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Analysis of caesarean section rates according to the Robson classification system and indications for caesarean delivery: experience from a tertiary health centre in Turkey

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Background Globally and in Turkey, caesarean section (CS) rates have risen steadily over recent decades, reflecting changes in clinical practice, maternal preference, medico-legal concerns, and healthcare system dynamics. The Robson Ten-Group Classification System, complemented by analysis of CS indications, provides a standardised and objective framework for identifying modifiable factors contributing to the increasing use of CS. This study aimed to evaluate CS rates in a tertiary healthcare centre in Turkey using the Robson classification in conjunction with specific clinical indications.

Methods This retrospective observational study included all women who delivered at Umraniye Training and Research Hospital, Department of Obstetrics and Gynaecology, between 01 August 2018 and 11 September 2025. Data were obtained from the hospital's electronic birth registry and categorised according to the Robson Ten-Group Classification System and indications for CS.

Results During the study period, 25,767 births were recorded, of which 11,939 (46.4%) were delivered by CS. The most significant contribution to the overall CS rate originated from Robson Group 5 (23.8%), followed by Group 1 (5.2%). The most common indication for CS was previous uterine surgery, including prior CS and/or myomectomy (54.9%), followed by foetal distress (19.1%).

Conclusion The overall CS rate in this study was 46.4%, with Robson Groups 5 and 1 accounting for the majority of procedures (29.0% combined). Previous uterine surgery and foetal distress were the predominant indications.

Keywords Robson Ten-Group classification system, Indications for caesarean delivery, Turkey

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Introduction

Caesarean section (CS) is a surgical procedure involving incisions through the abdominal wall (laparotomy) and uterine wall (hysterotomy) to facilitate foetal delivery. It is primarily indicated when vaginal birth presents increased risk to the mother or fetus, such as in cases of labour dystocia, obstructed labour, abnormal foetal presentation, placental pathology, or a history of prior uterine surgery. Although CS is often a life-saving intervention in high-risk obstetric scenarios, it remains a major operative procedure associated with considerable morbidity, including haemorrhage, infection, thromboembolic events, anaesthetic complications, and prolonged postoperative recovery. Furthermore, CS may have implications for subsequent pregnancies, notably an elevated risk of placenta accreta spectrum disorders and uterine rupture [1].

Globally, including in Turkey, CS rates have increased progressively over recent decades, driven by evolving clinical practices, rising maternal age, patient preferences, medico-legal pressures, and systemic factors within the healthcare infrastructure. While CS plays an indispensable role in managing complex obstetric conditions, its overutilization, particularly in the absence of clear medical indications, has emerged as a significant public health concern. Despite these challenges, CS remains a vital component of modern obstetric care worldwide [2].

The World Health Organization (WHO) has long guided the optimal use of CS. In its 2021 update, the WHO emphasized that CS rates of up to 10% are associated with significant reductions in maternal and neonatal mortality. However, rates above this threshold do not appear to confer additional mortality benefits and may indicate unnecessary surgical intervention [3]. Importantly, the WHO does not endorse a specific target rate for all countries, recognizing that appropriate CS rates may vary depending on population needs and access to healthcare. To improve the monitoring, comparability, and interpretation of CS rates across healthcare systems, the WHO formally endorsed the Robson Ten-Group Classification System in 2015. Originally proposed by Michael Robson in 2001, this framework provides a standardized, reproducible method for evaluating CS practices across diverse clinical contexts [4, 5].The system categorizes all deliveries into ten mutually exclusive and totally inclusive groups defined by six key obstetric parameters: parity, history of previous CS, onset of labour, number of fetuses, gestational age, and fetal presentation. By quantifying each group's relative contribution to the overall CS rate, the Robson system enables identification of the subpopulations driving CS trends and facilitates the development of targeted, evidence-based interventions to optimize obstetric outcomes [3, 5].

In Turkey, the Ministry of Health adopted the Robson 10-Group Classification System in 2012 to better analyse delivery data and address concerns over rising CS rates. Since its implementation, the Robson system has enhanced the monitoring and transparency of national CS trends. It has also supported the development of evidence-based guidelines and informed training programmes and played a central role in public health campaigns aimed at reducing unnecessary CS. Furthermore, the adoption of this classification system has facilitated international comparisons and underscored Turkey's commitment to aligning with global best practices. This study was designed to analyse the CS rates performed in a training band research health centre in Turkey according to the Robson 10-group classification system and CS indications. Contributing to a better understanding of surgical delivery trends in high-capacity hospitals.

