

## Original Article

# Comparison of cesarean section rate in Xingtai People's Hospital from 2015 to 2019 based on Robson Ten Group Classification System

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**Abstract:** Objective: To explore the changes of cesarean section rate in Xingtai People's Hospital from 2015 to 2019 using Robson Ten Group Classification System and analyze the related factors. Methods: A total of 12064 parturients who gave birth in Xingtai People's Hospital from January 2015 to December 2019 were divided into ten groups using Robson Ten Group Classification System, and the changes of cesarean section rate in each group were analyzed. Results: The age of parturients and proportion of multiparae increased yearly in recent five years, and the cesarean section rate decreased from 66.36% to 47.89% ( $P < 0.001$ ). Among the groups of parturients in recent five years, the proportions of parturients who had a singleton full-term pregnancy with cephalic presentation, who had a full-term pregnancy with scarred uterus and cephalic presentation, who had a singleton pregnancy with breech presentation, who had a multifetal pregnancy and who had a singleton premature pregnancy with cephalic presentation were increasing, but the proportions of parturients who had a singleton full-term pregnancy with cesarean section and cephalic presentation were decreasing ( $P < 0.05$ ). Moreover, the cesarean section rate of parturients who had a singleton full-term pregnancy with cephalic presentation, who had a singleton full-term pregnancy with cesarean section and cephalic presentation and who had a singleton premature pregnancy with cephalic presentation were decreasing in recent five years ( $P < 0.05$ ). Conclusion: The cesarean section rate in Xingtai People's Hospital showed a decreasing trend. The analysis of cesarean section rate and indication using Robson Ten Group Classification System improved the comparability of monitoring data.

**Keywords:** Robson classification, cesarean section, parturients

## Introduction

Cesarean section is a global public health problem [1]. The World Health Organization (WHO) recommends the cesarean section rate should be controlled at 5-15%. WHO points out that the cesarean section rate of over 15% cannot benefit the parturients and infants, and even increases the mortality of them [2-4]. In recent years, with the development of society, the cesarean section rate in China was rising. At present, the cesarean section rate was between 40-60% in most cities of China, even 70-80% in some cities [5]. Studies showed that high cesarean section rate may cause adverse effects on parturients and infants [6]. However, the judgment criteria of cesarean section indication tend to involve multiple factors. In 2001, Robson made a systematic and scientific analy-

sis of cases with cesarean section in Berlin, Germany using Ten Group Classification System for the first time [7]. In the same year, WHO identified the classification system as a standard method for evaluating, monitoring and comparing cesarean section classifications [8]. Robson Ten Group Classification System has been widely applied in various countries after modification and optimization and has achieved remarkable results [9, 10]. With the implementation of "two-child" policy in China and women's strong desire to have a second child, the analysis of cesarean section rate and related factors is still the focus of obstetricians. However, at present, Robson Ten Group Classification System is seldom applied in our country. Based on this, our study analyzed the changes of cesarean section rate in Xingtai People's Hospital from 2015 to 2019 using

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**Table 1.** Robson classification group

| Group | Description  |
|-------|--|
| 1     | Primiparas with cephalic presentation in singleton pregnancy, with gestational weeks $\geq 37$ and spontaneous delivery.   |
| 2     | Primiparas with cephalic presentation in singleton pregnancy, with gestational weeks $\geq 37$ and induced labor or cesarean section.                                    |
| 3     | Multiparae with cephalic presentation in singleton pregnancy, without uterus scars, with gestational weeks $\geq 37$ and spontaneous delivery.                           |
| 4     | Multiparae with cephalic presentation in singleton pregnancy, without uterus scars, with gestational weeks $\geq 37$ and induced labor or cesarean section before labor. |
| 5     | All multiparae with cephalic presentation in singleton pregnancy, with at least one uterus scar and gestational weeks $\geq 37$ .  |
| 6     | All primiparas with breech presentation in singleton pregnancy.  |
| 7     | All multiparae with breech presentation in singleton pregnancy including women with uterus scars.  |
| 8     | All parturients with multifetal pregnancy including women with uterus scars.   |
| 9     | All parturients with transverse or oblique presentation in singleton pregnancy including women with uterus scars.  |
| 10    | All parturients with cephalic presentation in singleton pregnancy including women with uterus scars, with gestational weeks $< 37$ .                                     |

Robson Ten Group Classification System, which is aimed at providing relevant information for hospitals and authorities at all levels.

