mean $\pm$ standard deviation or the median (minimum–maximum), according to the situation. The categorical variables were expressed as frequencies and percentages. Differences between categorical variables were assessed using the Pearson chi-square test or the Fisher–Freeman–Halton exact test, depending on which was applicable. Results with a p-value < 0.05 were determined to be statistically significant.

Ethical Considerations

Ethical approval was received from the Ethics Committee of the University of Health Sciences, İstanbul Şişli Hamidiye Etfal Training and Research Hospital (Approval No: 5163; Date: November 11, 2025).

RESULTS

Study Population and Baseline Characteristics

A total of 6.322 female participants were found to meet the study criteria and were enrolled in the final analysis. The women's ages ranged from 18 to 42, with a mean age of 30.79 ± 5.72 . Gravidity ranged from 1 to 7 (mean: 2.79 ± 1.53), and parity ranged from 0 to 9 (mean: 1.55 ± 1.35). In terms of gravidity distribution, the majority of cases consisted of gravida 1 (28.1%), with gravida 2 (18.8%), gravida 3 (18.6%), gravida 4 (22.1%), and gravida 5 or higher (12.5%) following. Women who had never given birth constituted 28.7% of our study population. In 59.1% of cases, there was a history of cesarean section, while in 40.9% of cases, it was performed for the first time. Of the cesarean sections, 60.5% were performed as emergency procedures, and 39.5% were scheduled operations. (Table 1).

Table 1. Sociodemographic and obstetric characteristics of women undergoing cesarean delivery in a tertiary care center in Istanbul, Türkiye, between 2020 and 2025 (N=6.322)

		n (%)
Age (years)	<i>Mean $\pm$ SD</i>	30.79 $\pm$ 5.72
	<i>Median (Min-Max)</i>	31 (18-42)
Gravida	<i>Mean $\pm$ SD</i>	2.79 $\pm$ 1.53
	<i>Median (Min-Max)</i>	3 (1-7)
	1 gravida	1775 (28.1)
	2 gravida	1189 (18.8)
	3 gravida	1174 (18.6)
	4 gravida	1395 (22.1)
	≥ 5 gravida	789 (12.5)
Parity	<i>Mean $\pm$ SD</i>	1.55 $\pm$ 1.35
	<i>Median (Min-Max)</i>	1 (0-9)
	Nulliparous	1817 (28.7)
	1 parity	1530 (24.2)
	2 parity	1360 (21.5)
	3 parity	979 (15.5)
	4 parity	555 (8.8)
Number of previous cesarean sections (CS)	≥ 5 parity	81 (1.3)
	None	2576 (40.7)
	1 CS	1623 (25.7)
	2 CS	1831 (29)
	3 CS	286 (4.5)
	4 CS	6 (0.1)
CS status	Primary CS	2583 (40.9)
	Previous CS	3739 (59.1)
CS type	Emergency	3826 (60.5)
	Scheduled	2496 (39.5)

SD: Standard deviation, Min-Max.: Minimum–maximum, n: Number of participants, $p < 0.05$. It was considered statistically significant

Clinical Profile and Cesarean Indications

The most common indication for cesarean section was previous cesarean delivery (56.6%), followed by fetal distress (28.0%). Other indications included twin pregnancy (5.7%), breech presentation (3.3%), cephalopelvic disproportion (1.2%), failure to progress (1.2%), and macrosomia (0.7%). Less frequent indications included placental abruption (0.5%), preeclampsia (0.5%), transverse lie (0.2%), placenta previa (0.1%), and cord prolapse (Table 2).

Table 2. Distribution of indications for cesarean section among women delivering at a tertiary care center in Istanbul, Türkiye, between 2020 and 2025 (N=6.322)

CS Indications	n (%)
Previous CS	3577 (56.6)
Breech presentation	211 (3.3)
Failure to progress	78 (1.2)
Fetal distress	1771 (28.0)
Twin	361 (5.7)
Transverse	11 (0.2)
Placental abruption	33 (0.5)
Placenta previa	5 (0.1)
Cord prolapse	3 (0)
Preeclampsia	29 (0.5)
Cephalopelvic disproportion (CPD)	75 (1.2)
Macrosomia	44 (0.7)
Other	124 (2)

SD: Standard deviation, Min-Max.: Minimum–maximum, n: Number of participants, $p < 0.05$. It was considered statistically significant.

Obstetric and Delivery Characteristics

The mean gestational age at delivery was 37.31 ± 2.76 weeks. Regarding fetal presentation, 93.1% were cephalic, 5.7% breech, and 1.2% transverse or oblique. Most pregnancies were singleton (94.3%), while 5.5% were twin and 0.2% were triplet pregnancies. Labor began spontaneously in 55.4% of cases, was induced in 7.8%, and 36.8% underwent cesarean section before labor onset (Table 3).