Materials and methods

Study design, participants, and data collection

This retrospective observational study included 25,767 consecutive women who delivered at the Department of Obstetrics of Ümraniye Training and Research Hospital over a seven-year period, from 1 august 2018 to 11 September 2025. All women were evaluated for caesarean section indications. Of these, 531 women were excluded from the Robson Ten-Group Classification analysis due to incomplete data ($n = 501$) or uterine rupture ($n = 30$). These cases were not included in the Robson classification because the required Robson-related variables were unavailable in the hospital information system for women with incomplete records and those with uterine rupture.

Data on deliveries were retrieved from hospitals' electronic automation system, which included Robson 10-group classification and patients' obstetrics characteristics including maternal age, parity (nulliparity or multiparity), previous CS, onset of labour, foetal presentation/lie (cephalic, breech, transverse or oblique), number of foetuses (single or multiple), mode of delivery (vaginal or CS), gestational age (GA) (term or preterm), and birth weight (BW). Additional data collected included stillbirths and 5-minute APGAR scores. The inclusion criteria were all pregnancies of 20 weeks' gestation or more, including both singleton and multiple pregnancies. Exclusion criteria were pregnancies with less than 20 weeks' gestation and cases complicated by uterine rupture. To ensure data accuracy, all extracted records were manually cross-checked by two independent researchers for completeness and consistency. Discrepancies were reviewed and resolved by consensus, ensuring internal validation of the dataset.

Caesarean section rate based on Robson criteria

The Robson Ten-Group Classification System (TGCS) is an internationally recognized method for categorizing women according to specific obstetric characteristics to facilitate the analysis and monitoring of caesarean section rates.

Data were organised following the standard Robson Classification reporting format, comprising seven columns:

1. Group type.
2. Number of CS in the group.
3. Total number of women in the group.
4. Group size (%).
5. Group CS rate (%).
6. Absolute contribution of each group to the overall CS rate (%).
7. Relative contribution of each group to the overall CS rate (%).

The ten Robson groups (Groups 1–10) were defined by parity (nulliparous or multiparous), previous CS, onset of labour, fetal presentation or lie (cephalic, breech, transverse or oblique), number of fetuses (single or multiple), and gestational age at delivery (< 37 weeks or ≥ 37 weeks).

Definition

Non-reassuring fetal status refers to a clinical condition in which fetal oxygenation is suspected to be inadequate, serving as a replacement for the historically used term "fetal distress." Fetal distress traditionally denotes progressive fetal hypoxia and/or acidemia secondary to insufficient oxygen supply. The assessment of fetal well-being commonly involves the Non-Stress Test (NST), which evaluates fetal heart rate patterns in response to spontaneous fetal movements. Abnormal NST findings—such as absent or delayed accelerations, reduced baseline variability, or recurrent decelerations—may indicate a non-reassuring fetal status, reflecting potential fetal compromise and necessitating timely clinical intervention to prevent adverse perinatal outcomes.

Ethics approval and consent to participate

The study protocol was approved by the Institutional Review Board of Ümraniye Training and Research Hospital (approval date and number: 11/09/2025, B.I0.1.TKH.4.34.H.GP.0.01/301). Following ethical approval, retrospective data from deliveries between 2018 and 2025 were evaluated. The requirement for informed consent was waived due to the retrospective design. All procedures complied with the Declaration of Helsinki and the STROBE reporting guidelines, and patient identifiers were anonymized to ensure confidentiality.In Turkey, the legal age of consent for pregnancy-related medical procedures is 18 years; parental consent may be required for individuals aged 17 years, and judicial approval may be required for those aged 16–17 years. All Turkish participants were aged 16 years or older. A small number of participants younger than 16 years were refugees; however, all participants, regardless of age or nationality, were managed in full compliance with institutional ethical standards and approved ethical procedures, including consent requirements applicable at the institutional level.

Data processing and analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 29.0 (IBM Corp., Armonk, NY, USA). The study was primarily descriptive in nature. Categorical variables were summarised as frequencies and percentages, and continuous variables were presented as means with standard deviations or medians with ranges, as appropriate. Caesarean section rates were calculated overall and according to the Robson Ten-Group Classification system. Categorical variables are expressed as (%) and compared using the Pearson's Chi-square test. Continuous variables are expressed as mean ± SD and compared using the Independent Samples t-test. Group comparisons were conducted using appropriate parametric or non-parametric tests. A two-sided p value of < 0.05 was considered statistically significant.

Results

During the study period, a total of 25,767 women were admitted for delivery and included in the analysis. The mean maternal age was 29.5 ± 6.2 years, and the mean gestational age at delivery was 38.6 ± 1.6 weeks, ranging from 20 to 42 weeks. Among these, 25,375 were singleton and 392 were multiple pregnancies.