## Materials and methods

### General materials

By means of field investigation and retrospective analysis, 12064 parturients who gave a live birth in Xingtai People's Hospital from January 1, 2015 to December 31, 2019 were enrolled in our study. The inclusion criteria were parturients ( $\geq 28$  weeks of gestation) with spontaneous delivery, vaginal midwifery delivery or cesarean section. The exclusion criteria were parturients with stillbirth, family planning or induction of fetal malformation. The information of parturients were collected through electronic medical records, including personal information, reproductive history, mode of delivery, indications for cesarean section, etc. Our study was approved by the Ethics Committee of Xingtai People's Hospital.

### Methods

The information of parturients including gestational weeks (preterm or full term), parity (primiparity, multiparity, history of cesarean section), and mode of labor (spontaneous labor, induced labor or cesarean section before labor), fetal position (cephalic, breech or transverse posi-

tion) and numbers of fetus (singleton or multiple pregnancy) was collected.

### Statistical analysis

Data were double-entered and managed by specific personnel. SPSS 22.0 was adopted for statistical analysis. The enumeration data were expressed as number and percentage (n, %) and the measurement data were expressed as means  $\pm$  standard deviation ( $\bar{x} \pm sd$ ). Data were analyzed using one-way analysis of variance combined with post-hoc pairwise comparisons for multiple groups. The constituent ratios of characteristics parturients and the distribution of cesarean section rate were analyzed with  $\chi^2$  trend test of Fisher's exact probability test.  $P < 0.05$  was considered statistically significant.

## Results

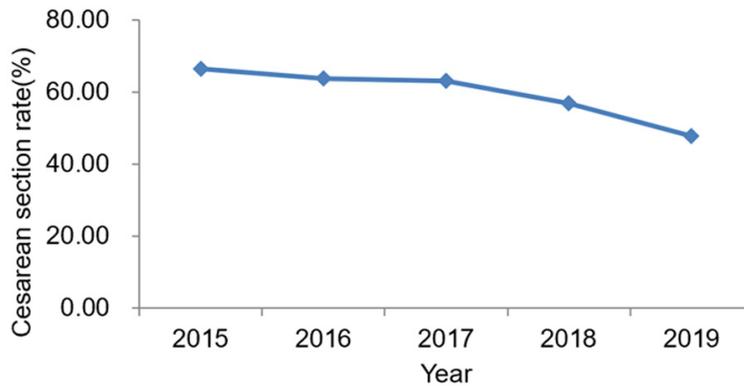
### General information

A total of 12,064 parturients were enrolled in Xingtai People's Hospital from 2015 to 2019 and the parturients were divided into ten groups according to Robson Ten Group Classification System. The characteristics of Robson classification are shown in **Table 1**. The cesarean section rate decreased from 66.36% to 47.89% in recent five years ( $Z=320.521$ ,  $P < 0.001$ ). See **Table 2** and **Figure 1**.

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**Table 2.** Number of parturient giving birth and cesarean section from 2015 to 2019

| Year | Number of labors | Number of spontaneous labors (%) | Number of cesarean section (%) |
|------|------------------|----------------------------------|--------------------------------|
| 2015 | 2158             | 726 (33.64)                      | 1432 (66.36)                   |
| 2016 | 2295             | 830 (36.17)                      | 1465 (63.83)                   |
| 2017 | 2386             | 882 (36.97)                      | 1504 (63.03)                   |
| 2018 | 2598             | 1122 (43.19)                     | 1476 (56.81)                   |
| 2019 | 2627             | 1569 (52.11)                     | 1158 (47.89)                   |
| Z    |                  | 320.521                          |                                |
| P    |                  | <0.001                           |                                |



**Figure 1.** Trends in cesarean section rate from 2015 to 2019.

**Table 3.** Puerpera age from 2015 to 2019

| Year | Age (year) |
|------|------------|
| 2015 | 27.92±4.21 |
| 2016 | 28.33±4.54 |
| 2017 | 28.72±4.17 |
| 2018 | 28.75±4.48 |
| 2019 | 29.69±4.64 |
| F    | 53.788     |
| P    | <0.001     |

### Changes in puerpera age from 2015-2019

The results showed the average age of parturients from 2015 to 2019 was 28.67±4.54 years old and was increasing yearly (F=53.788, P<0.001). See **Table 3**.

### Changes in parity of parturients from 2015 to 2019

The results showed that the proportion of multiparae was increasing yearly in recent five years (P<0.001). See **Table 4**.

### Grouping of parturients from 2015 to 2019

The results showed that the proportions of group 1, 3, 5, 6, 7, 8 and 10 were rising while those of group 2 and 4 were decreasing in recent five years (P<0.05). See **Table 5** and **Figure 2**.

