

Analysis of the Clinical Features of Critical Obstetric Cases After the "Two-Child Policy" was Fully Implemented

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Abstract

Objective: To analyse the changes in the clinical features of critical obstetric cases after the "two-child policy" was fully implemented.

Study Design: Retrospective analysis was used.

Results: In the study group, the percentage of pregnant women who were older (35~40 years (27.8% vs 26.8%), over 40 years (8.6% vs 5.7%)), and multipara (67.8% vs 47.8%). The major diagnoses for intensive care unit transfer were postpartum haemorrhage. In the two groups, the prevalence of WHO near-miss criteria critical scores was 83.5% vs 76.6%. ICU hospitalization time (2.8 days vs 4 days) and total hospitalization time (12 days vs 15 days). In the study group, the number cases with blood loss below 3000 ml was higher than that in the control group (47.3% vs 30.6%). The number of cases with blood transfusion volume greater than 2000 ml was lower than that in the control group (39.8% vs 60.5%). Postpartum haemorrhage was mainly due to placental previa/placental implantation and was significantly increased in the study group (61.6% vs. 44.2%), and the prevalence was higher in individuals who underwent hysterectomy (31.5% vs. 24.2%).

Conclusion: Under the new policy, the epidemiological characteristics of critical obstetric cases should be considered, and the effective critical care score should take into account not only the utilization rate, turnover rate and length of stay in the ICU but also the economic benefits, planned blood use, length of stay and cost of stay to minimize the incidence of critical cases and reduce maternal mortality.

Introduction

Since the 21st century, because of the low birth rate and the extension of life expectancy of the population, resulting in an increase in the degree of ageing, China's one-child policy has been significantly adjusted. In November 2011, China began to fully implement the "double alone two-child policy". In December 2013, the implementation of the "two-child policy" alone occurred and on January 1, 2016, the "two-child policy" was implemented countrywide. After the implementation of the policy, some patients who caught the "last bus", that is, those who had "planned" for more than 10 years, were over 35 years old. The "couple and a child" policy resulted in a high caesarean section rate. At the beginning of the implementation of the "two child" policy, a significant increase in the proportion of high maternal age, pathologic pregnancy rate, pregnancy complications, and maternal mortality rate has presented very large challenges for obstetric and intensive medicine ICU. Faced with the above clinical phenomena, we analysed the cases in our hospital in the past three years after the "two-child policy" was implemented, compared the data with those of the cases before the "policy" was implemented, proposed risk control measures, and provided ideas for improving adverse pregnancy outcomes to reduce the incidence of critical pregnancy and maternal mortality.

Study Subjects And Methods

Study subjects

Peking University Third Hospital is one of the 13 treatment centres designated by the Beijing municipal health committee of the National People's Congress (NPC) with comprehensive rescue capability for high-risk pregnant and postpartum women in Beijing. Peking University Third Hospital is also one of the referral centres for critically ill pregnant and postpartum women in Beijing and neighbouring provinces and cities. In addition to local high-risk pregnant and inpatient women, we also received patients who transferred from hospitals in Hebei, Shandong, Inner Mongolia, Shanxi and other neighbouring provinces and cities. The data of this study were mainly obtained from 475 critically ill pregnant and inpatient women who were treated in the obstetrics department and ICU of Peking University Third Hospital from January 2012 to July 2019, and the sample included the critically ill pregnant and inpatient women who were referred from local areas, remote suburbs and counties, and some neighbouring provinces and cities.

Study Methods

In this study, a retrospective study design was used to enrol 475 critically ill pregnant women who were admitted to the obstetrics department of Peking University Third Hospital from January 2012 to July 2019 and who were transferred to the ICU for treatment. According to the time of delivery in regard to the "two-child policy", 209 patients from January 2012 to September 2016 were allocated into the control group; from October 2016 to July 2019, 266 patients were allocated to the study group. The general characteristics (age of delivery, date of birth, nationality, etc.), marital and childbearing history (number of births, previous pregnancy outcome), pregnancy situation (gestational weeks, pregnancy complications and complications), main diagnosis, length of hospital stay and cost were retrospectively analysed; the severity of disease was assessed; and the characteristics of postpartum haemorrhage were analysed.

Standard Of Disease Diagnosis

Severe postpartum haemorrhage refers to a haemorrhage > 2000 ml 24 h after delivery [1].