The overall caesarean section (CS) rate was 46.4%. The figure shows the in C-section rates over a seven-year period at the study centre. The x-axis represents the years (2018–2025), and the y-axis indicates the percentage of CS deliveries. Data demonstrate a consistent year-on-year rise in CS rates, reaching 47.27% in 2023 (Fig. 1). The mean birth weight of neonates was 3,167 ± 610 g, with low birth weight (< 2,500 g) observed in 9.7% of cases and macrosomia (> 4,000 g) in 5.6%. The clinical, obstetric, and sociodemographic characteristics of the study population are summarised in Table 1.

The mode of delivery demonstrated that nearly all maternal and fetal characteristics differed significantly between delivery modes ($p < 0.05$), while gestational age remained statistically comparable ($p = 0.450$). Maternal age > 35 years and multiparity were significantly more prevalent in the Cesarean section (CS) cohort (28.2% and 74.1%, respectively) compared to the vaginal delivery

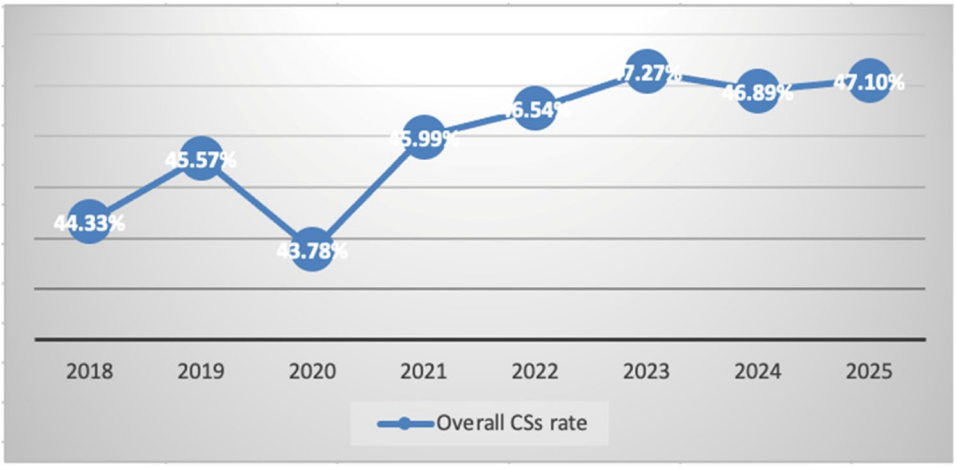

Fig. 1 Trend of caesarean section rates from 2018 to 2025

Table 1 Sociodemographic, clinical and obstetrics characteristics of the participants

Characteristics	Number (*n* = 25,767)	Percentage (%)
Age (years)		
< 18	229	0.9
≥ 18 < 35	19,890	77.2
≥ 35	5,648	21.9
Parity		
Primiparity	8,107	31.5
Multiparity	17,660	68.5
Gestational age (weeks) (mean ± SD)	38.6 ± 1.6	
Foetal presentation/lie (single pregnancy)		
Cephalic	24,941	97.3
Foetal malpresentation	434	2.1
Number of delivery		
Single	25,375	98.5
Multiple	392	1.5
Mode of delivery		
Vaginal delivery	13,833	53.6
Caesarean section (CS)	11,934	46.4
Fetal outcomes[b]	9 (7–9)	
APGAR 5th minute, median (IQR))		
Live birth	25,900	99.0
Stillbirth	259	1.0
Birth weight (g)[a](mean ± SD)	3,167 ± 610	
< 1,500	564	2.2
≥ 1,500 < 2,500	1924	7.5
≥ 2,500 < 4,000	21,836	84.7
≥ 4,000	1,443	5.6

N Number, *%* Percentage, *SD* Standard deviation, *g* Gram, *NICU* The neonatal intensive care unit

[a]Rate calculated per total number of babies born

[b]foetal outcomes include live births and stillbirths

Table 2 Distribution of maternal and fetal characteristics according to mode of delivery

