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ORIGINAL ARTICLE

The impact of cervical dilation at admission on cesarean section rates and hospital stay: A comparative study of early and late admission in term pregnancies

[1]Gizem Berfin ULUUTKU BULUTLAR
[2]Eralp BULUTLAR
[3]Büşra PARLAK SOMUNCU

[1]Department of Obstetrics and Gynecology, Haydarpaşa Numune Training and Research Hospital, Istanbul, Turkey

[2]Department of Obstetrics and Gynecology, University of Health Sciences, Turkey. Istanbul Zeynep Kamil Maternity and Children's Diseases Health Training and Research Center, Istanbul, Turkey

[3]Department of Public Health, Trabzon Provincial Health Directorate, Trabzon, Turkey

ORCID ID
GBUB : 0000-0001-6979-0854
EB : 0000-0002-2246-4899
BPS : 0000-0002-0271-7019

ABSTRACT

Objective: The increasing cesarean section rates both in our country and worldwide have become a major public health concern. While cesarean sections are life-saving operations when performed under proper indications, they increase the risks of complications and place a significant economic burden on healthcare systems.

Material and Methods: This retrospective cohort study aimed to evaluate the effects of cervical dilation at hospital admission on cesarean section rates and hospital stay durations. Birth records from City Hospital between May 2020 and January 2021 were reviewed. Pregnant women between 37–41 weeks of gestation with no prior cesarean section and vertex presentation were included. Participants were divided into two groups based on cervical dilation at admission: early admission (EA) and late admission (LA). Statistical analyses were performed using SPSS 23.0, with a significance level of $p<0.05$.

Results: A total of 550 pregnant women participated in the study. The cesarean section rate was significantly higher in the EA group (19.0%) compared to the LA group (2.5%) ($p<0.001$). The time between hospital admission and delivery was significantly longer in the EA group ($p<0.001$). The average hospital stay was 2.8±1.3 days for the EA group and 1.9±0.9 days for the LA group ($p<0.001$).

Conclusion: Early admission is associated with higher cesarean section rates, prolonged labor durations, and extended hospital stays. These findings suggest that the timing of hospital admission plays a crucial role in maternal outcomes and that managing admission timing could improve delivery processes. Reducing early admissions, particularly for low-risk pregnancies, may help decrease unnecessary medical interventions and improve maternal outcomes.

Keywords: Cervical dilatation, cesarean section, hospital administration, labor, maternal health.

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Correspondence: Gizem Berfin ULUUTKU BULUTLAR, MD. Haydarpaşa Numune Eğitim ve Araştırma Hastanesi, Kadın Hastalıkları ve Doğum Kliniği, İstanbul, Türkiye.
Tel: +90 533 774 52 15 **e-mail:** berfinuluutku@yahoo.com

INTRODUCTION

The rising cesarean section (CS) rates globally and nationally have emerged as a critical public health challenge. While CS is a lifesaving procedure when medically indicated, its classification as a major surgical intervention is associated with increased risks such as blood transfusion, anesthesia complications, infections, thromboembolic events, internal organ injuries, neonatal respiratory distress, and iatrogenic prematurity. Furthermore, CS poses a significant economic burden on healthcare systems. According to the World Health Organization (WHO), cesarean rates exceeding 10–15% are not associated with further reductions in maternal or neonatal mortality.[1,2]

WHO analyses indicate a threefold rise in global cesarean rates from 1990 to 2014 across 121 countries.[2] Similarly, the increase in cesarean rates over the years in the United States is remarkable, rising from 5.5% in 1970 to 21% in 1996 and 32.4% in 2023.[1,3] In our country, the cesarean section rate between 2018 and 2023 was 57.55%, with a primary cesarean rate of 28.83%. According to the WHO Multi-Country Survey (WHO MCS) population reference calculation, the expected number of total cesarean sections and primary cesarean operations were 1,833,116 and 754,039, respectively. However, the number of cesarean sections performed in our country was approximately twice the expected value.[4] Unfortunately, these figures place our country among the nations with the highest cesarean section rates in the world.