### Cesarean section rate of parturients in each group from 2015 to 2019

The results showed that the cesarean section rates of group 1, 2, 3, 4 and 10 showed a decreasing trend (P<0.05). See **Table 6** and **Figure 3**.

### Discussion

In sociology, cesarean section rate can be used as an important index to measure the levels of perinatal medicine, population quality and science and technology of a country or region [11]. When the parturients have the medical indications for cesarean section, this operation can be performed to save the lives of parturients and their babies and reduce the mortality. However, as an open surgery, cesarean section also carries short-term or long-term risks, especially in the absence of facilities or low levels of medical care, which may lead to pregnancy or fetal complications, disability and even death [12]. The results of our study showed that the cesarean section rate in Xingtai People's Hospital decreased from 66.36% to 47.89% between 2015-2019, which indicated that the social understanding of cesarean section is gradually deepened, and the levels of medical technology in Xingtai People's Hospital are improved. However, there is still a gap between the cesarean section rate in 2019 in Xingtai People's Hospital and that of 15% recommended by WHO. Moreover, with the implementation of the "two-child" policy in 2014 in China, the proportion of multiparae and pregnancy age also increased [5, 13], which is consistent with the results of our study, suggesting that the cesar-

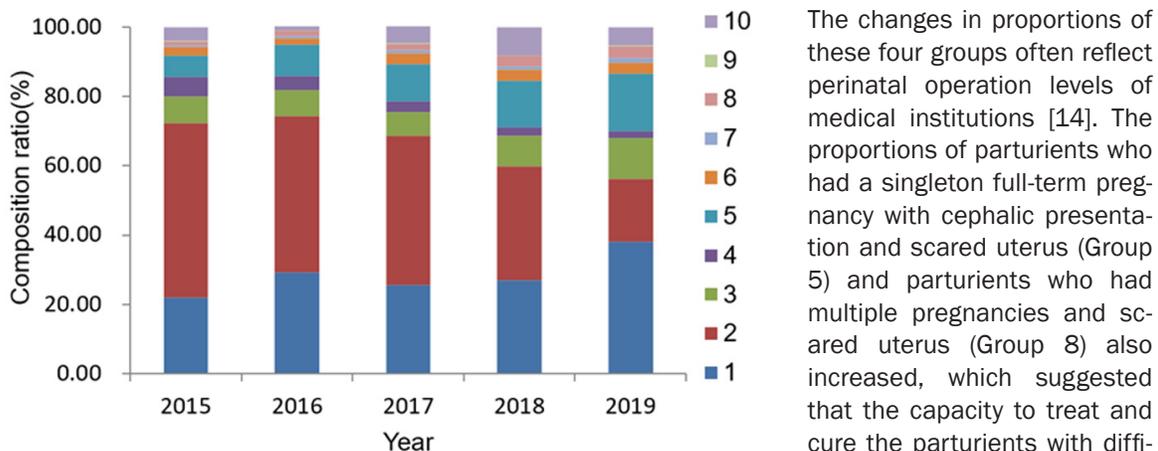
## Comparison of cesarean section rate based on Robson Classification System

**Table 4.** Parity of parturients from 2015 to 2019

| Year | Number of deliveries | Number of primiparas (%) | Number of multiparae (%) |
|------|----------------------|--------------------------|--------------------------|
| 2015 | 2158                 | 1711 (79.29)             | 447 (20.71)              |
| 2016 | 2295                 | 1790 (77.80)             | 505 (22.00)              |
| 2017 | 2386                 | 1836 (76.95)             | 550 (23.05)              |
| 2018 | 2598                 | 1907 (73.40)             | 691 (26.60)              |
| 2019 | 2627                 | 1751 (66.65)             | 876 (33.35)              |
| Z    |                      | 117.902                  |                          |
| P    |                      | <0.001                   |                          |