Characteristics (*n* = 25,767)	Vaginal Delivery (*n* = 13,833)	Caesarean Section (*n* = 11,934)	*P*
Maternal age, n (%)			< 0.001
< 18	179 (1.3)	50 (0.4)	
18–34.9	11,374 (82.2)	8,516 (71.4)	
≥ 35	2,280 (16.5)	3,368 (28.2)	
Parity, n (%)			< 0.001
Primiparity	5,021 (36.3)	3,086 (25.9)	
Multiparity	8,812 (63.7)	8,848 (74.1)	
Gestational age (weeks)	38.7 ± 1.5	38.5 ± 1.7	0.450
Fetal presentation, n (%)			< 0.001
Cephalic	13,801 (55.3)	11,140 (44.7)	
Malpresentation	32 (7.4)	402 (92.6)	
Birthweight (g), n (%)			< 0.001
< 1500	243 (1.8)	321 (2.7)	
1500–2499	748 (5.4)	1,176 (9.9)	
2500–3999	12,241 (88.5)	9,595 (80.4)	
≥ 4000	601 (4.3)	842 (7.1)	
Plurality, n (%)			< 0.001
Single	13,774 (99.6)	11,601 (97.2)	
Multiple	59 (0.4)	333 (2.8)	
Fetal Outcome, n (%)			0.005
Live birth	13,651 (98.7)	11,857 (99.3)	
Stillbirth	182 (1.3)	77 (0.7)	

group ($p < 0.001$). Fetal presentation and plurality served as major determinants for surgical intervention, with CS being the delivery mode for 92.6% of malpresentations and 2.8% of multiple gestations ($p < 0.001$). Furthermore, the CS group showed a higher incidence of neonates at both birthweight extremes (< 1500 g and > 4000 g), while also reporting a significantly higher survival rate (99.3%) relative to the vaginal delivery group (98.7%, $p = 0.005$) (Table 2).

Table 3 Distribution of the Robson groups with their contributions to the overall CS rate*

Setting: Umraniye Training and Research Hospital				**Period: Between 01 August 2018 and 11 September 2025**		
Group	**Number of CS in group**	**Number of women in group**	**Group Size1 (%)**	**Group CS rate2 (%)**	**Absolute group contribution to overall CS rate3 (%)**	**Relative contribution of group to overall CS rate4 (%)**
1: Nulliparous, single cephalic, ≥ 37 weeks, in spontaneous labour	1308	3035	12.0	43.1	5.2	11.2
2: Nulliparous, single cephalic, ≥ 37 weeks, induced or CS before labour.	1111	4025	15.9	27.6	4.4	9.5
3: Multiparous (excluding previous CS), single cephalic, ≥ 37 weeks, in spontaneous labour.	973	5265	20.9	18.5	3.9	8.3
4: Multiparous (excluding previous CS), single cephalic, ≥ 37 weeks, induced or CS before labour.	661	4580	18.1	14.4	2.6	5.6
5: Previous CS, single cephalic, ≥ 37 weeks	6013	6049	24.0	99.4	23.8	51.3
6: All nulliparous women with a single breech pregnancy	179	184	0.7	97.3	0.7	1.5
7: All multiparous breeches (including previous CS)	197	213	0.8	92.5	0.8	1.7
8: All multiple pregnancies (including previous CS)	310	361	1.4	85.9	1.2	2.6
9: All women with a single pregnancy with a transverse or oblique lie, including women with previous CS(s)	56	56	0.2	100.0	0.2	0.5
10: All single cephalic, < 37 weeks (including previous CS)	908	1467	5.8	61.9	3.6	7.8
Total*	11,716	25,236	100.0%	46.4%	46.4%	100%

CS Caesarean section

[1]Group size (%) = n of women in the group/total N women delivered in the hospital x 100

[2]Group CS rate (%) = n of CSs in the group/total N of women in the group x 100

[3]Absolute contribution (%) = n of CSs in the group/total N of women delivered in the hospital x 100

[4]Relative contribution (%) = n of CSs in the group/total N of CSs in the hospital x 100

*These totals and percentages come from the data in the table. *A total of 531 women were excluded because of missing data (*n* = 501) and uterine rupture (*n* = 30)

Table 4 CS indications among 11,934 CSs

Parameters	***N* = 11,934 (%)**
Maternal	7,130 (59.7)
Previous CS or uterine surgery	6557 (54.9)
Maternal comorbidities (e.g., cardiac disease, pulmonary disease, chronic or gestational hypertension)	254(2.1)
Preeclampsia or eclampsia	295 (2.5)
Maternal vertically transmitted infection (HIV, HCV, HSV, etc.)	14 (0.1)
Maternal request	10 (0.1)
Foetal	3,826 (32.1)
Foetal distress	2284 (19.1)
Multiple gestation	321(2.7)
Foetal malpresentation	434 (3.6)
Foetal macrosomia	735 (6.2)
Cord prolapses	30 (0.3)
Foetal gross congenital anomalies (teratoma, hydrocephaly, severe cardiac disease, etc.)	22 (0.2)
Maternal-foetal	978 (8.2)
Labour dystocia	458 (3.8)
Placental invasion anomalies/antepartum haemorrhage (e.g., PAS, placenta previa, vasa previa, placenta abruption)	274(2.3)
Cephalopelvic disproportion	246 (2.1)

