Research Article

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Prevalence of Cesarean Sections and Their Indications at Duhok Maternity Hospital: A Retrospective Study (2020–2024)

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Abstract

Cesarean section (CS) is an essential obstetric intervention when clinically indicated, but sustained increases in its use raise concerns regarding avoidable maternal risk, future reproductive consequences, and pressure on health-system resources. Updated local evidence is needed to distinguish between emergency and elective procedures and to describe the indications driving hospital practice. A retrospective hospital-based record review was conducted at Duhok Maternity Hospital, Kurdistan Region, Iraq, and included all deliveries from January 2020 to December 2024. Data were extracted from hospital records on mode of delivery, type of CS (emergency or elective), maternal age, parity, previous cesarean scars, and the primary recorded indication for CS. Descriptive statistics were used to summarize trends, and associations between CS type and maternal characteristics were assessed using the chi-square test, with a p-value <0.05 considered statistically significant. Among 79,174 total deliveries, 28,062 were cesarean sections, corresponding to an overall CS rate of 36.84%. The total CS rate remained consistently high throughout the study period. Within this overall rate, emergency CS declined over time, whereas elective CS increased significantly ($p < 0.001$). Maternal age, parity, and number of previous cesarean scars were significantly associated with CS type. Emergency CS was more common among younger and nulliparous women and among women without a previous scar, whereas elective CS predominated among multiparous women and those with one or more previous scars. Fetal distress and failure of progress were the leading recorded indications for emergency CS, while abnormal presentation, post-date pregnancy, bad obstetrical history, and previous cesarean scar were frequent indications for elective CS. Cesarean delivery accounted for more than one-third of all births in this tertiary hospital, substantially exceeding the population benchmark proposed by the World Health Organization. The findings suggest that repeat cesarean delivery is an important contributor to the growing proportion of elective procedures. Regular audit of indications, closer review of primary cesarean decisions, and wider implementation of evidence-based labor management and vaginal birth after cesarean policies may help optimize CS use in this setting.

Keywords: cesarean section, obstetric epidemiology, elective cesarean, emergency cesarean, maternal factors, Kurdistan Region, Iraq

1. INTRODUCTION

Cesarean section (CS) is a surgical procedure in which the fetus is delivered through incisions in the abdominal wall and uterus. It is an essential component of comprehensive obstetric care when vaginal birth would place the mother or fetus at unacceptable risk. Common indications include cephalopelvic disproportion, labor dystocia, placental disorders, malpresentation, fetal compromise, multiple gestation, and maternal medical conditions requiring urgent delivery [1, 2]. When appropriately indicated, CS can reduce maternal and perinatal mortality and morbidity; however, it is also associated with short-term and long-term risks, including hemorrhage, infection, thromboembolism, anesthetic complications, operative injury, neonatal respiratory morbidity, and complications in future pregnancies [3, 4, 5].

Because of this balance between benefit and risk, the growing use of CS without clear medical necessity has become an important concern in obstetric practice. Since its widespread adoption, CS rates have increased in both high-income and low- and middle-income countries [6, 7, 8]. The World Health Organization (WHO) has long emphasized that population CS rates substantially above 10–15% are unlikely to reflect additional health benefit at the population level [9]. The increase in CS use has been linked to multiple factors, including non-evidence-based indications, repeat cesarean delivery after a previous scar, medico-legal concerns, scheduling convenience, and maternal preference in selected settings [10, 11].

Marked international variation in CS rates further highlights the need for context-specific evaluation. Rates above 30% have been reported in several middle- and high-income settings, including Brazil, Australia, and parts of China, whereas much lower rates persist in resource-limited regions where access to comprehensive emergency obstetric care remains constrained [12]. Such variation indicates that both overuse and underuse of CS may coexist globally, depending on health-system capacity, referral patterns, and local clinical practice.