Table 3. Obstetric and delivery characteristics of cesarean cases in a tertiary care center in Istanbul, Türkiye, between 2020 and 2025 (N=6.322)

		n (%)
Gestational age (weeks)	Mean $\pm$ SD	37.31 $\pm$ 2.76
	Median (Min-Max)	38 (24-41)
Birth year	2020	893 (14.1)
	2021	1135 (18)
	2022	1108 (17.5)
	2023	1119 (17.7)
	2024	1074 (17)

	2025	993 (15.7)
Fetal presentation	Cephalic	5885 (93.1)
	Breech	360 (5.7)
	Transverse/Oblique	77 (1.2)
Number of fetuses	Singleton	5962 (94.3)
	Twins	349 (5.5)
	Triplets	11 (0.2)
Onset of labor	Spontaneous	3502 (55.4)
	Induced	496 (7.8)
	CS before the onset of labor	2324 (36.8)

SD: Standard deviation, Min-Max.: Minimum–maximum, n: Number of participants, $p < 0.05$. It was considered statistically significant

Neonatal Outcomes

The mean 1-minute APGAR score was 6.85 ± 0.84 , and the mean 5-minute APGAR score was 8.57 ± 0.78 . The live birth rate was 99.7%, while the stillbirth rate was 0.3%. The mean birth weight was 3068.40 ± 667.53 grams. Approximately 19.4% neonates required admission to the neonatal intensive care unit (Table 4).

Table 4. Neonatal outcomes following cesarean delivery in a tertiary care center in Istanbul, Türkiye, between 2020 and 2025 (N=6.322)

		n (%)
Sex	Male	2764 (43.7)
	Female	3558 (56.3)
APGAR 1st minute	Mean $\pm$ SD	6.85 $\pm$ 0.84
	Median (Min-Max)	7 (0-9)
APGAR 5th minute	Mean $\pm$ SD	8.57 $\pm$ 0.78
	Median (Min-Max)	9 (0-10)
Survival	Live Birth	6306 (99.7)
	Stillbirth	16 (0.3)
Birth weight	Mean $\pm$ SD	3068.40 $\pm$ 667.53
	Median (Min-Max)	3140 (510-5380)
NICU admission	Yes	1224 (19.4)
	No	5098 (80.6)

SD: Standard deviation, Min-Max.: Minimum–maximum, n: Number of participants

Temporal Trends in Cesarean Indications

The distribution of indications for cesarean section showed a statistically significant difference throughout the years ($p < 0.01$). While previous cesarean sections remained the most common indication during the study period, their rate gradually decreased between 2023 and 2025. Fetal distress, on the other hand, showed an increasing trend over time, rising from 2020 to 2025. Other indications remained relatively stable across the study period (Table 5).

Table 5. Yearly distribution of cesarean section indications in a tertiary care center in Istanbul, Türkiye, from 2020 to 2025 (N=6.322)

Birth Year	p
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CS Indications	2020	2021	2022	2023	2024	2025	
Previous CS	539 (60.4)	659 (58.1)	678 (61.2)	637 (56.9)	554 (51.6)	510 (51.4)	0.001**
Breech	43 (4.8)	31 (2.7)	39 (3.5)	49 (4.4)	25 (2.3)	24 (2.4)	
Failure to progress	7 (0.8)	3 (0.3)	12 (1.1)	23 (2.1)	24 (2.2)	9 (0.9)	
Fetal distress	217 (24.3)	303 (26.7)	284(25.6)	297 (26.5)	350 (32.6)	320 (32.2)	
Twin	44 (4.9)	87 (7.7)	64(5.8)	63 (5.6)	61 (5.7)	42 (4.2)	
Transverse	1 (0.1)	3 (0.3)	1 (0.1)	0 (0)	3 (0.3)	3 (0.3)	
Placental abruption	6 (0.7)	8 (0.7)	4 (0.4)	2 (0.2)	3 (0.3)	10 (1)	
Placenta previa	0 (0)	0 (0)	1 (0.1)	0 (0)	2 (0.2)	2 (0.2)	
Cord prolapse	0 (0)	2 (0.2)	0 (0)	0 (0)	1 (0.1)	0 (0)	
Preeclampsia	1 (0.1)	3 (0.3)	2 (0.2)	5 (0.4)	7 (0.7)	11 (1.1)	
Cephalopelvic disproportion (CPD)	16 (1.8)	18 (1.6)	7 (0.6)	5 (0.4)	15 (1.4)	14 (1.4)	
Macrosomia	9 (1)	5 (0.4)	2 (0.2)	8 (0.7)	11 (1)	9 (0.9)	
Other	10 (1.1)	13 (1.1)	14 (1.3)	30 (2.7)	18 (1.7)	39 (3.9)	

Fisher Freeman halton exact test **p<0.01 SD: Standard deviation, Min-Max.: Minimum–maximum, n: Number of participants

DISCUSSION

This retrospective, single-center study aimed to examine indications for cesarean section over five years and to identify temporal trends. A total of 12,364 births were recorded during the study period; of these, 6,400 (51.8%) were cesarean sections and 5,964 (48.2%) were vaginal births. The primary cesarean section ratio was 40.%. Overall, cesarean section rates are similar to those reported in previous studies from Turkey, including a four-year study involving 68,944 women that reported a cesarean section rate of 55.0% and a first-time cesarean section rate of 24.1% (11). In another study by Bulut and colleagues examining births that occurred between 2018 and 2020, the cesarean section rate was reported as 34.89%; a history of previous cesarean section was reported as the most common indication, while fetal distress was noted as the most common cause of primary cesarean sections (12).

