

ORIGINAL ARTICLE

Once therapeutic turns into elective: a cross-sectional analysis of cesarean section trends in İstanbul's private hospitals

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ABSTRACT

Objective: Türkiye has one of the highest cesarean section (CS) rates among OECD countries, with private hospitals performing the majority of CSs. This study aims to examine trends in mode of delivery and associated factors in two private hospitals in İstanbul between 2015 and 2020.

Methods: In this registry-based cross-sectional study, data from 11,885 births were analyzed. Hospital 1 operated with a Social Security Institution (SGK) contract, while hospital 2 served only with private financing. Data included delivery type, antenatal visits, maternal age and health insurance. Statistical analyses included chi-square, independent samples t-test, Mann-Whitney U test, Kruskal-Wallis, and Pearson correlation tests ($p < 0.05$).

Results: Overall, 73.7% of deliveries were by CS. The rate declined from 78.9% in 2015 to 69.7% in 2020. CS rates were higher in hospital 1 (77.9%) than in hospital 2. Only 15.5% of CSs were medically indicated. CS was significantly associated with higher maternal age (32.8 vs. 31.7 years; $p < 0.001$). Women who delivered vaginally attended more antenatal visits (10.6 vs. 9.9; $p = 0.001$). The number of antenatal visits declined sharply in 2020 (9.4 vs. 10.2 in 2019).

Conclusion: Despite a modest decline over time, CS rates remained high in both private hospitals studied, particularly in the one contracted with SGK. The findings suggest that demographic, institutional, and healthcare utilization factors influence CS practices. Further research is needed to address the low rate of medically indicated CS and inform strategies to promote appropriate use.

Keywords: Maternal health, Cesarean section, Prenatal care, Türkiye

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INTRODUCTION

Cesarean section (CS) is one of the most frequently performed surgical procedures worldwide. While CS is essential in managing obstetric complications such as dystocia, fetal distress, or abnormal presentation, its increasing use without clear medical indications has raised global concern^{1,2}. The World Health Organization (WHO) initially set a 15% threshold as the optimal CS rate³ and later introduced the Robson Classification to standardize monitoring and comparison across health systems^{4,5}.

Low CS rates may indicate limited access to life-saving obstetric care, while excessive rates can signal over-medicalization and expose women and newborns to unnecessary surgical risks, such as infection and hemorrhage^{6,7}.

The rise in primary CS, often in the absence of medical necessity, has been attributed to both healthcare provider practices and maternal preferences^{8,9}. The overuse of CS to a medically unjustifiable extent has been referred to as a “cesarean epidemic”¹⁰. This phenomenon points not only to individual choices or medical recommendations but also to broader systemic issues¹⁰. These include the over-medicalization, rationalization, and standardization of childbirth, processes that reflect what has been described as the “Fordization of childbirth,” where labor and delivery are managed in a routinized, fragmented, and efficiency-driven manner, akin to industrial production¹⁰. From a critical feminist perspective, it has been argued that in patriarchal societies, CS represent a form of control over women’s bodies by a male-dominated medical field, under the guise of science, modernity, capitalist profit, or pronatalist conservatism¹⁰.

According to OECD data, Türkiye has the highest CS rate among OECD countries, with 1,513 per 100,000 live births, and also exhibits the most rapid increase in CS rates^{10,11}. In Türkiye, there has been a dramatic surge in CS rates over the past two decades. In 2020, the cesarean rate reached 57.3%, a sharp rise from

just 7% in 1993^{9,12}. Furthermore, the primary cesarean rate also increased from 24.9% in 2011 to 28.8% in 2020⁹. This rise has been particularly pronounced in the private sector, where 51% of CSs are scheduled before labor onset¹²⁻¹⁴. Notably, İstanbul stands out as the city with the highest proportion of births in the private sector (63%)¹².

