Rate of Cesarean Section in Hospitals Affiliated with Ahvaz Jundishapur University of Medical Sciences, Iran

A R T I C L E   I N F O

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Authors
Babadi E.[1] *MSc*
Abbaspoor Z.[2] *PhD*
Ghanbari S.[3] *PhD*
Mohammadi S.[2] *PhD*
Javadnoori M.[2]* *PhD*

A B S T R A C T

Aims The cesarean section rate in Iran is much higher than the rate recommended by the World Health Organization. Implementation of effective measures to reduce the cesarean rate requires proper analysis and classification. Robeson's classification can be useful in identifying the groups that play the most important role in the cesarean section rate. The present study was conducted to analyze the rate of cesarean section based on Robson's system in hospitals affiliated with Jundishapur University of Medical Sciences, Ahvaz, Iran.

Instrument & Methods This multi-center cross-sectional study, in 2019, examined 950 pregnant women admitted for delivery or cesarean section in two teaching hospitals affiliated with Jundishapur University of Medical Sciences, Iran, using a convenient sampling method. The data collection tool was a checklist based on Robson's ten classification system. Data were analyzed using SPSS 22 software and descriptive-analytical statistical tests.

Findings The overall cesarean rate was 48.94%. the largest relative contributions to the CS rate were group 5, group 10, and group 1, respectively. The main causes of cesarean section in all groups were previous cesarean section, fetal distress, and severe pre-eclampsia. The number of cesarean sections in midwife-led hospitals was less than in physician-centered hospitals.

Conclusion Group 5 of Robeson's classification, representing repeated cesarean sections, contributed the most to the overall cesarean rate.

Keywords Childbirth; Cesarean Section; Robson's Classification

[1]Department of Midwifery, School of Nursing and Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[2]"Reproductive Health Promotion Research Center" and "Department of Midwifery, School of Nursing and Midwifery", Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[3]Department of Biostatistics and Epidemiology, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Correspondence
Address: School of Nursing and Midwifery, Jundishapur University of Medical Sciences, Golestan, Esfand Street, Ahvaz, Iran. Postal Code: 3333761357
Phone: +98 (916) 9163082048
Fax: +98 (61) 33738333
mojganjavadnoori@gmail.com

C I T A T I O N   L I N K S

[1] Reasons for elective cesarean section on maternal ... [2] Maternal complications and cesarean section without indication: systematic ... [3] Trend and sociodemographic correlates of cesarean section utilization in Nepal: evidence from ... [4] The increasing trend in cesarean section rates: global, ... [5] Non-Clinical Variables Influencing Cesarean Section ... [6] Trends and projections of cesarean section rates: global and regional ... [7] Evaluation of relationship between delivery mode and postpartum ... [8] Cesaren section in maternity hospitals in ... [9] Beyond 'Cesarean Overuse': Hospital-Based Audits of Obstetric Care and Maternal ... [10] Cesarean delivery in Iran: a population-based analysis using the ... [11] Cesarean delivery: Shocking ... [12] Prevalence, causes, and complications of cesarean delivery ... [13] China's 50% cesarean delivery rate: is it ... [14] Cesarean section rate in Iran, multidimensional approaches for ... [15] WHO recommendations on intrapartum care for a positive ... [16] Non-clinical interventions to reduce unnecessary cesarean sections: ... [17] Non-clinical interventions for reducing unnecessary ... [18] Classifications for cesarean section: A systematic ... [19] Robson classification of cesarean births: implications for reducing cesarean section ... [20] Classification of cesarean ... [21] Best practice advice on the 10-Group ... [22] Cesarean delivery in the United States 2005 through 2014: A ... [23] An analysis of the high cesarean section rates in Turkey by Robson ... [24] Examining cesarean section rates in Canada using the Robson ... [25] Cesarean delivery rates using Robson classification system in ... [26] Analysis of the cesarean section rate using the 10-Group Robson ... [27] Vaginal birth after cesarean section in Iran: A narrative ... [28] Impact of clinical audits on cesarean section rate in a Spanish hospital: Analysis of 6 year data ... [29] Examining cesarean section rates in Canada using the modified ... [30] Using the Robson 10-group classification system to compare cesarean ...