Dangerous placenta previa refers to patients with a previous history of caesarean section or hysteromyomectomy in whom the placenta was attached to the original scar [2].

Placental implantation before delivery is diagnosed mainly based on high-risk factors and auxiliary examination, and the diagnosis is based on what is seen during caesarean section or vaginal trial delivery or confirmed by pathological report [3]. In our hospital, antenatal ultrasound examination is used to predict the placenta increta rating scale (patent no.: 2016107944516). A score of 5 or more was used to predict adhesion-type and heavy-type (implant/penetration) placental implants, and a score of 10 points indicated the possibility of penetrative implant. The greater the score, the higher the risk of bleeding and the greater the chance of undergoing a hysterectomy [4].

The diagnostic criteria for eclampsia/preeclampsia/HELLP syndrome were adopted as "guidelines for gestational hypertension and preeclampsia 2019" issued by the American College of Obstetricians and Gynaecology (ACOG) in 2019 [5].

Statistical Analyses

SPSS 20.0 was used for analysis. Quantitative variables that were normally distributed are expressed as $x \pm SD$ and were analysed with an independent t-test for two groups and a one-way analysis of variance for more than two groups. Quantitative parameters that did not follow a normal distribution are expressed as median values (min, max) and were analysed by the intergroup non-parametric Mann-Whitney U test. Qualitative parameters are expressed as n (%) and were tested by Pearson chi-square test or Fisher exact test. All reported P values are two-tailed, and $P < 0.05$ was the significance level.

Results

After the "two-child policy" was fully implemented, the general characteristics of obstetric critical illness patients were compared.

In the 209 patients in the control group, the average delivery age was 31.9 ± 5.3 years old, and the group included 141 patients (141/209, 67.5%) who were < 35 years old, 56 patients (56/209, 26.8%) who were 35 ~ 40 years old, and 12 patients (12/209, 5.7%) who were ≥ 40 years old. The mean gestational time was 33 ± 5.0 weeks. Among the 266 patients in the study group, the average delivery age was 33.2 ± 4.5 years old; 169 patients were < 35 years old (169/266, 63.5%), 74 patients were 35 ~ 40 years old (74/266, 27.8%), and 23 patients were ≥ 40 years old (23/266, 8.6%). The mean gestational time was 33 ± 4.9 weeks. Compared with the control group, there was no significant difference in gestational time. The percentage of pregnant women who were multipara (67.8% vs. 47.8%) and older (aged 35 ~ 40 years (27.8% vs. 26.8%), ≥ 40 years old (8.6% vs. 5.7%)) was significantly higher in the study population than in the control group ($P < 0.05$; Table 1).

| Observations | Study (n = 266, %) | Control (n = 209, %) | χ^2 | P |
|----------------------------|--------------------|----------------------|----------|------|
| age (, years old) | 33.2 ± 4.5 | 31.9 ± 5.3 | | |
| ≥35 | 169(63.5%) | 141 (67.5%) | 0.80 | 0.04 |
| 35 ~ 40 | 74(27.8%) | 56 (26.8%) | 0.06 | 0.08 |
| ≥ 40 | 23(8.6%) | 12 (5.7%) | 1.45 | 0.02 |
| Gestational weeks (,weeks) | 33 ± 4.9 | 33 ± 5.0 | - | - |
| Multipara (≥ 2, n (%)) | 180 (67.8%) | 100 (47.8%) | 19.0 | 0.00 |

Table 1 After the “two-child policy” was fully implemented, the general characteristics of obstetric critical illness patients were compared, n (%)

Patients with major obstetric diagnoses transferred to the ICU before and after the "two-child policy" was fully implemented

The major diagnosis associated with ICU transfer in the study group was postpartum haemorrhage (52.3%) (139/266). Pregnancy complicated by medical diseases accounted for 32.3% (86/266), and this figure included preeclampsia/eclampsia/HELLP syndrome (14.7%, 39/266) and haematological immune system diseases (4.5%, 12/266). Surgical diseases in pregnancy accounted for 7.5% (20/266) of pregnancy complications, including acute pancreatitis (1.1%, 3/266) and AFLP (2.3%, 6/266). Infectious factors accounted for 6.0% (16/266). Postpartum haemorrhage was diagnosed in 45.9% (96/209) of individuals who were transferred to the ICU in the control group. Pregnancy complicated with medical diseases accounted for 35.9% (75/209) of pregnancy complications, including preeclampsia/eclampsia/HELLP syndrome (19.6%, 41/209) and haematological immune system diseases (1.9%, 4/209). Surgical complications in pregnancy accounted for 9.6% (20/209), including acute pancreatitis (4.3%, 9/209) and AFLP (2.9%, 6/209); infectious factors accounted for 8.1% (17/209). Compared with the control group, the rate of postpartum haemorrhage and blood immune system diseases in the study group was significantly higher ($P < 0.05$); the rates of preeclampsia/eclampsia/HELLP syndrome, pregnancy complicated with acute pancreatitis and infection whereas significantly lower ($P < 0.05$); and no significant difference was noted in the rate of heart disease or AFLP ($P > 0.05$) (Table 2).