This upward trend in cesarean sections coincides with the neoliberal transformation of the Turkish health system, initiated through the Health Transformation Program in 2003¹⁵. Regulatory changes during this period encouraged public sector physicians, including obstetricians and gynecologists, to transition to private hospitals, which also increased in number. Between 2002 and 2017, the number of private hospitals more than doubled, from 271 to 571, while the number of public hospitals rose modestly, from 774 to 879¹⁶. Another major development was the introduction of universal health insurance in 2006, which expanded coverage for most of the population, including maternal and childbirth services¹⁷.

This expansion was facilitated by the public procurement of services from the private sector and regulatory flexibility that permitted additional billing practices in private hospitals¹⁸. These changes attracted both domestic and international investment, fueling the growth of large hospital chains, particularly luxury private hospitals in metropolitan areas¹⁹. Healthcare spending also increased during this period, rising from 5.5% of GDP in 2000 to 6.7% in 2011²⁰.

In 2012, Türkiye implemented a policy to reduce rising CS rates, motivated by concerns over the financial burden on the health system and supported by pronatalist discourse¹⁰. The regulation mandated that CS should be performed only when medically indicated, though maternal anxiety was included as a valid reason¹⁰. Insurance coverage for elective CS was restricted, and physicians were incentivized through performance-based systems rewarding lower CS rates. An electronic registry system was implemented to systematically monitor CS practices

across healthcare institutions in Türkiye. This system includes information such as the Robson Classification, birth records, and obstetric outcomes⁸. Analyses based on this registry show that Robson Group 5 (women with a previous cesarean) constitutes a major portion of all CS deliveries^{8,21}. However, a substantial number of cesarean sections are also performed among women in Robson Groups 1 to 4, who are generally considered eligible for vaginal delivery. These four groups account for 58.4% of all births, and CS rates within them are particularly high in private hospitals. Notably, women in Group 1 (nulliparous, term, cephalic presentation, spontaneous labor) are overrepresented among cesarean deliveries in private settings^{8,21}.

This pattern may reflect institutional preferences and patient expectations shaped by enhanced privacy, pain management, and physician-led delivery models common in private settings¹⁰. Following the 2012 regulation, CS rates have stabilized or declined in public hospitals but continued to rise in the private sector²², echoing global trends seen in highly medicalized and commercialized birth systems such as Brazil's²³. İstanbul, where private sector birth rates are highest, offers a critical site for examining these dynamics.

This study aims to evaluate changes in the distribution of birth types over time in two private hospitals in İstanbul and identify factors associated with CS.

METHODS

This study is a registry-based, retrospective cross-sectional analysis of all deliveries occurring between January 1, 2015 and December 31, 2020, conducted at two private hospitals located on the European side of İstanbul. The study was carried out between March 2021 and August 2023. A key element of this study lies in the differing approaches of the selected private hospitals in serving patients according to their insurance status. One of the hospitals (hospital 1), in line with health reforms enacted post-2003, operates under a contract with the Social Security Institution

(SGK), whereby the costs of deliveries for patients with public insurance are partially covered by SGK and partially met through co-payments, within legally defined limits. In contrast, the second hospital (hospital 2) does not have such an agreement with SGK. Both hospitals are private and belong to the same hospital chain. The study included all deliveries that took place in these hospitals between 2015 and 2020.

Data were collected from electronic patient records of all pregnant women who delivered at these two hospitals. Information included in the statistical analysis is as follows:

- Sociodemographic characteristics of the pregnant women: maternal age, place of residence, marital status
- Health insurance status and financing type: Private financing, SGK (public), and other (the category includes individuals covered by social assistance programs, solidarity funds, charitable donations, institutional discounts (e.g., employees of institutions and their relatives), and foreign nationals insured through their home countries.)
- Type of delivery (vaginal, instrumental vaginal, CS, and CS and an additional procedure)
- Medical indication for CS
- Number of antenatal care (ANC) visits (only hospital visits included)

Since the dataset was derived from patients' hospital records, which also included insurance status, missing data were minimal. Information on the province of residence was available for 11,528 out of 11,885 patients. Although district-level data were missing for a small number of individuals, this did not impact the analysis, as place of residence was evaluated based on whether patients lived within or outside İstanbul. Patients without valid residence data were excluded from the bivariate analyses involving this variable.