Introduction

The cesarean section rate is the global indicator for evaluating access to obstetric and gynecological services [1]. However, it is important to note that this procedure is a major surgery and carries certain risks, such as increased postpartum bleeding, anesthesia complications, infection, thromboembolism, and maternal death [2]. Over the past three decades, there has been a significant and steady increase in cesarean rates, particularly in middle- and high-income countries [3]. Recent data suggests that approximately one-fifth of women undergo cesarean surgery, and this rate continues to rise in most regions of the world [4, 5]. The World Health Organization has set a guideline stating that the cesarean rate in any region should not exceed 10-15% [6]. However, research conducted in Iran reveals that more than 70% of pregnant women have a cesarean section for unnecessary reasons [7]. In Iran, the reported cesarean rates vary from 26% to 66.5% in different studies, with some private centers even reporting rates as high as 87% [8-10]. In Khuzestan province, the cesarean section rate was 47% in 2018 and increased to 48% in 2019 [11]. The reasons behind the rising cesarean rates are multifactorial and include factors such as fear of pain, concerns about post-vaginal delivery changes in the reproductive system, the misconception that cesarean section is better for the child, fear of medical procedures, and various economic, organizational, social, and cultural factors [5, 12, 13] .It is worth noting that a significant portion of the increase in cesarean rates in Iran is attributed to healthcare providers' concerns regarding legal issues that may arise during natural childbirth [14]. To address the global increase in cesarean sections and prevent harm to women and infants caused by unnecessary use of this method, the World Health Organization (WHO) published new recommendations in 2018 on non-clinical interventions aimed at reducing unnecessary cesarean sections [15]. Non-clinical interventions encompass a range of interventions implemented outside the usual clinical interactions between a service provider and a pregnant woman. These interventions can target women, such as childbirth preparation classes, or healthcare providers, such as clinical practice guidelines. They can also be directed toward health organizations, such as implementing different payment systems for cesarean sections [16].

One of the factors that hamper the accurate understanding of the increasing trend of cesarean section surgeries is the lack of an internationally accepted standard classification system to monitor and compare their rates consistently and practically [17]. In 2011, a systematic and critical review was conducted to evaluate existing classifications for cesarean sections, and it was concluded that women-based classifications in general, and specifically Robeson's 10-group classification system, are the most suitable choices to meet current needs at both international and national levels [18, 19]. To standardize the use of cesarean sections in hospitals or birthing centers, the WHO recommends adopting Robson's classification system [6] .This system was proposed in 2001 and has been utilized to assess variations in cesarean delivery across different prenatal care delivery systems in various countries, enabling comparisons of rates within and between hospitals, health systems, and countries. By categorizing women based on known obstetric characteristics such as the number of births, history of cesarean section, gestational age, onset of labor, fetal position, and number of fetuses, the Robson system allows for the identification of changes in the perinatal care system and informs interventions aimed at enhancing quality and safety [20]. In this system, women are categorized into ten distinct groups based on their obstetric characteristics, including the number of births, history of cesarean section, gestational age, onset of labor, fetal position, and number of fetuses [17]. Robson's intentional and consistent classification system is an appropriate tool to enhance clinical practice [21]. Due to its prospective nature and comprehensive and reciprocal categories, any woman admitted for delivery can be promptly classified based on a few fundamental characteristics commonly employed by obstetricians worldwide. The data can be collected and categorized [18]. Several countries, such as America [22], Nigeria [19], Canada, Turkey, Egypt, Ireland, and Spain [22-24], have utilized Robson's classification system as a tool to monitor the cesarean rate and assess the impact of management changes on clinical practice. In the United States, there is a growing demand for the greater integration of the Robson classification into quality improvement initiatives [25].

There had been no previous study in Ahvaz investigating the causes of cesarean section, especially about differences between the rate of cesarean deliveries in midwife-centered hospitals and physician-centered hospitals. Therefore, the present study was conducted to analyze the rate of cesarean section based on Robson's system in hospitals affiliated with Jundishapur University of Medical Sciences, Ahvaz, Iran. Additionally, a comparison was made between the rate of cesarean deliveries in midwife-centered hospitals and physician-centered hospitals.