HIV Human immunodeficiency virus, *HSV* Herpes simplex virus, *CS* Cesarean Section

The distribution of deliveries according to the Robson classification, along with their corresponding contributions to the overall CS rate, is presented in Table 3. Over the seven-year study period, the four largest patient groups, in descending order, were Robson Groups 5, 3, 4, and 2. The highest proportion of deliveries occurred in Group 5, accounting for 24.0% of all births, followed by Group 3 (20.9%), Group 4 (18.1%), and Group 2 (15.9%). Among deliveries without missing data or uterine rupture ($n = 25{,}236$) and all CSs ($n = 11{,}716$), the overall CS rate was 46.4%. These four Robson groups together accounted for 34.7% of all CSs. Group 5 contributed the largest proportion, representing an absolute contribution of 23.8% and a relative contribution of 51.3%. This was followed by Group 1 (absolute 5.2%, relative 11.2%), Group 2 (absolute 4.4%, relative 9.5%), and Group 3 (absolute 3.9%, relative 8.3%).

The specific indications for CS are detailed in Table 4. The most common indication was previous uterine surgery (including previous CS and/or myomectomy), accounting for 54.9% of cases. This was followed by foetal distress (19.1%), foetal macrosomia (6.2%), labour dystocia (3.8%), foetal malpresentation (3.6%), and multiple gestation (2.7%).

Discussion

This study provides a comprehensive evaluation of caesarean section (CS) rates in a research and training facility in Turkey, utilizing the Robson classification system as a standardized method for analyzing and examining CS indications. The overall CS rate observed in this cohort was 46.4%. Although this figure remains considerably high, it is lower than the national averages reported in several studies from Turkey. Previous research has consistently documented CS rates among Turkish women, ranging between 51.9% and 57.6% [6–10]. One nationwide study analysing data from 6,161,976 women over a five-year period reported an overall CS rate of 57.55% [6], while another study involving 5,323,500 women found a rate of 51.9% [7]. Similarly, an analysis of 2016 data from 1,189,578 women revealed a CS rate of 54.6% [8]. CS rates in Turkey also vary significantly by hospital type. According to previous analyses, the CS rate was 38.6% in state hospitals, 68.9% in university hospitals, and 70.6% in private hospitals. Another nationwide investigation encompassing 1,503 healthcare facilities (covering 1,266,300 women) reported an overall CS rate of 51.2%, with corresponding rates of 39.7% in state hospitals, 70.6% in private hospitals, and 70.3% in university hospitals [10]. The recent study from the tertiary health centre reported a CS rate of 56.2% [9].

In Turkey, high CS rates were among the highest globally, exceeding rates reported in both high-income and low-income countries. A systematic review and meta-analysis of European countries reported CS rates ranging from 16% to 52.2% over a four-year period [11]. In contrast, rates in several low-income countries were notably lower, including 30.6% in Burkina Faso [9], 34.7% in Ethiopia [10], and 38.6% in Somalia [12].Cesarean section (CS) rates in Turkey remain persistently elevated due to a combination of medical and non-medical factors. Medical contributors include advanced maternal age, high prevalence of previous CS, and limited availability or acceptance of vaginal birth after cesarean (VBAC). Non-medical determinants, such as defensive clinical practices, over-interpretation of fetal monitoring, and cultural or patient-driven preferences, further influence CS utilization.Elevated CS rates are associated with well-documented risks, including prolonged maternal recovery, increased perioperative complications, and higher risk in subsequent pregnancies. Mitigating these trends requires a multifaceted, evidence-based approach, encompassing guideline-driven care, promotion of VBAC, midwifery-led models, and shared decision-making informed by clinical evidence, as demonstrated in successful international experiences.

A notable finding in this study was the significant contribution of Robson Group 5 (women with a previous cesarean section who have a term pregnancy with a cephalic presentation) to the overall CS rate. This group accounted for 23.8% of all caesarean deliveries in absolute terms. Consistent with our results, previous studies highlight that women with a prior caesarean delivery are considerably more likely to undergo previous CSs, thereby substantially increasing overall CS rates [6, 7, 9]. In a previous study conducted in Türkiye, the overall caesarean section (CS) rate was reported as 54.2%. Within the Robson classification, Group 5 was identified as the largest contributor to the overall CS rate, accounting for 23.9% of all CSs [9]. Furthermore, a previous history of uterine surgery has been widely recognized in the literature as a major indication for CS, with numerous studies identifying it as one of the most prevalent contributing factors to the decision for surgical delivery [8, 10].