Descriptive statistics of the numeric variables (age, antenatal care) were expressed as the mean, standard

deviation, median and range. Categorical parameters (hospital, year of delivery, type of delivery, health insurance status) were represented with frequency and percentage values. Data normality was assessed using the Kolmogorov-Smirnov test. For comparisons between two independent groups, the independent samples t-test was used when variables were normally distributed, while the Mann-Whitney U test was applied for non-normally distributed variables. For comparisons involving more than two independent groups, the Kruskal-Wallis test was employed. Categorical parameters were analyzed using the chi-square test. Pearson correlation coefficient was used to evaluate the association between continuous variables. We have represented the time-dependent variables' longitudinal trend with line charts for percentage values of categorical variables. A p value less than 0.05 was considered statistically significant. R programming language (Version 4.1.0) was used for all statistical analyses.

Ethical considerations

This research protocol has been approved by Acıbadem University Medical Research Ethics

Commission on June 26th, 2020 (decree no: ATADEK-2020/13). Institutional permissions were obtained from both hospitals prior to data collection.

RESULTS

During a six-year period, 11,885 pregnant women delivered in both hospitals. The mean maternal age was 32.5 years (standard deviation: 4.6), the majority of women were married (96.1%) and 96.0% of all births were among women residing in Istanbul. In this period, 73.7% of all births were through cesarean section. The rate of cesarean births among all births in 2015 was 78.8%; however, it decreased steadily over the years and regressed to 69.7% in 2020. While 46.9% of the total births took place in hospital no. 1, the CS rate throughout the six-year time span was higher in hospital no. 1 (81.2%) compared to hospital no. 2 (67.0%). Between 2015 and 2020, the CS rate declined relatively by 6.0% in hospital no. 1, 14.0% in hospital no. 2, and 11.5% overall, based on the proportionate change from 2015 rates (Table 1; Figure 1). Differences in maternal and birth characteristics between the two hospitals are summarized in Table 2.

Table 1. Annual distribution of deliveries by hospital and mode of birth (2015-2020)

	Hospital 1			Hospital 2			Overall		
Year	C/S n (%)	Vaginal n (%)	Total n (%)	C/S n (%)	Vaginal n (%)	Total n (%)	C/S n (%)	Vaginal n (%)	Total n (%)
2015	979 (82.9)	201 (17.0)	1,180 (100.0)	745 (74.0)	261 (25.9)	1,006 (100.0)	1,724 (78.8)	462 (21.1)	2,186 (100.0)
2016	907 (83.3)	181 (16.6)	1,088 (100.0)	751 (70.1)	319 (29.8)	1,070 (100.0)	1,658 (76.8)	500 (23.1)	2,158 (100.0)
2017	749 (81.4)	171 (18.5)	920 (100.0)	703 (65.9)	363 (34.0)	1,066 (100.0)	1,452 (73.1)	534 (26.8)	1,986 (100.0)
2018	671 (80.2)	165 (19.7)	836 (100.0)	686 (65.7)	358 (34.2)	1,044 (100.0)	1,357 (72.1)	523 (27.8)	1,880 (100.0)
2019	586 (80.1)	145 (19.8)	731 (100.0)	630 (62.9)	371 (37.0)	1,001 (100.0)	1,216 (70.2)	516 (29.7)	1,732 (100.0)
2020	641 (77.9)	181 (22.0)	822 (100.0)	714 (63.6)	407 (36.3)	1,121 (100.0)	1,355 (69.7)	588 (30.2)	1,943 (100.0)

Table 1. Continued.