Instrument and Methods

This cross-sectional study was conducted in two teaching hospitals affiliated with the Ahvaz Jundishapur University of Medical Sciences in 2019. The statistical population included all pregnant women admitted for childbirth or cesarean section in two hospitals. Imam Khomeini Hospital is a referral hospital to which complicated childbirth cases in the province are referred, and it is the main training

center for obstetrics and gynecology assistants at this university. Sina Hospital, which is the main training center for midwifery students, and vaginal births are mainly performed by midwives, and women's assistants are not present there. The sample size of 950 people was determined using Med-Cal statistical software based on previous studies, investigation, and analysis of the cesarean rate in Egypt according to Robeson's tenfold classification [26]. The error rate was set at 5% with a power of 80%, while p1=0.43 and p2=0.03. The inclusion criteria encompassed pregnant women with a gestational age of 28 weeks or more and a birth weight exceeding 500g who were referred for termination of pregnancy, delivery, or cesarean section. The exclusion criteria were incomplete medical records.

The data collection tool consisted of demographic information and obstetric records. The obstetric records included the number of births, previous delivery method, gestational age, onset of labor, fetal position, and number of fetuses. A checklist based on Robson's classification system was also included (Table 1).

Once the criteria for entering the research units were determined, demographic information and obstetric records were completed.

The researcher effectively communicated the research objectives to the participants and obtained verbal consent from them, ensuring the confidentiality of their information. Throughout the research process, scientific integrity was upheld.

Descriptive statistics tests were employed to determine the cesarean section rate and the frequency of its causes. Additionally, the Chi-square test was utilized to establish the relationship between demographic characteristics and the causes and frequency of cesarean sections in SPSS 22 software.

Table 1. Displays Robson's ten-group classification system (10 groups)

Group 1	Primiparous women, singleton pregnancy with cephalic presentation, gestational age of 37 weeks or more, and spontaneous onset of labor.
Group 2	Primiparous women, singleton pregnancy with cephalic presentation, gestational age of 37 weeks or more, with induction of labor or cesarean delivery before the onset of labor.
Group 3	Multiparous women (no history of uterine scar), singleton pregnancy with cephalic presentation, gestational age of 37 weeks or more and spontaneous onset of labor.
Group 4	Multiparous women (with no history of uterine scar), singleton pregnancy with cephalic presentation, gestational age of 37 weeks or more with induction of labor or cesarean delivery before the onset of labor.
Group 5	All multiparous women (with at least one uterine scar), singleton pregnancy with cephalic presentation, gestational age of 37 weeks or more.
Group 6	All primiparous women, singleton pregnancy with breech presentation.
Group 7	All multiparous women, singleton pregnancy, and breech presentation (with or without previous uterine scar).
Group 8	All women with multiple pregnancies (with or without previous uterine scar).
Group 9	All women with a singleton pregnancy with a transverse or oblique view (with or without previous uterine scar).
Group 10	All women with singleton pregnancy with cephalic presentation and gestational age less than 37 weeks (with or without previous uterine scar).

Findings

The study examined 950 pregnant women receiving care at Imam Khomeini and Sina hospitals, each with 475 participants. Most participants were 18 to 35 years old and multiparous (Table 2).

Table 2. Comparing the frequency (the numbers in parentheses are percentages) of demographic and midwifery characteristics between the Imam physician-oriented (n=475) and Sina midwife center (n=475) hospitals (Chi-square test)

Parameter		Imam	Sina	p-Value
Age (year)	18<	31 (6.5)	27 (5.7)	0.024
	18-35	363 (76.4)	395 (83.2)	
	35>	81 (17.1)	81 53 (11.2)	
Education (year)	6<	221 (46.5)	237 (49.9)	0.320
	6-12	229 (48.2)	221 (46.5)	
	12>	25 (5.3)	17 (3.6)	
Employment status	Housewife	457 (96.2)	456 (97.9)	0.178
	Employed	18 (3.8)	10 (2.1)	
Gestational age	Term	331 (69.7)	441 (92.8)	0.0001
	Preterm	144 (30.3)	34 (7.2)	
Gravida	Noli Par	122 (25.7)	119 (25.1)	0.881
	Multi par	353 (74.3)	356 (74.9)	
Type of delivery	Normal delivery	192 (40.4)	293 (61.7)	0.0001
	Cesarean section	283 (59.6)	182 (38.3)	