| Major diagnosis | Study (n = 266, %) | Control (n = 209, %) | χ^2 | P |
|---|-----------------------|-------------------------|----------|------|
| PPH | 139 (52.3) | 96 (45.9) | 1.87 | 0.17 |
| pregnancy complicated with medical diseases | 86 (32.3) | 75 (35.9) | 0.66 | 0.42 |
| preeclampsia/eclampsia/HELLP syndrome | 39 (14.7) | 41 (19.6) | 2.05 | 0.15 |
| Haematological immune system disease | 12 (4.5) | 4 (1.9) | 2.43 | 0.12 |
| Heart disease, peripartum cardiomyopathy | 10 (3.8) | 12 (5.7) | 1.04 | 0.31 |
| Respiratory failure | 4 (1.5) | 3 (1.4) | 0.00 | 0.95 |
| Heart failure | 4 (1.5) | 4 (1.9) | 0.12 | 0.74 |
| Pregnancy with other medical diseases | 17 (6.4) | 11 (5.3) | 0.27 | 0.60 |
| Pregnancy with surgical disease | 20 (7.5) | 20 (9.6) | 0.64 | 0.42 |
| Acute pancreatitis | 3 (1.1) | 9 (4.3) | 4.80 | 0.03 |
| AFLP | 6 (2.3) | 6 (2.9) | 0.18 | 0.67 |
| Pregnancy with other surgical diseases | 11 (4.1) | 5 (2.4) | 1.09 | 0.30 |
| Infections | 16 (6.0) | 17 (8.1) | 0.81 | 0.37 |
| Others | 5 (1.9) | 1 (0.5) | 1.84 | 0.24 |

Table 2 Major obstetric diagnoses of individuals transferred to the ICU before and after the "two-child policy" were fully implemented.

Before and after the implementation of the "two-child policy", the length of hospital stay and the cost of hospitalization

After the full implementation of the "two-child policy", ICU stay and total length of hospital stay were shortened, by an average of 2.8 days for ICU stay and 12 days for total hospital stay, compared with the control group, for an average ICU stay of 4 days and a total hospital stay of 15 days, which were significantly lower ($P < 0.05$); the hospitalization cost was not significantly different between the two groups ($P > 0.05$, Table 3).

| Length of stay/cost of stay | Study (n = 266) | Control (n = 209) | T | P |
|-------------------------------------|--------------------|----------------------|------|------|
| ICU time (min, max) | 2.8 (1,41) | 4.0 (1,90) | 2.23 | 0.03 |
| Total hospital stay (min, max) | 12.0 (1,50) | 15.0 (3,106) | 3.38 | 0.00 |
| Median cost (min, max), 10,000 yuan | 3.87 (1.13,66.05) | 3.43 (0.94,93.96) | 0.28 | 0.78 |

Table 3 the length of hospital stay and the cost of hospitalization

Diagnostic criteria of critical degree score for critical obstetric cases transferred to the ICU

The WHO near-miss criteria were used to determine the severity of critical care cases transferred to the ICU from the obstetrics department. As shown in Table 4, the proportion of critical care patients in the two groups meeting the criteria was 83.5% (222/266) and 76.6% (160/209), and the difference was statistically significant ($P < 0.05$).