	Hospital 1			Hospital 2			Overall		
Year	C/S n (%)	Vaginal n (%)	Total n (%)	C/S n (%)	Vaginal n (%)	Total n (%)	C/S n (%)	Vaginal n (%)	Total n (%)
Change % from 2015 to 2020*	-6.0	+29.4		-14.0	+40.1		-11.5	+43.1	
Total	4,533 (81.2)	1,044 (18.7)	5,577 (100)	4,229 (67.0)	2,079 (32.9)	6,308 (100.0)	8,762 (73.7)	3,123 (26.2)	11,885 (100.0)

*These values represent relative percentage changes based on the initial rate in 2015

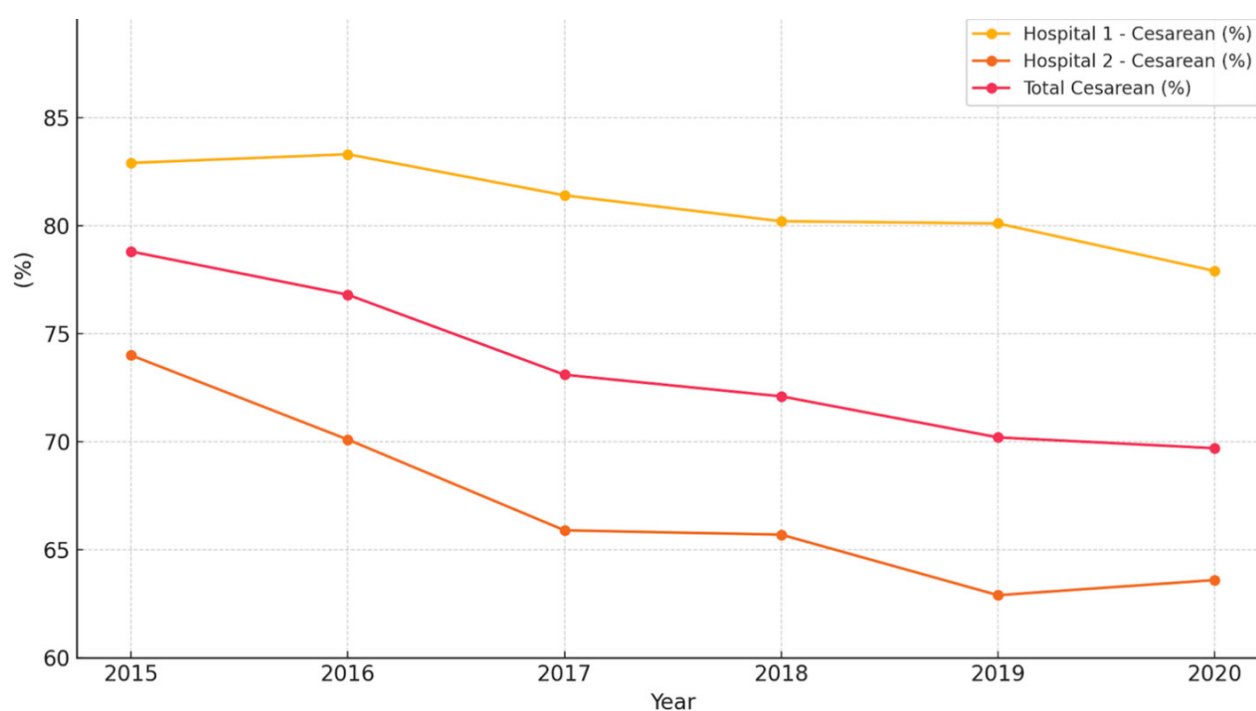


Figure 1. Trends in cesarean section rates by hospital, 2015-2020

Table 2. Comparison of maternal and birth characteristics by hospital

Variable	Hospital 1 (mean ± SD / %)	Hospital 2 (mean ± SD / %)	Total (mean ± SD / %)	Test statistics	p-value
Maternal age (years)	31.7±6.6 Mean rank: 5368.2	33.1±4.4 Mean rank: 6450.3	32.5±4.5	Mann-Whitney U Z=-17.1	<0.001
Marital status: married (%)	96.7 (N=5391)	95.7 (N=6034)	96.1 (N=11425)	Pearson chi- square $\chi^2=8.0$	0.004
Antenatal visits (n)	9.7±6.2 Mean rank: 5768.4	10.3±6.03 Mean rank: 6096.4	10.0±6.1	Mann-Whitney U test Z=-5.2	<0.001
Residing out of İstanbul (%)	3.6 (N=193)	4.1 (N=264)	4.0 (N= 457)	Pearson chi- square $\chi^2=4.0$	0.043
SD: Standard deviation					