Group 10, comprising women with singleton cephalic pregnancies at less than 37 weeks' gestation, made a notable contribution to the overall caesarean section (CS) rate, accounting for 3.6% in absolute terms. This observation is consistent with recent literature indicating that preterm birth is frequently associated with medical and obstetric complications such as hypertensive disorders of pregnancy, diabetes mellitus, intrauterine growth restriction, and other maternal-foetal conditions that often necessitate CS. In the present study, a substantial proportion of women in this group presented with high-risk pregnancies, which likely contributed to the elevated CS rate observed. These findings are consistent with previous research from various settings, where similar patterns have been reported [13].

The cesarean section rates observed in Group 1 and Group 2, including primiparous women with term, singleton pregnancies in cephalic presentation, were notably elevated, at 5.2% and 4.4%, respectively. These values substantially exceed the expected rates for this low-risk population, as defined by the Robson classification system. Elevated CS rates in these groups are concerning, given that nulliparous women with term, cephalic pregnancies in spontaneous labor are generally considered optimal candidates for vaginal birth. Previous studies have demonstrated that unnecessary cesarean deliveries in this population are associated with increased maternal morbidity, as well as adverse outcomes in subsequent pregnancies [14, 15]. Several factors may contribute to the higher CS rates observed in Group 1, including greater use of intrapartum interventions, medicolegal pressures, provider preferences, and heightened concern regarding the potential risks of vaginal delivery. Furthermore, institutional policies and inadequate support for physiological labor may also play a contributory role.

Groups 3 and 4, comprising multiparous women with term, singleton pregnancies in cephalic presentation who entered spontaneous labor, demonstrated relatively low CS rates of 3.9% and 2.6%, respectively, yielding a

combined rate of 7.7%. Despite constituting the largest proportion of the study population, the CS rate within these groups remained comparatively low. This finding aligns with previous studies indicating that multiparous women—particularly those without a history of uterine surgery—are more likely to achieve successful vaginal delivery with a lower incidence of maternal and neonatal complications [16]. The low CS rate observed in these groups underscores the favorable obstetric characteristics associated with multiparity. It supports the expectation that these women generally experience more efficient labor progress and fewer indications for operative intervention. Moreover, this pattern may reflect both inherent biological advantages, such as enhanced uterine contractility and increased cervical compliance, and greater provider confidence in managing spontaneous labor among women with previous vaginal births.

The contribution of Groups 6, 7, 8, and 9 to the overall CS rate was relatively modest but remains clinically noteworthy. Cesarean delivery in these categories is commonly indicated due to safety concerns associated with malpresentation and multiple gestations, both of which are associated with an increased risk of maternal and perinatal complications. Nevertheless, accumulating evidence indicates that, with comprehensive antenatal assessment, judicious case selection, and the involvement of skilled obstetric teams, vaginal delivery can be a safe and viable option in carefully selected cases of breech presentation and twin pregnancies. This observation suggests that, while CS is indispensable in specific high-risk situations, its frequency could be further optimized through the implementation of evidence-based management protocols, individualized risk assessment, and informed, shared decision-making between clinicians and patients.

In our study, the most common indication for CS was previous uterine surgery, which included women with a history of prior CS and myomectomy, accounting for 54.9% of all CS cases. Foetal indications represented 32.1% of cases, with foetal distress being the leading cause, observed in 19.1% of CS deliveries. Other notable fetal indications included fetal macrosomia (6.2%), labor dystocia (3.8%), fetal malpresentation (3.6%), and multiple gestation (2.7%). Our findings are consistent with previous studies conducted in Turkey. One study identified previous uterine surgery as the most common indication for CS, followed by foetal distress and cephalopelvic disproportion (CPD) [17]. Similarly, another study reported previous uterine surgery as the leading cause, followed by foetal distress, with other common indications including malpresentation (breech, transverse, oblique, or foot presentation), multiple pregnancies, and CPD [18]. A previous study conducted in Türkiye reported an overall caesarean section (CS) rate of 55.0%, with previous uterine surgery, particularly a history of prior CS, being the most common indication for caesarean delivery [19].