In Iraq and the Kurdistan Region, published studies also suggest an increasing reliance on cesarean delivery. A study from Erbil reported that the CS rate rose from 28.5% in 2010 to 35.77% in 2015 [13]. Another Iraqi study in Erbil reported rates increasing from 38.09% in 2009 to 44.2% in 2013 [14], whereas a study from Mosul reported a lower prevalence of 28.8% during 2019–2020 [15]. These findings indicate substantial variation across Iraqi settings and underline the importance of updated hospital-level data.

Although cesarean section is a life-saving intervention when clinically justified, sustained increases in its use beyond evidence-based necessity create concern for maternal safety, neonatal outcomes, and healthcare costs [4, 5, 6]. In the Kurdistan Region of Iraq, available reports suggest a rising CS burden, yet recent studies that examine multi-year trends, distinguish between elective and emergency procedures, and relate these patterns to maternal characteristics remain limited [13, 14, 15]. In addition, hospital-based evidence on the indications driving this pattern is needed to support audit and quality-improvement efforts in routine obstetric care.

To address this gap, the present study assessed the prevalence, temporal pattern, and recorded indications of cesarean section at Duhok Maternity Hospital from 2020 to 2024. It also examined how maternal age, parity, and previous cesarean scars were associated with emergency and elective procedures. By providing updated local descriptive evidence from a large tertiary maternity hospital, the study aims to inform evidence-based strategies to reduce unnecessary primary and repeat cesarean deliveries [9, 16].

Our aim from this study is to determine the prevalence of CS and to identify its main indications at the Maternity Hospital for Obstetrics and Gynecology in Duhok.

2. MATERIALS AND METHODS

2.1. STUDY DESIGN

A retrospective hospital-based observational study was conducted to assess the prevalence, pattern, and indications of cesarean section (CS). Medical records of women who delivered at the Maternity Hospital for Obstetrics and Gynecology in Duhok City, Iraq, were reviewed for the period from 1 January 2020 to 31 December 2024.

2.2. DATA COLLECTION

Data were extracted using a structured data-collection form designed for this study and based on routine obstetric documentation in the hospital. Each case was assigned a unique study code to preserve confidentiality.

Collected variables included maternal age, parity, number of previous cesarean scars, and bad obstetric history (BOH), as documented in the medical record. Cesarean sections were classified as emergency or elective according to the recorded timing and clinical context of the operation. For each case, the primary indication for surgery was recorded from the operative notes or delivery record to avoid double counting. Indications included cephalopelvic disproportion, hypertensive disorders of pregnancy, antepartum hemorrhage, fetal distress, abnormal fetal presentation, multiple pregnancy, prematurity, maternal medical disorders, and previous cesarean section. Fetal outcome (alive or demised) and immediate post-delivery information were also reviewed when available in the record.

Because this was a retrospective review, diagnostic categories such as fetal distress, failure of progress, and bad obstetrical history were analyzed as recorded by the treating team; no retrospective reclassification of indications was undertaken.

2.3. INCLUSION AND EXCLUSION CRITERIA

All women who underwent cesarean section during the study period were eligible for inclusion. Records with missing key demographic data or without a documented primary indication for cesarean delivery were excluded from the analytic summaries.

2.4. STATISTICAL ANALYSIS

Data were entered and analyzed using SPSS version 27. Categorical variables were summarized as frequencies and percentages, while continuous variables were presented as mean ± standard deviation when applicable. Annual proportions were used to describe temporal trends in total, emergency, and elective cesarean section rates. Associations between categorical variables were assessed using the chi-square test or Fisher's exact test where appropriate. A p-value <0.05 was considered statistically significant. The analysis was planned as a descriptive and bivariate assessment; therefore, the findings should be interpreted as associations rather than independent predictors.

2.5. ETHICAL CONSIDERATIONS

Ethical approval was obtained from the institutional ethics committee. As this was a retrospective study using anonymized data, informed consent was waived. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

3. RESULTS

During the study period, 28,062 cesarean sections were performed among 79,174 total deliveries, yielding an overall CS prevalence of 36.84%. The annual CS rate increased from 33.59% in 2020 to 36.30% in 2022 and then remained relatively stable through 2024 (35.74%). Within this overall rate, the proportion of emergency CS declined steadily from 25.97% in 2020 to 15.74% in 2024, whereas elective CS increased from 7.63% to 20.0% over the same period (Table 1).