**Table 5.** Grouping of parturients from 2015 to 2019

| Group | 2015         | 2016         | 2017         | 2018        | 2019         | Z       | P      |
|-------|--------------|--------------|--------------|-------------|--------------|---------|--------|
| 1     | 475 (22.01)  | 573 (29.25)  | 611 (25.61)  | 698 (26.87) | 1003 (38.18) | 146.496 | <0.001 |
| 2     | 1087 (50.37) | 1032 (44.97) | 1025 (42.96) | 857 (32.99) | 476 (18.12)  | 626.251 | <0.001 |
| 3     | 162 (7.51)   | 173 (7.54)   | 162 (6.79)   | 226 (8.70)  | 310 (11.80)  | 31.743  | <0.001 |
| 4     | 125 (5.79)   | 97 (4.23)    | 76 (3.19)    | 67 (2.58)   | 52 (1.98)    | 60.280  | <0.001 |
| 5     | 134 (6.21)   | 204 (8.89)   | 257 (10.77)  | 350 (13.47) | 434 (16.52)  | 154.014 | <0.001 |
| 6     | 52 (2.41)    | 41 (1.79)    | 76 (3.19)    | 78 (3.00)   | 81 (3.08)    | 5.972   | 0.015  |
| 7     | 11 (0.51)    | 18 (0.78)    | 23 (0.96)    | 26 (1.00)   | 37 (1.41)    | 10.486  | 0.001  |
| 8     | 24 (1.11)    | 34 (1.48)    | 43 (1.80)    | 81 (3.12)   | 92 (3.50)    | 46.632  | <0.001 |
| 9     | 2 (0.09)     | 1 (0.04)     | 2 (0.08)     | 3 (0.12)    | 5 (0.19)     | 1.773   | 0.183  |
| 10    | 86 (3.99)    | 122 (5.32)   | 111 (5.65)   | 212 (8.16)  | 137 (5.22)   | 12.229  | <0.001 |



**Figure 2.** Trends in grouping of parturients from 2015 to 2019.

ean section rate in Xingtai People's Hospital may still be at a high level.

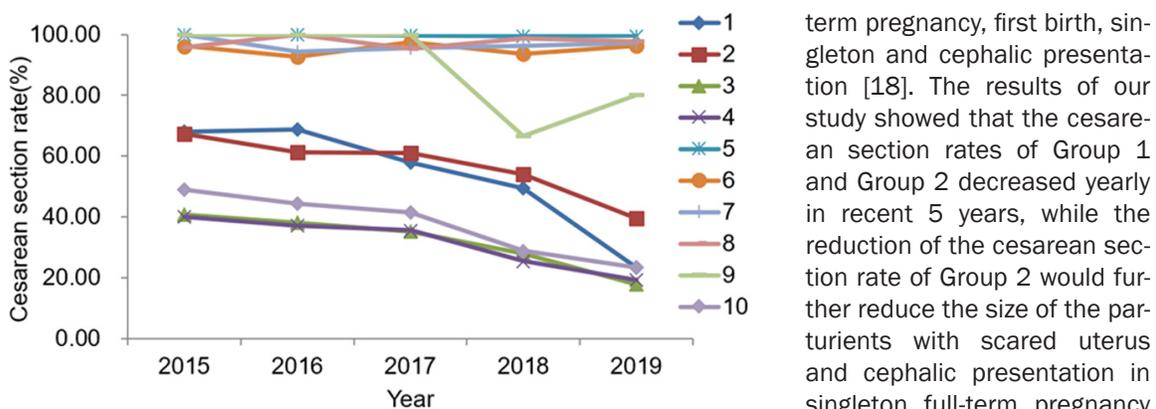
The results of our study showed that the proportion of parturients with cephalic presentation in singleton full-term pregnancy (Group 1 and Group 3) increased yearly, while the proportion of parturients with cephalic presentation in singleton full-term pregnancy and cesarean section (Group 2 and Group 4) decreased.

proportion of parturients with breech presentation (Group 6 and Group 7) was 3.00-4.00%. The proportion of parturients with preterm delivery and cephalic presentation in singleton pregnancy (Group 10) was 4.90-7.20%. The proportion of parturients with transverse presentation and other presentations (Group 9) was very low. The constituent ratio of above four groups tends to be relatively stable [15-17]. The results of our study showed that the

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**Table 6.** Cesarean section rate of parturients in each group from 2015 to 2019

| Group | 2015         | 2016         | 2017        | 2018        | 2019        | Z       | P      |
|-------|--------------|--------------|-------------|-------------|-------------|---------|--------|
| 1     | 323 (68.00)  | 383 (68.84)  | 354 (57.94) | 345 (49.43) | 233 (23.23) | 384.932 | <0.001 |
| 2     | 731 (67.25)  | 632 (61.24)  | 625 (60.98) | 462 (53.91) | 188 (39.50) | 100.797 | <0.001 |
| 3     | 66 (40.74)   | 66 (38.15)   | 57 (35.19)  | 63 (27.88)  | 55 (17.74)  | 36.408  | <0.001 |
| 4     | 50 (40.00)   | 36 (37.11)   | 27 (35.53)  | 17 (25.37)  | 10 (19.23)  | 9.149   | 0.002  |
| 5     | 134 (100.00) | 204 (100.00) | 256 (99.61) | 348 (99.43) | 432 (99.54) | 1.337   | 0.958  |
| 6     | 50 (96.15)   | 38 (92.68)   | 74 (97.37)  | 73 (93.59)  | 78 (96.30)  | 0.004   | 0.947  |
| 7     | 11 (100.00)  | 17 (94.44)   | 22 (95.65)  | 25 (96.15)  | 36 (97.30)  | 1.138   | 1.000  |
| 8     | 23 (95.83)   | 34 (100.00)  | 41 (95.35)  | 80 (98.77)  | 90 (97.83)  | 0.101   | 0.751  |
| 9     | 2 (100.00)   | 1 (100.00)   | 2 (100.00)  | 2 (66.67)   | 4 (80.00)   | 2.572   | 1.000  |
| 10    | 42 (48.84)   | 54 (44.26)   | 46 (41.44)  | 61 (28.77)  | 32 (23.36)  | 24.287  | <0.001 |