Elevated CS rates are linked to considerable maternal and neonatal risks. Maternal risks in the short term include infections, hemorrhage, pelvic or abdominal organ injuries, venous thromboembolism, prolonged recovery, and extended hospital stays.[5,6] In the long term, CS increases the likelihood of abnormal placentation, including placenta accreta spectrum (PAS), and uterine scar complications such as cesarean scar pregnancies, uterine rupture, and pelvic adhesions, which may lead to infertility or bowel obstruction.[7–9] For neonates, CS is associated with respiratory complications like transient tachypnea, respiratory distress syndrome, and increased NICU admissions.[5,6,10,11]

High cesarean rates are associated with significant short- and long-term maternal and neonatal risks. In the short term, maternal risks include an increased likelihood of infection, hemorrhage, injury to pelvic and abdominal organs, and venous thrombosis or embolism. Compared to vaginal births, cesarean sections also result in more postpartum pain, longer hospital stays, and extended recovery periods.[5,6]

In the long term, cesarean births notably increase the risk of abnormal placentation in future pregnancies, significantly contributing to the rise in cases of placenta accreta spectrum (PAS). The elevated cesarean birth rate is a key factor in this increase.[7] Neonates born via cesarean section are at a heightened risk for respiratory issues, such as transient tachypnea, respiratory distress syndrome, persistent pulmonary hypertension, and a higher likelihood of NICU admission.[5,6,10,11]

Efforts to optimize CS rates have led to national initiatives, including strategies by the Ministry of Health to lower cesarean rates through education, partogram use, external cephalic version for breech presentations, and support for vaginal birth after cesarean where appropriate.[12]

Furthermore, future pregnancies after a cesarean carry a small but serious risk of uterine scar rupture, which plays a critical role in determining the mode of delivery for subsequent pregnancies. Approximately 60% of patients develop a uterine niche at the cesarean scar site, which can lead to cesarean scar pregnancies, abnormal uterine bleeding, pain, and infertility. Additionally, long-term complications include the development of abdominal or pelvic adhesions, which can cause bowel obstruction or subfertility.[8,9]

Efforts are being made globally to optimize cesarean section rates to reduce complications and minimize the burden on healthcare systems. In our country, the Ministry of Health is collaborating with obstetric associations to develop strategies aimed at reducing cesarean section rates.[12]

A study by Holmes et al.[13] demonstrated the impact of cervical dilation at hospital admission on CS rates. Women admitted with cervical dilation of 0–3 cm were significantly more likely to undergo CS, with nulliparous and multiparous women having 2.62 and 4.73 times the risk, respectively.

In this study, we aim to evaluate the influence of cervical dilation at hospital admission on CS rates and hospital stay durations in term singleton pregnancies without risk factors and to explore whether early admission provides neonatal benefits or reduces adverse outcomes.

MATERIAL AND METHODS

The data were obtained by reviewing the birth records from a City Hospital between May 2020 and January 2021. Ethical approval was obtained from the Bahçeşehir Çam and Sakura City Hospital Clinical Research Ethics Committee with the subject KAEK/2021.04.42 and the decision number 2021.04.92. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Pregnant women between 37–41 weeks of gestation who were admitted to the birth clinic, with no history of previous cesarean section and vertex presentation, were included in the study group. Pregnant women with hypertensive disorders of pregnancy, diabetes, placenta previa, placenta accreta spectrum, multiple gestation, an estimated fetal weight >4500 g or <2500 g, identified fetal anomalies, a history of previous uterine surgery, or membrane rupture were excluded from the study. All patients received oxytocin induction after hospital admission, while those who underwent mechanical induction or were followed up spontaneously were excluded from the study to ensure homogeneity among the groups. Age, gravida, parity, prepartum and postpartum hematocrit levels, estimated fetal weight, newborn weight, newborn sex, 1st and 5th minute Apgar scores, mode of delivery, need for transfusion, duration from hospital admission to delivery, and total hospitalization time were retrieved and recorded from the system.

The study group was divided into two: those with a cervical dilation of ≥4 cm at the time of admission were classified as the late admission (LA) group, and those with a cervical dilation of <4 cm were classified as the early admission (EA) group. In the total patient group, the EA and LA groups were compared for the above parameters. Then, the study group was further divided into nulliparous and parous women, and the EA and LA groups were compared within each subgroup.

Cesarean section rates, duration from hospital admission to delivery, total hospitalization time, and transfusion needs of the EA and LA groups were compared.

Statistical Methods

The data were analyzed using the SPSS 23.0 statistical package program. Descriptive statistics for the evaluation results were presented as numbers and percentages for categorical variables and as means, standard deviations, minimum, and maximum values for numerical variables. The Chi-square test was used to analyze the differences in the proportions of categorical variables between independent groups. The Kolmogorov-Smirnov test was employed to assess whether the data met the conditions for normal distribution. Comparisons of numerical variables between two independent groups were performed using the Student's t-test when the normal distribution condition was met, and the Mann-Whitney U test when it was not. Changes in numerical variables between two dependent groups were compared using the Split Plot ANOVA test. A p-value of <0.05 was considered statistically significant.