Table 1. *Annual cesarean section rates (2020–2024)*

Year	Total deliveries	Emergency CS	Elective CS	Emergency %	Elective %	Total CS %
2020	17319	4497	1321	25.97	7.63	33.59
2021	17063	3042	3021	17.83	17.70	35.53
2022	15794	2686	3047	17.01	19.29	36.30
2023	15471	2488	3126	16.08	20.21	36.29
2024	13527	2129	2705	15.74	20.00	35.74
Overall	79174	14842	13220	18.75	16.70	36.84

Further analysis of the distribution of emergency and elective cesarean sections by year is presented in Table 2. The percentages shown in this table are calculated within the total emergency and elective CS groups across the study period and demonstrate a statistically significant shift toward planned cesarean deliveries over time ($p < 0.001$).

Table 2. *Type of cesarean section by year (column percentages within emergency and elective groups)*

Year	Emergency CS F (%)	Elective CS F (%)	P-value
2020	4497 (30.3)	1321 (10)	<0.001
2021	3042 (20.5)	3021 (22.9)	
2022	2686 (18.1)	3047 (23)	
2023	2488 (16.8)	3126 (23.6)	
2024	2129 (14.3)	2705 (20.5)	

3.1. ASSOCIATION BETWEEN CESAREAN SECTION TYPE AND MATERNAL CHARACTERISTICS

Maternal characteristics, including age, parity, and previous cesarean section, were analyzed for their association with the type of cesarean delivery.

As shown in Table 3, maternal age was significantly associated with the type of cesarean section ($p < 0.001$). Emergency cesarean section was most frequent among women aged 20–29 years (55.5%), whereas elective cesarean section was most

common among women aged 30–39 years (48.3%).

Table 3. *Association between maternal characteristics and type of cesarean section*

Variable	Category	Emergency CS n (%)	Elective CS n (%)	P-value
Age (years)	<20	758 (5.1)	151 (1.1)	<0.001
	20–29	8235 (55.5)	5837 (44.2)	
	30–39	5168 (34.8)	6386 (48.3)	
	≥40	681 (4.6)	846 (6.4)	
Parity	Nulliparous	5495 (37.0)	1512 (11.4)	<0.001
	Primiparous	3218 (21.7)	3455 (26.1)	
	Multiparous (2–4)	4920 (33.2)	7371 (55.8)	
	Grand multiparous (≥5)	1209 (8.1)	882 (6.7)	
Previous cesarean section	No scar	9051 (61.0)	2661 (20.1)	<0.001
	One scar	3190 (21.5)	4180 (31.6)	
	≥2 scars	2601 (17.5)	6379 (48.3)	

Parity also demonstrated a statistically significant association with cesarean section type ($p < 0.001$). Emergency cesarean section occurred most commonly among nulliparous women (37.0%), while elective cesarean section was more frequent among multiparous women with parity 2–4 (55.8%).

In addition, the number of previous cesarean sections showed a strong association with the type of cesarean delivery ($p < 0.001$). Women with no previous cesarean scar constituted the majority of emergency cesarean sections (61.0%), whereas women with one or more previous scars, particularly those with two or more scars, accounted for the largest proportion of elective cesarean sections (48.3%).

3.2. INDICATIONS FOR ELECTIVE CESAREAN SECTION

The distribution of indications for elective cesarean section is presented in Table 4.