The highest proportion of cesarean sections was observed in group 5 (multiple with a uterine scar, singleton, cephalic, term), group 10 (singleton, cephalic, preterm), and group 1 (primiparous, singleton, cephalic, term, spontaneous onset of labor). There was a significant difference between the groups (χ^2=497.07; p<0.001). Imam (n=283) and Sina (n=182) hospitals had a notable disparity in the cesarean section rate (p<0.0001; Table 3).

Imam Khomeini Hospital had a higher prevalence of Group 1 and groups 4 to 10. The comparison of cesarean section indications between the two hospitals also revealed a significant difference (χ^2=32.071; p<0.001). However, both hospitals had the highest proportion of repeated cesarean sections (Table 4).

Group 1 had the highest percentage of fetal distress (87.2%), while Group 2 had a lack of progress (53.8%). Groups 3 and 4 had fetal distress (74.3 and 40%, respectively). Group 5 had a previous cesarean section (97.4%).

Table 3. Frequency (the numbers in parentheses are percentages) of cesarean section in Robson's groups in the Imam physician-oriented (n=475) and Sina midwife center (n=475) hospitals

Robson groups	Women	Cesarean	Absolute contribution	Cesarean Rate	Imam Hospital	Percent of CS	Sina Hospital	Percent of CS
Group 1	109 (11.5)	47 (10.10)	4.9	43.11	28 (6.0)	9.9	19 (4.1)	10.5
Group 2	82 (6.8)	26 (59.5)	2.7	31.7	13 (2.8)	4.6	13 (2.8)	7.2
Group 3	315 (33.2)	35 (7.52)	3.7	11.11	16 (3.4)	5.7	19 (4.1)	10.5
Group 4	55 (5.8)	10 (2.15)	1.1	18.18	6 (1.3)	2.1	4 (0.9)	2.2
Group 5	189 (19.9)	189 (64.40)	19.9	100	95 (20.5)	33.6	93 (20.0)	51.4
Group 6	11 (1.2)	11 (2.36)	1.2	100	8 (1.7)	2.8	3 (0.6)	1.7
Group 7	21 (2.2)	21 (4.51)	2.2	100	15 (3.2)	5.3	6 (1.3)	3.3
Group 8	22 (2.3)	22 (4.57)	2.3	100	15 (3.2)	5.3	7 (1.5)	3.9
Group 9	6 (0.6)	6 (1.29)	0.6	100	6 (1.3)	2.1	0	0
Group 10	140 (14.7)	98 (21.07)	10.3	70	81 (17.5)	28.6	17 (3.7)	9.4

Table 4. Comparing the frequency (the numbers in parentheses are percentages) of demographic and midwifery characteristics between the Imam physician-oriented (n=283) and Sina midwife center (n=182) hospitals (Chi-square test)

Causes of cesarean section	Imam Hospital	Sina Hospital
Previous cesarean section	146 (31.4)	108 (23.3)
Fetal distress	64 (13.8)	36 (7.8)
Multiple pregnancies	9 (1.9)	6 (1.3)
Abnormal presentation	10 (2.2)	12 (2.6)
Extreme hyperactivity	23 (5)	4 (0.9)
Failure to progress in labor	7 (1.5)	5 (1.1)
Placenta accreta	5 (1.1)	0 (0.0)
macrosomia	1 (0.2)	2 (0.4)
Placental abruption	10 (2.2)	0 (0.0)
Chorioamnionitis	1 (0.2)	0 (0.0)
Placenta Previa	4 (0.9)	0 (0.0)
Non-response to induction	2 (0.4)	8 (1.7)
Previous scar	1 (0.2)	0 (0.0)
Total	283 (61.0)	182 (39.0)