Women visited hospitals for ANC 10.8 times on average throughout their pregnancy (Table 2). This number is higher for those pregnant women who delivered vaginally (10.5±5.8) compared to those who delivered with CS (9.9±6.2), and the difference is statistically significant (p=0.001) (Table 4).

There was also a statistically significant difference (p=0.001) between patients visiting for ANC outside of Istanbul (7.8±5.6) and those who reside in Istanbul (10.2±6.2). The year 2020 is a unique year due to

the COVID-19 pandemic. Hospital visits for ANC in 2020 significantly decreased in comparison to previous years (Table 3).

Over the six-year period, births covered by SGK increased from 15.1% in 2015 to 25.3% in 2020, while those covered by private financing declined from 72.9% to 57.8%. Coverage under other insurance types also increased slightly from 11.9% to 16.9% (Figure 2). These trends were statistically significant (p=0.001).

Table 3. Number of hospital visits for antenatal care

Year	Mean ± SD	Median (min-max)	Statistics
2015	9.9±6.5	10 [1-31]	KW=134,880 p<0.001
2016	10.2±6.2	11 [1-31]	
2017	10.3±6.1	11 [1-39]	
2018	10.8±5.8	11 [1-33]	
2019	10.7±6.3	11 [1-38]	
2020	8.8±5.8	9 [1-36]	
SD: Standard deviation, min: Minimum, max: Maximum			