Table 4. *Primary recorded indications for elective cesarean section*

Indication	Yes n (%)
Abnormal presentation	1164 (8.8)
Post-date pregnancy	1093 (8.3)
Fetal distress	1086 (8.2)
Bad obstetrical history	1062 (8.0)
Previous CS (fresh scar)	926 (7.0)
CPD	916 (6.9)
Hypertensive disorders	582 (4.4)
Medical diseases	383 (2.9)
Multiple pregnancy	142 (1.1)
APH	96 (0.7)

Among elective cesarean sections, the most frequent primary recorded indications were abnormal fetal presentation (8.8%), post-date pregnancy (8.3%), fetal distress (8.2%), bad obstetrical history (8.0%), and previous cesarean scar (7.0%). Other indications, including hypertensive disorders, medical diseases, and multiple pregnancy, accounted for smaller proportions. These findings indicate that planned cesarean delivery in this hospital was driven by a mix of repeat-scar cases and non-urgent obstetric indications requiring individualized clinical judgment.

3.3. INDICATIONS FOR EMERGENCY CESAREAN SECTION

The indications for emergency cesarean section are summarized in Table 5. Fetal distress was the leading indication for emergency cesarean section (35.3%), followed by failure of progress (25.2%). Other indications included malpresentation (9.3%) and hypertensive disorders (8.2%), while antepartum hemorrhage accounted for 5.3% of cases. Cord prolapse was relatively uncommon (0.9%).

3.4. INDICATIONS ACCORDING TO NUMBER OF PREVIOUS CESAREAN SCARS

The distribution of selected elective cesarean section indications according to the number of previous cesarean scars is shown in Table 6. Among the selected indications shown in Table 6, abnormal presentation and fetal distress were more frequent among women with no previous cesarean scar, whereas post-date pregnancy and bad obstetrical history were relatively more common among women with one previous scar ($p < 0.001$). Women with two or more previous scars

were predominantly represented in the broader repeat-cesarean category rather than in the selected non-scar indications displayed in this table.

Table 5. *Primary recorded indications for emergency cesarean section*

Indication	Yes n (%)
Fetal distress	5244 (35.3)
Failure of progress	3744 (25.2)
Malpresentation	1386 (9.3)
Hypertensive disorders	1211 (8.2)
APH	790 (5.3)
Previous CS (fresh scar)	635 (4.3)
Multiple pregnancy	276 (1.9)
Cord prolapse	131 (0.9)

Table 6. *Selected primary elective CS indications by number of previous cesarean scars*

Indication	No scar %	One scar %	≥2 scars %	P-value
Abnormal presentation	28.7	9.5	0	<0.001
Fetal distress	24.3	10.5	0	<0.001
Post-date pregnancy	3.6	23.9	0	<0.001
Bad obstetrical history	19.8	12.8	0	<0.001
CPD	15.3	12.2	0	<0.001

4. DISCUSSION

This study provides updated hospital-based evidence on cesarean section practice at Duhok Maternity Hospital over a five-year period. The main findings are that cesarean delivery accounted for 36.84% of all births, the overall rate remained consistently high throughout the study period, and the internal distribution of procedures shifted from predominantly emergency operations toward a greater proportion of elective cesarean sections. In addition, maternal age, parity, and previous cesarean scars were significantly associated with CS type. Emergency CS was more frequent among younger, nulliparous women and women without a previous scar, whereas elective CS was concentrated among multiparous women and those with one or more previous cesarean scars.

The overall CS rate observed in this hospital is substantially higher than the population benchmark proposed by the World Health Organization [9]. Although such benchmarks should be interpreted cautiously in tertiary referral settings, the present findings are consistent with reports from other low- and middle-income countries showing persistently elevated hospital CS rates [17]. The rate observed in Duhok is also broadly comparable to figures reported from other Iraqi and regional urban hospitals [13, 14, 15, 18, 19]. Taken together, these results suggest that the high use of CS in the present study reflects not only local practice but also a wider regional pattern. We refer to the readers for further details [20, 21, 22].

One of the most notable findings was the decline in emergency CS and the concurrent rise in elective CS over time. Because the present study was descriptive and record based, it cannot determine the exact reasons for this shift. Nevertheless, several explanations are plausible. Improved antenatal identification of high-risk pregnancies, earlier scheduling of repeat cesarean deliveries, increased caution in women with previous uterine scars, and evolving institutional practice may all contribute to a relative move from unscheduled to planned operative birth. These interpretations should be regarded as hypotheses consistent with the observed pattern rather than as direct causal conclusions from the dataset.