A cohort study using 2017 data from the Turkish Ministry of Health reviewed 1.266.300 women across 1.503 healthcare facilities (879 public, 557 private, and 67 university hospitals). Overall, the cesarean section rate was stated as 51.2%, and there were significant differences by hospital type, with public hospitals showing the lowest rate (39.7%). In comparison, private hospitals (70.6%) and university hospitals (70.3%) reported higher rates (13). These findings are in line with our results, which suggest that the rate of cesarean deliveries in Turkey is high.

Indications for cesarean section can be classified as emergency or elective. The mother's request and certain physicians' preferences are considered elective indications. While the health

of the fetus is the primary factor in preferring cesarean delivery, defensive medical practices aimed at preventing potential malpractice lawsuits also influence clinical decisions (12). In a review by Court and colleagues, it was estimated that cesarean deliveries without medical indication occurred in 0.3% to 14% of cases (14). In our study, a previous cesarean section was the most common indication (56.6%); this was followed by fetal distress (28%). Among other fetal indications were multiple pregnancy (5.8%), fetal malposition (3.5%), and macrosomia (0.7%). Studies in Poland (2020–2022) and India (2016–2020) have shown similar trends and highlight both global similarities and regional differences in cesarean section indications (15,16).

The higher rate of repeat cesarean sections underscores the need to concentrate on strategies aimed at reducing the rate of primary cesarean sections. In particular, standardizing diagnostic criteria for indications such as fetal distress can contribute to preventing unnecessary surgical interventions and adverse outcomes for mothers and newborns. In our study, 19.4% of newborns had to be admitted to the neonatal intensive care unit (NICU). Worldwide, NICU admission rates following cesarean section vary: in Ghana, the rate is 41% (17), approximately 30% in Jordan (18), 9.1% in Pakistan (19), and 21.8% at 37 weeks in Ireland, decreasing to 10% at 39 weeks (20). These differences reflect variations in local NICU admission criteria, the level of care, the presence of intermediate care units, patient population characteristics, and hospital protocols. The relatively high rate of admission to the NICU observed in our cohort may also be linked to our institution's status as a tertiary referral center that receives a significant proportion of high-risk pregnancies.

In our study, previous cesarean history remained the most common indication across all years, reflecting the persistence of high cesarean rates in Türkiye and globally (2). The gradual decline in the rate of repeat cesarean deliveries observed as an indication may reflect ongoing clinical approaches aimed at reducing the number of these procedures (21). However, an increased number of cases of fetal distress was observed as an indication during the study period. That increase may be related to the use of electronic fetal monitoring, differences in the interpretation of fetal heart rate tracings, and medical-legal concerns that influence the clinical decision-making process (22,23). Cesarean section rates have increased dramatically in recent years. Even though cesarean sections are beneficial for maternal and neonatal health with medical indications, this increase is leading to a socioeconomic strain on a global scale. The expansion of midwife-led birth care, the standardization of decision-making processes, the strengthening of medical and legal protections, and the improved provision of prenatal counseling are among the strategies that can help reduce unnecessary cesarean sections and related complications.

Strengths and Limitations

There are some limitations in this study. Maternal health status, medical protocols, and physicians' practices are factors that may influence cesarean section rates; however, these factors were not fully examined in this analysis. A major strength is that the hospital follows strict protocols for data entry, ensuring that birth reports are recorded in detail in the electronic system, resulting in a low proportion of missing data and high data completeness. The main limitation is that the study was conducted retrospectively. Future research could investigate the impact of hospital policies, the implementation of VBAC programs, staff training, and patient education on cesarean rates, as well as evaluate interventions aimed at reducing unnecessary cesarean deliveries in specific populations.

CONCLUSION AND RECOMMENDATIONS

In this five-year retrospective study, a high cesarean section rate of 51.8% was observed at a tertiary referral center; previous cesarean delivery and fetal distress were found to be the leading indications. Despite a gradually decreasing trend in repeat cesarean deliveries over the course of the study, fetal distress has become an increasingly common indication. Strategies to reduce primary cesarean deliveries, support appropriate VBAC practices, and improve the reliability of fetal distress assessment can help lower cesarean rates without compromising maternal or neonatal outcomes.

Abbreviations

APGAR: Appearance, Pulse, Grimace, Activity, Respiration

BMI: Body Mass Index

CPD: Cephalopelvic Disproportion

CS: Cesarean Section

EHR: Electronic Health Record

ICD-10: International Classification of Diseases, 10th Revision

NICU: Neonatal Intensive Care Unit

SD: Standard Deviation

VBAC: Vaginal Birth After Cesarean

WHO: World Health Organization

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Ethical Considerations: This research has been approved by Ethics Committee of the University of Health Sciences, Istanbul Şişli Hamidiye Etfal Training and Research Hospital (Approval No: 5163; Date: November 11, 2025).

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