Table 5. Frequency of cesarean section reasons in Robeson's 10 groups

Causes	1	2	3	4	5	6	7	8	9	10	Total
Previous cesarean section	0	0	1 (2.9)	0 (0.0)	184 (97.4)	0	5 (2.9)	2 (9.1)	4 (66.7)	59 (60.2)	255 (54.8)
Fetal distress	41 (87.2)	9 (34.6)	26 (74.3)	4 (40.0)	1 (0.5)	2 (18.2)	1 (4.8)	0	0	16 (16.3)	100 (21.5)
Multiple pregnancies	0	0	0	0	0	0	0	15 (68.2)	0	0	0
Abnormal presentation	0	0	0	0	0	10 (80.3)	11 (52.4)	1 (4.5)	0	0	22 (4.7)
Extreme hyperactivity	1 (2.1)	2 (2.7)	2 (5.7)	2 (20.0)	3 (1.6)	2 (18.2)	1 (4.8)	2 (9.1)	0	12 (12.2)	27 (5.8)
macrosomia	0	0	3 (8.6)	0	0	0	0	0	0	0	3 (0.6)
Failure to progress in labor	3 (6.4)	14 (53.8)	1 (2.9)	3 (30.0)	0	0	0	0	0	1 (1.0)	22 (4.8)
Causes of fetal placenta	0	0	0	0	1 (0.5)	0	0	0	0	1 (1.0)	2 (0.4)
Other causes	47 (100)	26 (100)	35 (100)	10 (100)	189 (100)	11 (100)	21 (100)	22 (100)	6 (100)	98 (100)	465 (100)

Abnormal presentations were prevalent in groups 6 and 7 (80.3 and 52.4%, respectively). Group 8 had multiples (68.2%), and Groups 9 and 10 had previous cesarean sections (66.7 and 60.2%, respectively). These factors were the leading causes of cesarean sections ($\chi2=1152.09$; $p<0.001$; Table 5).

Discussion

The present study examined the frequency of cesarean section using Robson's classification system in two educational hospitals associated with Jundishapur University of Medical Sciences in Ahvaz. Moreover, the causes of cesarean sections were investigated based on the type of hospital (physician-centered/midwife-centered). According to the findings, the overall cesarean section rate was 48.94%. The Ministry of Health released data indicating that the cesarean section rates in Khuzestan province were 47% and 48% in 2018 and 2019, respectively [11]. Furthermore, a recent study conducted in Iran reported a cesarean rate of 51.6% [10].

One study reported that nearly half of the mothers in Iran undergo a cesarean section for childbirth, and two-thirds of them have repeated cesarean sections [27]. The study reveals that the highest contribution to the cesarean section rate comes from group 5, which consists of multiparous women with at least one uterine scar, singleton pregnancy, cephalic presentation, and term delivery. This group alone accounts for 40% of all cesarean sections and represents repeated cesarean sections, thus significantly impacting the overall high rate of cesarean sections in Iran. Following group 5, groups 10 (preterm births) and 1 (primiparous women with term, cephalic, singleton pregnancies) rank second and third, contributing to 21% and 10% of the cesarean section rate. Notably, groups 5 to 9 have a 100% cesarean section rate, while group 10 has a 70% rate. Group 1, on the other hand, has a 43% rate, indicating that vaginal birth after cesarean was not performed in any previous cesarean cases. Furthermore, all cases involving breech presentation, multiple pregnancies, and transverse view necessitated cesarean section. Additionally, 70% of

premature births are delivered via cesarean section. To address this issue, it is crucial to focus on training programs aimed at enhancing the practical skills of midwives and gynecologists in performing vaginal delivery for breech presentation. This approach can prove to be an effective solution. In line with this, the WHO has developed nonclinical strategies to tackle this matter [15, 16]. According to a recent study conducted in Iran, Robeson's group 5 accounted for the highest proportion of cesarean sections, with a rate of 98.4%. Groups 2 and 1 followed closely behind in total cesarean sections, with rates of 20.6% and 10.8%, respectively [10].

Robeson's group 5 has consistently emerged as one of the primary contributors to the rise in cesarean rates across numerous studies. Notably, a study conducted in Egypt revealed that groups 10, 6, and 5 significantly drove up the cesarean section rate [26]. Furthermore, a study carried out at the esteemed National Maternity Hospital in Dublin, Ireland, a renowned referral center in Europe, highlighted that groups 2,5,10 exhibited the highest rate of cesarean section [25].