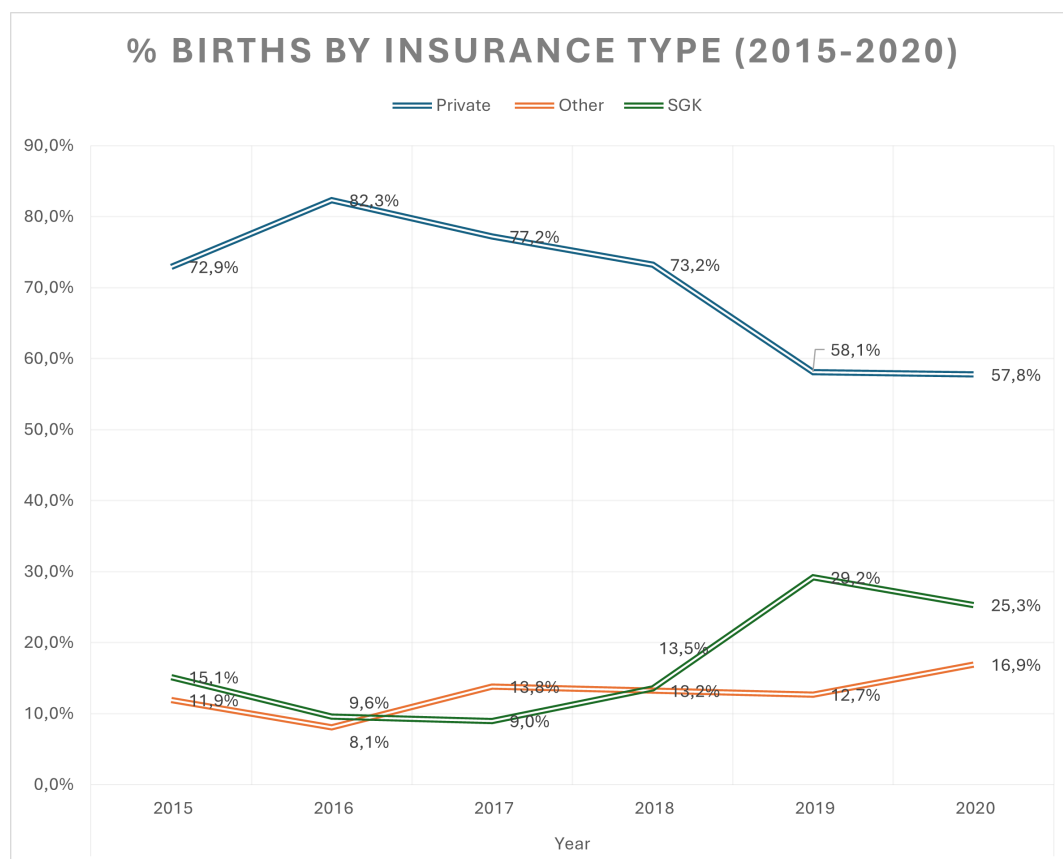


Figure 2. Percentage of births by health financing type (2015-2020)

As maternal age at childbirth increases, women are more likely to undergo CS (age: 32.78 ± 4.69) than those who did not (age: 31.7 ± 4.03) ($p < 0.001$) (Table 4). This is also the case for women who use assisted

reproductive techniques. Again, the number of visits for antenatal care ANC has a high positive correlation with the average age of the pregnant woman (Pearson correlation coefficient $r = 79.1\%$ / $p = 0.043$).

Table 4. Comparison of maternal and institutional characteristics by mode of delivery

Variable	Normal delivery (mean ± SD / %)			Cesarean delivery (mean ± SD / %)			p-value
Maternal age (years)	31.7±4.0 Mean rank: 5392.0			32.7±4.6 Mean rank: 6138.7			<0.001
	Hospital 1	Hospital 2	p<0.001	Hospital 1	Hospital 2	p<0.001	
	30.7±4.2	32.2±3.8		31.9±4.6	33.6±4.6		
Marital status: married (%)	95.2 (N=2974)			96.5 (N=8451)			0.002
	Hospital 1	Hospital 2	p=0.498	Hospital 1	Hospital 2	p=0.016	
	95.6 (N=998)	95.0 (N=1,976)		96.9 (N=4,393)	96.0 (N=4,057)		

Table 4. Continued

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Variable	Normal delivery (mean ± SD / %)			Cesarean delivery (mean ± SD / %)			p-value
Antenatal visits (n)	10.5±5.8 Mean rank: 6222.3			9.9±6.2 Mean rank: 5842.7			<0.001
	Hospital 1	Hospital 2	p<0.001	Hospital 1	Hospital 2	p=0.079	
	9.6±6.3	11.0±5.5		9.7±6.2	10.0±6.2		
Residence outside İstanbul (%)	3.4 (N=104)			4.2 (N=353)			0.082
	Hospital 1	Hospital 2	p=0.047	Hospital 1	Hospital 2	p= 0.120	
	2.5 (N=25)	3.9 (N=79)		3.8 (N=165)	4.4 (N=181)		
SGK-insured births (%)	21.7 (N=678)			38.8 (N=3400)			<0.001
Hospital 1 (%)	33.4 (N=1044)			51.7 (N=4533)			<0.001
Hospital 2 (%)	66.6 (N=2079)			58.3 (N=4229)			
SD: Standard deviation							

Out of 2,419 CSs performed, 14.8% were due to medical indications in hospital no. 1. This rate is 16.5% for hospital no. 2. Overall, it was 15.5%. Major medical indications for CS included fetal distress, multiple gestation, fetal mal-presentation, obstructed labor, cephalo-pelvic disproportion, pelvic and perineal pain, early membrane rupture, and prior cesarean sections.

The investigation of the six-year data of the two hospitals revealed that the distribution of cesarean deliveries per doctor was not even throughout the six years. A balanced distribution in performing cesarean births was found among the obstetrician/gynecologists in one hospital; however, this was not the case in the other hospital.