**Figure 3.** Trends in cesarean section rate of parturients from 2015 to 2019.

proportions of parturients with breech presentation and parturients with cephalic presentation in singleton preterm pregnancy increased, which is different from the above-mentioned results. It may be related to the levels of medical treatment in Xingtai People's Hospital and the source of samples.

The parturients with full-term pregnancy, first birth, singleton and cephalic presentation (Group 1 and Group 2) made the largest proportion of all parturients. The parturients in above two groups have a greater impact on the total cesarean section rate [16]. The research found that too much artificial intervention to induce delivery in parturients of Group 2 is not conducive to reducing the cesarean section rate. With the implementation of the "two-child" policy, primiparas who plan to have a second child may consider vaginal trial delivery, and as indications and techniques for inducing labor become more mature, this will reduce the cesarean section rate of parturients with full-

term pregnancy, first birth, singleton and cephalic presentation [18]. The results of our study showed that the cesarean section rates of Group 1 and Group 2 decreased yearly in recent 5 years, while the reduction of the cesarean section rate of Group 2 would further reduce the size of the parturients with scared uterus and cephalic presentation in singleton full-term pregnancy (Group 5) and reduced the cesarean section rate of Group 5. The parturients of Group 5

often have a history of cesarean section, and the cesarean section rate of this group tends to be difficult to reduce. Researches in recent five years showed that cesarean section rate of Group 5 was close to 100%. To reduce the constituent ratio of Group 5, we should start from the following two aspects: on the one hand, clinicians should fully evaluate the conditions of parturients and infants before the first cesarean section and strictly follow the indications for cesarean section, which can reduce the size of Group 5 indirectly by decreasing the cesarean section rate of Group 1 and 2; on the other hand, parturients of Group 5 should be encouraged to perform vaginal birth after cesarean section (VBAC) or trial of labor after cesarean (TOLAC) [19, 20]. For the parturients who accepted the operation of VBAC, it is necessary to communicate with them and their families. In the process of delivery, cesarean section is performed immediately once emergency occurs. The parturients of Group 6-10 are at a high risk. A foreign research showed that the cesarean

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section rate of parturients with multiple pregnancies was as high as 90% [21], which is consistent with the results of our study. Parturients of Group 6, 7, 9 are all with fetal malposition. The proportion of them is low, and they have the indications for cesarean section in themselves, so they have little effect on reducing the cesarean section rate. Our study showed that the cesarean section rates of above three groups were all close to 100% in recent five years. The proportion of Group 10 was the largest in all groups of high-risk parturients. The parturients of this group tend to be complicated with other diseases such as hypertension and eclampsia, which leads to cesarean section on them. Therefore, preventing these diseases from happening is needed to reduce the cesarean section rate in Group 10. Parturients of Group 3 and 4 are the multiparae with cephalic presentation in singleton pregnancy and vaginal delivery in their first labor. With the implementation of “two-child” policy, the proportion of these parturients increased and their cesarean section rates showed a decreasing trend. However, it has little influence on the total cesarean section rate.

This study has the following limitations: Firstly, the source of samples is single-center and the sample size of our study is limited; secondly, the classification method does not involve obstetric comorbidities and complications, so it is of limited significance to guide reducing the cesarean section rate for non-medical need; moreover, this study compared the cesarean section rate horizontally and vertically, and the follow-up will be performed to explore the differences of various indicators among different groups of infants delivered.

In conclusion, the cesarean section rate in Xingtai People's Hospital showed a decreasing trend. The analysis of cesarean section rate and indications by Robson Ten Group Classification System improved the comparability of monitoring data, which can help clinicians to make individualized treatment plan for specific group of parturients to reduce the cesarean section rate and improve the outcomes of parturients and infants.

### Disclosure of conflict of interest

None.

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