The research conducted by Pinto *et al.* [28] from 2011 to 2018 and Guo *et al.* [29] from 2016 to 2017 further emphasized the substantial impact of Robeson's group 5 on the overall proportion of cesarean sections. The frequency of cesarean sections in Robson's groups in the studied hospitals was influenced by various factors. Notably, previous cesarean section and fetal distress were prominent causes of cesarean section. Group 5 had the highest cesarean section rate among the groups, with previous cesarean section being one of the obvious causes. Similarly, groups 9 and 10 also had a significant association with previous cesarean section as a cause of cesarean delivery. On the other hand, groups 1, 3, and 4 were primarily affected by fetal distress as the main cause of cesarean section. Another study found that "fetal distress" and "undefined symptoms" were the most common reasons for cesarean delivery, with cesarean rates of 13.6 and 13.4%, respectively [10].

The methodological difference is the reason for the variation between this study and others. In this study, the causes of all cesarean sections in Iran were evaluated using a population-based approach.

No research has been conducted in Iran to examine the potential variances in cesarean rates between midwife and physician-centered hospitals. Our investigation revealed that at Sina Hospital, a facility focused on midwifery care, the rate of vaginal deliveries was notably higher compared to Imam Khomeini Hospital, which prioritizes physician-led care. Pourshirazi's study also identified a significant disparity in the cesarean section rates among three categories of hospitals: public, private, and other hospitals, for Robson groups 1, 2, 3, 4, and 10 [10].

A study conducted by Smith *et al.* in 2019 aimed to compare the utilization of cesarean delivery in birth centers in the United States of America. The study examined birth centers both with and without a midwife. The findings revealed that when a midwife was present, the rates of cesarean section and labor induction were lower. Additionally, women with a history of previous cesarean section had a higher rate of natural delivery. These results demonstrate the advantages of having a midwife present in reducing the cesarean section rate, which aligns with the outcomes of our research [30].

In Iran, the significance of VBAC as a global strategy to decrease the cesarean rate has unfortunately been overlooked [15, 16]. A recent study conducted in hospitals affiliated with Mashhad University of Medical Sciences revealed that the VBAC rate was only 2%. This study identified several obstacles within the healthcare system that contribute to this low rate, including an atmosphere of restriction, fear, and discouragement. These obstacles stem from various factors such as limited access to specialized services, an inadequate encouragement system, a prevailing preference for cesarean sections, a physician-centered approach to VBAC, concerns regarding legal liability, imposed policies, the marginalization of midwives, and a lack of support from the birth team [16].

The present results will aid in formulating essential strategies to decrease the number of cesarean sections, focusing on the principle of avoiding unnecessary primary cesarean sections. Based on the findings of the study, enhancing the clinical expertise of midwives in the area of natural childbirth, improving the quality of prenatal education on physiological childbirth, employing pharmacological interventions to alleviate pain during labor, and providing woman-centered care can contribute to reducing primary cesarean section rates and increase the likelihood of women experiencing effective natural childbirth. Consistent with the global initiative to decrease the rate of cesarean sections and in alignment with the recommendations of the World Health Organization (WHO), strategic and operational planning to reduce the rate of repeat cesarean sections, along with strategies to decrease elective cesarean sections in first pregnancy, are effective measures to decrease the overall rate of cesarean sections in Iran.

The analysis of the factors leading to the cesarean section cesarean groups, which was not addressed in prior studies focusing on evaluating the cesarean section rate utilizing Robeson's classification, is a notable aspect of this research. This study had a few limitations. One limitation was that we did not analyze each Robson group's maternal and neonatal outcomes, so we could not establish any associations between higher CS rates and obstetric outcomes. The information presented in this research could prove valuable in a subsequent study to enhance the physiological aspects of labor and delivery. It is recommended that future studies focus on maternal

and perinatal outcomes and CS rate trends of consecutive years using the Robson classification.

Conclusion

The largest proportion is in Group 5 of Robson's classification, which represents repeated cesarean sections. The most common reasons for cesarean sections are previous cesarean deliveries and fetal distress. Additionally, there are variations in cesarean rates by hospital peer group, especially physician-oriented.

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