RESULTS

The mean age of the 550 pregnant women included in the study was 26.5±5.5 years. Of these participants, 231 were in the EA group, while 319 were in the LA group. Of the pregnancies, 498 (90.5%) resulted in normal vaginal delivery, while 52 (9.5%) ended in cesarean section. Blood and blood product replacement were performed in 23 patients (4.2%) during the postpartum period (Table 1).

There were significant differences in the number of pregnancies (gravidity) and births (parity) between nulliparous and multiparous women, especially regarding the total population (p<0.001 for both). However, there were no significant differences between the early and late admission groups regarding gestational week, estimated fetal weight, prepartum hematocrit levels, and newborn birth weight (Table 1).

When examining nulliparous women, parous women, and the total patient population, cesarean rates were found to be significantly higher in the EA group in all groups. Among nulliparous women, 21.5% (28 patients) in the EA group underwent cesarean delivery, compared to only 3.2% (3 patients) in the LA group (p<0.001). Similarly, 15.8% (16 patients) of EA parous women underwent cesarean delivery, while only 2.2% (5 patients) in the LA group did (p<0.001). When considering the total population, 19.0% (44 patients) of women in the EA group underwent cesarean delivery, while only 2.5% (8 patients) of women in the LA group did (p<0.001) (Table 2).

The time between hospital admission and delivery for nulliparous women was 20.9±21.5 hours for early admissions and 6.8±6.2 hours for late admissions (p<0.001). Among multiparous women, the average time to delivery was 15.2±11.1 hours in the EA group and 4.5±4.5 hours in the LA group (p<0.001). Similarly, in the total population, the average time between hospital admission and delivery was 18.4±17.9 hours in the EA group, compared to 5.2±5.2 hours in the LA group (p<0.001). In all patient groups, EA significantly prolonged the time spent in the hospital until delivery (Table 2).

Table 1: Characteristics of the study population categorized by cervical dilation at the time of hospital admission

	Nulliparous women			Parous women			Total		
	Early admission	Late admission	p	Early admission	Late admission	p	Early admission	Late admission	p
Maternal age (year)	24.0±4.7	24.0±4.0	0.654	29.2±5.7	27.7±5.5	**0.035**	26.3±5.7	26.6±5.3	0.209
Gravidy (n)	1.1±0.5	1.1±0.3	0.878	3.1±1.1	3.2±1.5	0.879	2.0±1.3	2.6±1.6	**<0.001**
Parity (n)	0.0±0.0	0.0±0.0	1.000	1.7±0.9	1.8±1.0	0.638	0.8±1.0	1.2±1.1	**<0.001**
Gestational age(week)	39.3±1.2	39.0±0.9	**<0.001**	39.1±1.0	39.1±1.2	0.586	39.1±1.1	39.0±1.1	0.094
Estimated fetal weight (EFW) (gr)	3369.2±336.3	3331.1±343.8	0.421	3497.7±393.0	3441.8±400.4	0.272	3425.4±366.9	3409.2±387.4	0.644
Prepartum hematocrite levels	36,5±3,5	35.6±3.7	0.067	35.1±3.7	35.5±3.2	0.222	35.9±3.6	35.6±3.3	0.310
Postpartum hematocrite levels	32.42±3.88	32.27±3.95	0.777	33.01±4.10	33.02±3.83	0.983	32.7±4.12	32.9±3.93	0.598
Baby weight (gram)	3281.9±393.2	3163.4±396.1	**0.027**	3433.2±410.8	3408.8±401.2	0.614	3348.0±407.1	3336.5±414.5	0.745
Female baby (n)	67 (27.8%)	104 (72.2%)	0.233	40 (27.8%)	104 (72.2%)	0.266	107 (40.1%)	160 (59.9%)	0.374
Male baby (n)	63 (62.4%)	38 (37.6%)		61 (33.5%)	121 (66.5%)		124 (43.8%)	159 (56.2%)	

Table 2: Comparison of maternal and neonatal outcomes between early and late admission in nulliparous and parous women