A large-scale Turkish study involving 69,051 cases also reported comparable patterns, with previous CS accounting for 46.1% of cases, followed by fetal distress (13.2%) and CPD (8%) [20]. Internationally, patterns of CS indications exhibit regional variability. A systematic review and meta-analysis of 23 studies from Ethiopia identified CPD as the most common indication, followed by foetal distress [21]. In contrast, a systematic review and meta-analysis of 44 studies from Nigeria found previous uterine surgery to be the leading cause, followed by hypertensive disorders, CPD, foetal distress, obstructed labour, antepartum haemorrhage, and multiple gestations [22]. In Poland, prior CS was the most frequent obstetric indication, while psychological disorders represented the most common non-obstetric reason for CS [23]. These comparisons highlight both global similarities and regional differences in CS indications, which are influenced by factors such as clinical practice guidelines, healthcare accessibility, referral systems, and patient demographics. The predominance of repeat CS underscores the need for strategies aimed at reducing primary CS rates and promoting vaginal birth after caesarean (VBAC) where clinically appropriate. Equally important is the standardization of diagnostic criteria, particularly for subjective indications such as foetal distress, to prevent unnecessary surgical interventions and optimize maternal and neonatal outcomes.

Strengths and limitations

A significant strength of this study is the application of the Robson classification system in conjunction with detailed documentation of CS indications, facilitating a standardized and comprehensive analysis of caesarean section rates across clinically relevant subgroups. Furthermore, this study offers valuable insights into CS practices within the tertiary health centre in Turkey. Although conducted at a single tertiary care centre, the findings are pertinent and potentially generalizable to similar clinical settings. A notable advantage is the hospital's strict adherence to standardized protocols for data entry, ensuring the accurate and complete capture of birth information within the electronic delivery registry. The principal limitation of this study is its retrospective design, which may introduce inherent biases and limit the ability to control for confounding variables.

Conclusion

In this study, the overall caesarean section rate was 46.4%, with Robson Groups 5 and 1 accounting for nearly one-third of all CS deliveries. Previous uterine surgery and foetal distress were the most frequent indications. These findings emphasise the need for targeted measures

to reduce unnecessary caesarean deliveries, particularly among low-risk obstetric populations. Efforts should focus on lowering primary CS rates, encouraging vaginal birth after cesarean (VBAC) when clinically appropriate, and standardising diagnostic criteria to improve maternal and neonatal outcomes.

Abbreviations

CS	Caesarean section
WHO	The World Health Organization
SD	Standard deviation
IRB	Institutional Review Board
VBAC	Vaginal birth after caesarean
CPD	Cephalopelvic disproportion

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Authors' contributions
SD, FGS, and IK: conceptualisation, manuscript writing, data collection, manuscript editing, review, and data analysis. INBD contributed exclusively to the critical revision of the manuscript for important intellectual content during the revision process. IK also acted as the guarantor for the study, accepting full responsibility for the completed work and the conduct of the study. All authors had access to the data and controlled the decision to publish.

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Data availability
All data generated or analysed during this study are included in this article. The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request. However, restrictions apply to the availability of these data, as they were used under license for this study and are not publicly available. The corresponding author (email: duzgunersoner@gmail.com) can be contacted for data requests.