DISCUSSION

This study examined 11,885 deliveries at two private hospitals in İstanbul over a six-year period (2015-2020), revealing a persistently high CS rate of 73.7%, with only a modest decline observed from 2015 to 2020. Notably, hospital 1 (contracted with SGK) had a significantly higher CS rate than hospital 2. Only 15.5% of all CSs were performed for documented medical indications. Maternal age

and type of insurance were significantly associated with CS. Moreover, ANC utilization patterns showed an inverse relationship with CS. These findings point to the complex interplay between institutional, demographic, and service-related factors in shaping delivery practices.

Maternal age

A higher rate of cesarean delivery was observed among women of advanced maternal age in line with earlier research^{24,25}.

Antenatal care use

The women in this study attended an average of 10.1 ANC visits, more than twice the national average of 4.7 for pregnant women in Türkiye²⁶. This figure reflects the intensified follow-up often seen in private healthcare settings. Notably, ANC visits declined substantially in 2020, likely due to the COVID-19 pandemic. Contrary to the literature suggesting a positive association between frequent ANC and higher cesarean rates^{27,28}, women who delivered vaginally in our sample had significantly more visits than those who delivered via CS. This inverse trend warrants further investigation. One

possible explanation may be that increased contact with healthcare professionals, especially midwives, could encourage confidence in vaginal delivery and provide support to manage childbirth-related anxiety which affects 21% of healthy pregnant women in Türkiye^{28,29}. However, our dataset does not include information on the timing or content of ANC visits, which limits the scope of interpretation.

Topçu's¹⁵ analysis of birth practices in Türkiye provides a relevant sociological lens. She argues that vaginal births, much like cesareans, have become increasingly medicalized-routinized through interventions such as continuous monitoring, oxytocin induction, and episiotomy. This medicalization may account, in part, for the higher ANC utilization among women who delivered vaginally, reflecting both increased surveillance and clinical standardization. Moreover, concerns around medico-legal risk may shape provider behavior during antenatal care, particularly in private institutions.

Insurance type and hospital choice

The rising global prevalence of cesarean sections has been linked to socioeconomic and cultural inequalities²⁴. Empirical evidence suggests that CS rates are disproportionately higher among women of advanced maternal age, higher educational attainment, and elevated socioeconomic status, particularly in primiparous women and those covered by social insurance³⁰⁻³². While public health systems remain central to maternity care provision, cesarean deliveries are increasingly concentrated in private sector settings, where higher-income women are more likely to undergo CS³³. Insurance coverage has become a crucial determinant of the delivery mode. It is not merely the presence of insurance that influences the CS rates, but also the kind of insurance plays a decisive role. Studies have shown that individuals with private health insurance are more likely to opt for cesarean deliveries³⁴⁻³⁶. The findings of the present study are consistent with this pattern, revealing a higher proportion of CS among privately financed patients. However, a notable trend was the increasing

number of publicly insured women (SGK) delivering in private hospitals. This mirrors trends observed in Chile, where publicly insured women access private hospitals through co-payment schemes and exhibit even higher CS rates than privately insured counterparts (77.2% vs. 57.3%)²⁵. A similar co-payment mechanism exists in Türkiye, rendering this finding particularly salient in the national context. In Türkiye, SGK co-payment agreements facilitate access to private hospitals for women who would otherwise be limited to delivery method options provided in public services. When coupled with the less stringent implementation of the 2012 national CS-reduction policy in private settings¹⁰, this institutional pathway enables publicly insured women to pursue delivery options, including CS, that may not be equally accessible in public hospitals.

Cesarean preferences, autonomy, and provider influence

Only 15.5% of cesarean deliveries were medically indicated, whereas 73.7% of all births occurred via CS. This discrepancy underscores the predominance of non-clinical drivers in shaping cesarean delivery practices within the studied hospitals. Several studies have shown that fear of childbirth, concerns about pelvic floor trauma, sexual dysfunction, and the perception of vaginal birth as painful or risky contribute to the increasing preference for CS among women³⁷. Cesarean delivery also offers the benefit of scheduling convenience, allowing women, particularly those managing multiple responsibilities, to exert greater control over the timing of birth.