	Nulliparous women			Parous women			Total		
	Early admission	Late admission	p	Early admission	Late admission	p	Early admission	Late admission	p
Vaginal delivery (n)	102 (78.5%)	91 (96.8%)	**<0.001**	85 (84.2%)	220 (97.8%)	**<0.001**	187 (81.0%)	311 (97.5%)	**<0.001**
Cesarean delivery (n)	28 (21.5%)	3 (3.2%)		16 (15.8%)	5 (2.2%)		44 (19.0%)	8 (2.5%)	
Need for transfussion (n)	6 (4.6%)	6 (6.4%)	0.780	8 (7.9%)	3 (1.3%)	**0.005**	14 (6.1%)	9 (2.8%)	0.097
Duration from hospital admission to delivery (hour)	20.9±21.5	6.8±6.2	**<0.001**	15.2±11.1	4.5±4.5	**<0.001**	18.4±17.9	5.2±5.2	**<0.001**
Total hospitalization time (day)	3.0±1.4	2.0±1.0	**<0.001**	2.6±1.0	1.8±0.8	**<0.001**	2.8±1.3	1.9±0.9	**<0.001**
1. minute apgar	7.4±1.2	7.6±1.0	0.539	7.4±1.1	7.5±0.9	0.229	7.4±1.2	7.6±0.9	0.274
5. minute apgar	9.1±1.3	9.1±0.7	0.362	9.2±0.6	9.1±0.6	0.690	9.1±1.0	9.1±0.6	0.590

Regarding total hospitalization time, the average hospital stay for EA nulliparous women was 3.0±1.4 days, while for LA nulliparous women, it was 2.0±1.0 days (p<0.001). Similarly, among parous women, the average hospital stay for the EA group was 2.6±1.0 days, compared to 1.8±0.8 days for the LA group (p<0.001). In the total population, the average hospital stay for EA women was 2.8±1.3 days, while for LA women, it was 1.9±0.9 days (p<0.001). In all patient groups, EA significantly prolonged total hospitalization time (Table 2).

The 1st and 5th-minute Apgar scores showed no statistically significant differences between the early admission (EA) and late admission (LA) groups among both nulliparous and parous women, as well as in the total population (p>0.05) (Table 2).

In the EA group, the prepartum hematocrit level was 35.9±3.6, and the postpartum hematocrit level was 32.7±4.1. In the LA group, the prepartum hematocrit level was 35.6±3.3, and the postpartum hematocrit level was 32.9±3.9. The decrease in hematocrit levels was found to be greater in the EA group compared to the LA group (p=0.043) (Table 1).

Among nulliparous women, 4.6% (6 patients) in the EA group and 6.4% (6 patients) in the LA group required transfusion, but this difference was not statistically significant (p=0.780). However, among parous women, 7.9% (8 patients) in the EA group required transfusion compared to 1.3% (3 patients) in the LA group, with the transfusion requirement being significantly higher in the EA group (p=0.005). In the total population, 6.1% (14 patients) in the EA group and 2.8% (9 patients) in the LA group required transfusion, but this difference was not statistically significant (p=0.097).

In conclusion, there was no significant difference between the EA and LA groups in terms of neonatal Apgar scores. Regarding transfusion needs, while the need for transfusion was higher in parous women in the EA group compared to the LA group, no significant difference was found for nulliparous women or in the total population (Table 2).

Among maternal outcomes, two cases of fourth-degree perineal laceration were observed in both the EA and LA groups. No instances of maternal infection, venous thromboembolism, or abdominal organ injury were reported in either group.

DISCUSSION

This study evaluated the effects of cervical dilation on vaginal delivery and cesarean section rates in pregnant women who were admitted in the early (EA) and late (LA) stages of labor. Our study shows that while the vaginal delivery rate in late admission women is 97.5%, this rate remains at 81% in early admission women. It is noteworthy that the cesarean section rate is 7.6 times higher in the EA group. According to the literature, pregnant women with cervical dilation ≥4 cm at the time of admission have a significantly higher chance of vaginal delivery.[14–16]

In many developed countries, such as the USA, the National Partnership for Maternal Safety recommends the hospitalization of low-risk pregnant women if they present with regular contractions, ≥80% cervical effacement, and 4–5 cm cervical dilation. Similarly, Norwegian obstetric guidelines also recommend hospitalization in

the active phase of labor.[14,17] In our country, since there are no clear recommendations on the subject from the Ministry of Health, obstetric clinics and physicians adopt different approaches.