The association between maternal characteristics and CS type was clinically coherent. Emergency CS was most common among nulliparous women, a pattern that is compatible with the established vulnerability of first labors to dystocia, failed progress, and intrapartum fetal compromise [23]. By contrast, elective CS was more frequent among multiparous women, especially those with prior cesarean scars. This finding supports the view that repeat cesarean delivery is an important driver of overall CS volume, as also reported in regional and global studies [17]. Older maternal age was likewise associated with elective CS, which may reflect higher comorbidity, greater obstetric caution, or a stronger tendency toward planned delivery in this age group [24].

With regard to indications, fetal distress and failure of progress were the most common recorded reasons for emergency CS, together accounting for more than half of emergency procedures. These are widely reported indications in obstetric literature and are frequently associated with intrapartum decision-making [4, 25]. Among elective procedures, abnormal presentation, post-date pregnancy, bad obstetrical history, and previous cesarean scar were common primary recorded indications. These findings suggest that planned cesarean delivery in this setting is influenced by both repeat-scar status and other antenatal risk categories. However, indication-based interpretation should remain cautious because diagnostic labels in retrospective hospital records depend on routine clinical documentation and may vary between clinicians.

An important strength of the study is the large sample size and the inclusion of five consecutive years of delivery data from the main maternity hospital in the province. This provides a useful descriptive overview of institutional practice and offers a strong basis for local audit and service planning. At the same time, several limitations should be recognized. First, this was a single-center retrospective study and therefore reflects the case mix and referral pattern of one tertiary hospital rather than the general population. Second, the analysis relied on routinely recorded indications and did not independently validate diagnostic categories such as fetal distress or failure of progress. Third, the study used descriptive and bivariate analyses only; it therefore identifies associations but does not establish independent predictors or causal mechanisms. Fourth, the absence of a Robson Ten-Group Classification analysis limits comparison with international audit standards.

Despite these limitations, the findings have clear practical implications. The concentration of elective CS among women with previous scars highlights the importance of reducing avoidable primary cesarean deliveries and strengthening policies that support appropriately selected vaginal birth after cesarean. Similarly, the prominence of fetal distress and failure of progress among emergency procedures points to the value of regular review of labor-management practices, fetal monitoring protocols, and decision-to-delivery thresholds. Future studies would be strengthened by prospective data collection, standardized indication definitions, use of the Robson classification, and multivariable analysis to identify independent contributors to CS use.

5. CONCLUSION

The study shows that cesarean delivery represented more than one-third of all births at Duhok Maternity Hospital during 2020–2024 and that the proportion of elective procedures increased over time. Previous cesarean scar, maternal age, and parity were closely associated with the type of operation, while fetal distress and failure of progress remained the leading recorded indications for emergency surgery. These findings support the need for regular clinical audit, use of the Robson Ten-Group Classification System, and evidence-based labor-management protocols. Particular attention should be given to avoiding unnecessary primary cesarean sections and to expanding safe, well-supervised options for vaginal birth after cesarean in appropriately selected women.

REFERENCES

[1] Abd Elatay, Nehad B., Hanan M. Hathout, and Hala M. Gabr. "Prevalence of Cesarean section delivery and associated risk factors." The Egyptian Family Medicine Journal 5.1 (2021): 40-51.

[2] Glasier, Anna, et al. "Sexual and reproductive health: a matter of life and death." The Lancet 368.9547 (2006): 1595-1607.

[3] National Institute for Health and Care Excellence (NICE) (2011) Caesarean section (Clinical Guideline CG132). London: NICE. Available at: https://www.nice.org.uk/guidance/cg132.

[4] Souza, J. P., et al. "A global reference for caesarean section rates (C-Model): a multicountry cross-sectional study." BJOG: An International Journal of Obstetrics & Gynaecology 123.3 (2016): 427-436.

[5] Souza, Joao P., et al. "Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008 WHO Global Survey on Maternal and Perinatal Health." BMC Medicine 8.1 (2010): 71.