Declarations

Ethics approval and consent to participate
The study protocol was approved by the Institutional Review Board of Ümraniye Training and Research Hospital (approval date and number: 11/09/2025, B.I0.1.TKH.4.34.H.GP.0.01/301). Following ethical approval, retrospective data from deliveries between 2018 and 2025 were evaluated. The requirement for informed consent was waived due to the retrospective design. All procedures complied with the Declaration of Helsinki and the STROBE reporting guidelines, and patient identifiers were anonymized to ensure confidentiality. In Turkey, the legal age of consent for pregnancy-related medical procedures is 18 years; parental consent may be required for individuals aged 17 years, and judicial approval may be required for those aged 16–17 years. All Turkish participants were aged 16 years or older. A small number of participants younger than 16 years were refugees; however, all participants, regardless of age or nationality, were managed in full compliance with institutional ethical standards and approved ethical procedures, including consent requirements applicable at the institutional level.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Sung S, Mikes BA, Martingano DJ, Mahdy H. Cesarean Delivery. In: StatPearls. Treasure Island (FL): StatPearls Publishing Copyright © 2025, StatPearls Publishing LLC.; 2025.
2. Angolile CM, Max BL, Mushemba J, Mashauri HL. Global increased cesarean section rates and public health implications: a call to action. Health Sci Rep. 2023;6(5):e1274.
3. https://www.who.int/news-room/questions-and-answers/item/who-statement-on-caesarean-section-rates-frequently-asked-questions. Accessed 14 October 2025. *1* 1.
4. https://www.who.int/publications/i/item/WHO-RHR-15.02. Accessed 14 October 2025. *2* 2.
5. Robson Classification. Implementation Manual: https://iris.who.int/bitstream/handle/10665/259512/9789241513197-eng.pdf?sequence=1: Accessed 14 October 2025. *3* 3.
6. Ulgu MM, Birinci S, Altun Ensari T, Gözükara MG. Cesarean section rates in Turkey 2018–2023: overview of National data by using Robson ten group classification system. Turk J Obstet Gynecol. 2023;20(3):191–8.
7. Tontus HO, Nebioglu S. Improving the caesarean decision by Robson classification: a population-based study by 5,323,500 livebirth data. Ann Glob Health. 2020;86(1):101.
8. Sanisoglu S, Engin-Ustun Y, Karatas Baran G, Kurumoglu N, Keskinkilic B. Use of ten-group Robson classification in Türkiye to discuss Cesarean section trends. Minerva Obstet Gynecol. 2023;75(4):333–9.
9. Guner G, Yeniocak AS. A cross-sectional analysis of caesarean sections according to Robson 10-group classification system: experience from a tertiary centre in Turkiye. BMC Pregnancy Childbirth. 2025;25(1):674.
10. Eyi EGY, Mollamahmutoglu L. An analysis of the high cesarean section rates in Turkey by Robson classification. J Matern Fetal Neonatal Med. 2021;34(16):2682–92.
11. Amyx M, Philibert M, Farr A, Donati S, Smárason AK, Tica V, et al. Trends in caesarean section rates in Europe from 2015 to 2019 using Robson's Ten Group Classification System: a Euro-Peristat study. BJOG. 2024;131(4):444–54.
12. Barut A, Erkok U, Hassan HB. Cross-sectional analysis of caesarean sections according to the Robson 10-group classification system in Somalia. BMJ Open. 2025;15(1):e086525.
13. Maeda E, Ishihara O, Tomio J, Miura H, Kobayashi Y, Terada Y, et al. Cesarean delivery rates for overall and multiple pregnancies in Japan: a descriptive study using nationwide health insurance claims data. J Obstet Gynaecol Res. 2021;47(6):2099–109.
14. Vogel JP, Betrán AP, Vindevoghel N, Souza JP, Torloni MR, Zhang J, Tunçalp Ö, Mori R, Morisaki N, Ortiz-Panozo E, et al. Use of the Robson classification to assess caesarean section trends in 21 countries: a secondary analysis of two WHO multicountry surveys. Lancet Glob Health. 2015;3(5):e260–270.
15. Jadoon B, Assar TM, Nucier A, Raziq HEA, Abd El-Azym Saad AS, Megahed Amer W. Analysis of the caesarean section rate using the 10-group Robson classification at Benha university Hospital, Egypt. Women Birth. 2020;33(2):e105-10.
16. Vila-Candel R, Martín A, Escuriet R, Castro-Sánchez E, Soriano-Vidal FJ. Analysis of caesarean section rates using the Robson classification system at a University Hospital in Spain. Int J Environ Res Public Health. 2020. https://doi.org/10.3390/ijerph17051575.
17. Aksoy H, Özyurt S, Aksoy Ü, Açmaz G, Karadağ Öİ, Babayiğit MA. Kocaeli Tıp Dergisi. 2014;3(3):1–7.
18. Bulut AN, Ceyhan V. Cesarean rate and indications at a tertiary center. J Clin Pract Res. 2022;44:39–43.
19. Guner G, Karabudak CB. Caesarean section rates and indications: a cross-sectional study from a tertiary care centre in Türkiye. BMC Pregnancy Childbirth. 2025. https://doi.org/10.1186/s12884-025-08494-z.
20. Golbasi C, Golbasi H, Bayraktar B, Omeroglu I, Vural T, Sahingoz Yildirim AG, et al. Cesarean delivery rates based on time and indication using the Robson ten-group classification system: assessment at a Turkish tertiary center. J Obstet Gynaecol Res. 2023;49(3):883–92.
21. Gedefaw G, Demis A, Alemnew B, Wondmieneh A, Getie A, Waltengus F. Prevalence, indications, and outcomes of caesarean section deliveries in Ethiopia: a systematic review and meta-analysis. Patient Saf Surg. 2020;14:11.
22. Osayande I, Ogunyemi O, Gwacham-Anisiobi U, Olaniran A, Yaya S, Banke-Thomas A. Prevalence, indications, and complications of caesarean section in health facilities across Nigeria: a systematic review and meta-analysis. Reprod Health. 2023;20(1):81.

23. Zahorowska A, Cwiertnia A, Winter A, Wolkowska N, Maksym K, Dzidek S, et al. Understanding caesarean section indications in Poland: trends and analysis. Ginekol Pol. 2025;96(8):670–7.

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