Admitting pregnant women with cervical dilation less than 4 cm to the hospital can lead to unnecessary medical interventions, which, in turn, increases cesarean section rates and other complications. However, it is not possible for women to check their cervical dilation before admission, leading to hospitalizations during the latent phase. In these cases, due to insufficient data in the literature, different approaches are adopted regarding hospitalization or discharge. In a study conducted with more than 17,000 pregnant women in Texas, criteria were established for discharge in latent phase pregnancies with cervical dilation <4 cm, intact membranes, no cervical changes after two hours of observation, and normal fetal heart rate. Of the women meeting these criteria, 3,949 were discharged, and no adverse maternal or fetal outcomes were observed.[18]

In the EA group, the duration from hospital admission to delivery was 3.5 times longer, and the total hospitalization time was 1.4 times longer, which could have negative psychological and social effects as well as place an excessive burden on the healthcare system.

One possible explanation for the higher cesarean section rates among women admitted during the latent phase of labor is that these women are more likely to receive interventions such as epidural analgesia and oxytocin augmentation.[16,19]

Low-risk pregnant women should not be hospitalized early if possible. If discharge is not an option due to anxiety, distance from the hospital, transportation difficulties, or other reasons, midwifery care should be effectively utilized, and an intrapartum care model should be implemented in line with WHO recommendations. The main goal should be to improve the care provided to early-admission women without reducing their chances of spontaneous delivery by preparing physical environments where they can remain mobile, continue oral intake, and receive social support in the hospital but outside of the labor ward. To avoid unnecessary interventions, pregnancy, labor, and childbirth care should focus on treating childbirth as a physiological process.

In our study, cesarean section rates, hospital stay durations, and transfusion needs were significantly higher in the EA group compared to the LA group. These findings are consistent with the literature highlighting the role of cervical dilation in the delivery process and its effect on cesarean section rates.[13,20]

In the study by Holmes et al.,[13] it was found that cervical dilation at the time of hospital admission had a significant effect on cesarean section risk. The study showed that as cervical dilation increased, the risk of cesarean decreased; women who presented with early dilation (0–3 cm) had higher rates of cesarean section, oxytocin induction, and epidural anesthesia. In our study, similarly, the low cervical dilation in the EA group was associated with significantly increased cesarean section rates. These results suggest that early admission may make the delivery process more interventionist.

The significantly longer hospital stay in the EA group may be related to the need for more medical interventions during the delivery process in these women. Similar findings have been reported in the literature. For example, Miller et al.[21] reported that women admitted early in labor had longer labor durations and higher complication risks.[21,22] This supports the hypothesis that prolonged labor can lead to more medical interventions, which, in turn, extend hospital stays.

In our study, the need for transfusion was significantly higher among parous women in the EA group. This finding indicates that the amount of bleeding during and after delivery is closely related to how long labor takes. The literature also reports that prolonged labor increases the risk of postpartum hemorrhage, which can lead to the need for transfusion.[23] In this context, our study's findings suggest that prolonged labor and early admission can increase this risk.

In terms of neonatal outcomes, there was no significant difference in 1st and 5th minute Apgar scores between the EA and LA groups. However, the adverse maternal outcomes in the EA group are noteworthy.

The World Health Organization (WHO) also recommends keeping cesarean section rates between 10–15% and emphasizes that unnecessary cesarean sections can negatively impact maternal and neonatal health.[2]

Limitations and Strengths

This study's main limitation is its retrospective design, which may introduce selection bias. Additionally, the study was conducted in a single institution, which may limit the generalizability of the findings. However, the strengths of our study include its relatively large sample size and focus on a topic of clinical importance that is underrepresented in the literature.

CONCLUSION

Our study highlights the negative impact of early hospital admission during the latent phase of labor on cesarean section rates, hospital stay durations, and maternal outcomes. To mitigate these risks, we recommend the adoption of guidelines encouraging the hospitalization of low-risk women only during the active phase of labor. Additionally, alternative care models such as midwifery-led care units and birth schools should be explored to provide support for women in early labor without resorting to unnecessary medical interventions. Future research should focus on the implementation and outcomes of such models to enhance maternal and neonatal health outcomes while reducing the burden on healthcare systems.

Statement

Ethics Committee Approval: The Bahçeşehir Çam and Sakura City Hospital Clinical Research Hospital Ethics Committee granted approval for this study (date: 14.04.2021, number: 42).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Conflict of Interest: The authors have no conflict of interest to declare.

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