[6] Betrán, Ana P., et al. "Rates of caesarean section: analysis of global, regional and national estimates." Paediatric and Perinatal Epidemiology 21.2 (2007): 98-113.

[7] Zizza, A., et al. "Caesarean section in the world: a new ecological approach." Journal of Preventive Medicine and Hygiene 52.4 (2011): 161-73.

[8] Litorp, Helena, et al. "Increasing caesarean section rates among low-risk groups: a panel study classifying deliveries according to Robson at a university hospital in Tanzania." BMC Pregnancy and Childbirth 13.1 (2013): 107.

[9] World Health Organization (2018) WHO statement on caesarean section rates. Geneva: World Health Organization.

[10] Robson, Michael, Lucia Hartigan, and Martina Murphy. "Methods of achieving and maintaining an appropriate caesarean section rate." Best Practice & Research Clinical Obstetrics & Gynaecology 27.2 (2013): 297-308.

[11] Ye, Jiangfeng, et al. "Searching for the optimal rate of medically necessary cesarean delivery." Birth 41.3 (2014): 237-244.

[12] Gibbons, Luz, et al. "The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage." World Health Report 30.1 (2010): 1-31.

[13] Ahmed, Hamdia Mirkahn, and A. L. Namir. "Rate and indications of cesarean section in the Maternity Teaching Hospital in Erbil City, Kurdistan region, Iraq." Zanco Journal of Medical Sciences (Zanco J Med Sci) 22.2 (2018): 148-154.

[14] Mehedi, Shahla, Jawad Al AlDiwan, and Tariq Al Hadithi. "Cesarean section rate in a sample of primigravida women in the public maternity hospital in Erbil City, Iraq." (2018): 150-153.

[15] Al-Sanjary, Noor, Omaima Abdulrazzaq Zubair, and Raida Al-Wazzan. "Prevalence of Caesarean Sections in Mosul City Hospitals: A Cross–Sectional Study." Annals of the College of Medicine Mosul 42.2 (2020): 126-0.

[16] Barnea, Eytan R., et al. "FIGO good practice recommendations for cesarean delivery: prep-for-labor triage to minimize risks and maximize favorable outcomes." International Journal of Gynecology & Obstetrics 163 (2023): 57-67.

[17] Betran, Ana Pilar, et al. "Trends and projections of caesarean section rates: global and regional estimates." BMJ global health 6.6 (2021).

[18] Gibbons, Luz, et al. "Inequities in the use of cesarean section deliveries in the world." American Journal of Obstetrics and Gynecology 206.4 (2012): 331-e1.

[19] Yazdizadeh, Bahareh, et al. "Cesarean section rate in Iran, multidimensional approaches for behavioral change of providers: a qualitative study." BMC Health Services Research 11.1 (2011): 159.

[20] Chiocchi, Marcello, Simone Steffani, and Mario Laudazi. "Cardiac CT: The new cornerstone of precision cardiovascular medicine." 21.1 (2026): 1-4.

[21] Demirsoy, Ergun, Mehmet Ali Yesiltas, and Ahmet Ozan Koyuncu. "Bilateral mini-thoracotomy for combined coronary bypass and mitral valve repair: A case series of two patients." 21.1 (2026): 16-20.

[22] Rodrıguez-Martınez, José Antonio. "Aumento de herramientas con calculadora obligatoria y mapeo de conceptos erróneos basado en solapamiento para el razonamiento cuantitativo odontológico con mod-elos de lenguaje de gran tamano." 16.1 (2025): 19-27.

[23] Janssen, Patricia A., et al. "A predictive model for cesarean among low-risk nulliparous women in spontaneous labor at hospital admission." Birth 44.1 (2017): 21-28.

[24] Bayrampour, Hamideh, and Maureen Heaman. "Advanced maternal age and the risk of cesarean birth: a systematic review." Birth 37.3 (2010): 219-226.

[25] Villar, José, et al. "Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America." The Lancet 367.9525 (2006): 1819-1829.