The ability to opt for a CS, when informed and voluntary, can be interpreted as an exercise of reproductive agency, particularly in systems where shared decision-making with healthcare providers is practiced³⁸. Yet, this autonomy narrative is complicated by Türkiye's political climate. The routine practice of performing tubal ligations during a third cesarean has been publicly criticized within conservative discourse, which often frames both CS and abortion as anti-natalist acts¹⁰. In response, feminist movements have

emphasized bodily autonomy, countering with the slogan: “My uterus is my own; I will have an abortion or cesarean if I want.”

Despite the centrality of maternal choice in feminist movement discourse, our findings, along with existing literature, suggest that physician-driven factors play an equally, if not more, substantial role. Panda et al.³⁹ highlight physician-induced demand as a major determinant of elective CS, a finding echoed by our findings showing that certain physicians in one hospital performed significantly more CS than their peers, while a more equitable distribution of cesareans was observed in the other hospital. Although healthcare providers often cite maternal request as the justification for non-medically indicated CS^{8,21}, national studies report that maternal request accounts for only 4-18% of all CS and 14-22% of elective procedures in Türkiye⁴⁰. This gap may reflect a medico-legal climate in which clinicians preemptively comply with perceived patient preferences to avoid litigation risks or complications associated with vaginal delivery^{10,15,21,22}.

Moreover, qualitative interviews with women from lower-income groups reveal a strong preference for private hospital settings, where individual rooms and bodily privacy are prioritized, even when financial access is limited²². Thus, the convergence of institutional incentives (e.g., scheduling efficiency, resource optimization) and women’s demands for control and dignity may reinforce the normalization of non-medically indicated CS in private settings.

Limitations

Potential limitations of this research include the investigation of two hospitals that belong to the same private healthcare group in Istanbul, the only difference being that one is private, and the other has a contract with the SGK. Thus, these rates are not representative of Istanbul. Second, we observed during the research that some medical records were insufficient, and there was not a standard method followed when data were being recorded in both hospitals. Especially for these

kinds of analyses to be more adequate, we emphasize that it is critical to obtain standard, clear, and complete medical data. Diverse analyses could have been made if the medical data were adequate. Due to the nature of the dataset, it was not possible to directly assess the influence of patient preferences or physician guidance on the mode of delivery. Therefore, the mechanisms underlying the high cesarean rates, such as physician-driven decision-making or patient demand, could not be definitively distinguished.

CONCLUSION

This study reveals persistently high CS rates in two private hospitals in Istanbul, with higher rates observed in the hospital contracted with the national Social Security Institution. Although cesarean rates have slightly declined over time, they remain well above WHO recommendations. Maternal age and fewer antenatal visits were associated with cesarean deliveries. Rather than reflecting purely individual preferences, these findings address factors such as institutional arrangements and provider practices shape delivery methods.

Given the study’s focus on two hospitals within a single private healthcare group, these findings should be interpreted with caution and are not generalizable to the entire Turkish health system. Nonetheless, the study contributes to the limited empirical literature on cesarean practices in Türkiye’s private sector and raises important questions about the roles of medical authority, reproductive autonomy, and institutional incentives in shaping childbirth practices.

Efforts to reduce non-medically indicated cesareans should prioritize not only expanding publicly funded maternal healthcare but also ensuring that women can access respectful, informed, and non-coercive care. Strengthening midwife-led and community-based services, alongside broader structural reforms, may help reshape childbirth as a process rooted in dignity and autonomy.

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Conflict of Interest: The authors report no declarations of interest.

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Ethical Declaration: This research protocol has been approved by Acıbadem University Medical Research Ethics Commission on June 26th, 2020 (decree no: ATADEK-2020/13). Permission to use the registry data was obtained from the hospital administrations.

Author Contrubition: Concept: YY, DD, EC, IS, Design: YY, DD, EC, IS, Data collection and entry: YY, DD, EC, IS, Literature search: YY, DD, EC, IS, Writing: YY, DD, EC, IS

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