| Disease | Number of cases (n) | | WHO near-miss criteria (%) | |
|--|---------------------|---------|----------------------------|------------|
| | Study | Control | Study | Control |
| PPH | 139 | 96 | 129 (92.8) | 89 (92.7) |
| preeclampsia/eclampsia/HELLP syndrome | 39 | 41 | 31 (79.5) | 24 (58.5) |
| Haematological immune system disease | 12 | 4 | 8 (66.7) | 3 (75.0) |
| Heart disease, peripartum cardiomyopathy | 10 | 12 | 6 (60.0) | 6 (50.0) |
| Respiratory failure | 4 | 3 | 4 (100) | 3 (100) |
| Acute heart failure | 4 | 4 | 4 (100) | 4 (100) |
| Pregnancy with other medical diseases | 17 | 11 | 13 (76.5) | 7 (63.6) |
| Acute pancreatitis | 3 | 9 | 3 (100) | 7 (77.8) |
| AFLP | 6 | 6 | 6 (100) | 4 (66.7) |
| Pregnancy with other surgical diseases | 11 | 5 | 9 (81.8) | 3 (60.0) |
| Infections | 16 | 17 | 7 (43.8) | 9 (52.9) |
| Others | 5 | 1 | 2 (40.0) | 1 (100) |
| Total | 266 | 209 | 222 (83.5) | 160 (76.6) |
| P | 0.05 | | | |

Table 4 Comparison of severity of critical obstetric patients transferred to the ICU

Analysis and comparison of characteristics of postpartum haemorrhage

Among the 266 patients in the study group, there were 146 cases (blood loss ≥ 1000 ml) of postpartum haemorrhage (146/266, 54.9%), and among the 209 patients in the control group, there were 95 cases (95/209, 45.5%) of postpartum haemorrhage. Compared with the control group, the number of patients with blood loss of 1000-2000 ml (23.3% vs 13.7%) and 2000-3000 ml (24.0% vs 16.9%) was significantly greater than that of patients with blood loss of 3000 ml ($P < 0.05$). The number of patients with blood loss ≥ 5000 ml (15.7% vs 34.7%) was significantly lower than that in the control group, with a statistically significant difference ($P < 0.05$). The number of patients who underwent blood transfusion < 2000 ml in the study group was significantly higher than that in the control group (60.2% vs. 29.5%), and the difference was statistically significant ($P < 0.05$). The blood transfusion volumes were as follows: 2000-3000 ml (21.2% vs. 30.5%), 3,000-5000 ml (13.1% vs. 28.4%), and ≥ 5000 ml (5.5% vs. 1.6). The prevalence of blood transfusion volumes above 2000 ml was significantly lower in the study group than in the control group ($P < 0.05$, Table 5).

| | Postpartum haemorrhage volume (ml) | | | | Blood transfusion volume (ml) | | | | Placenta previa/implantation | Hysterectomy |
|---------------------|------------------------------------|---------------|---------------|---------------|-------------------------------|---------------|---------------|---------------|------------------------------|---------------|
| | 1000-2000 | 2000-3000 | 3000-5000 | ≥5000 | ≤2000 | 2000-3000 | 3000-5000 | ≥5000 | | |
| Study (n=146,%) | 34 (23.3%) | 35 (24.0%) | 54 (37.0%) | 23 (15.7%) | 88 (60.2%) | 31 (21.2%) | 19 (13.1%) | 8 (5.5%) | 90 (61.6%) | 46 (31.5%) |
| Control (n=95,%) | 13 (13.7%) | 16 (16.9%) | 33 (34.7%) | 33 (34.7%) | 28 (29.5%) | 29 (30.5%) | 27 (28.4%) | 11 (11.6%) | 42 (44.2%) | 23 (24.2%) |
| χ^2 | 3.38 | 1.75 | 0.13 | 11.63 | 19.88 | 2.66 | 8.85 | 2.95 | 7.06 | 1.50 |
| P | 0.01 | 0.02 | 0.07 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 |

Table 5 Comparison of postpartum haemorrhage characteristics before and after the implementation of the “two-child policy”

Among the abovementioned postpartum haemorrhage cases, 90 cases (90/146, 61.6%) had placenta previa/placenta implantation in the study group, compared to 42 cases (42/95, 44.2%) in the control group. There were 46 cases of hysterectomy in the study group (46/146, 31.5%) and 23 cases in the control group (23/95, 24.2%). The above results were statistically significant ($P < 0.05$, Table 5).

Discussion

With the change in China's national conditions, the birth policy has been adjusted accordingly. On January 1, 2016, the “two-child policy” was fully implemented. Although it has largely solved social problems such as the “ageing population” and the “imbalance in the ratio of males to females”, it has also resulted in more severe consequences. In particular, the high rate of caesarean section in China more than a decade ago has resulted in a serious problem: the dangerous placenta previa in the second pregnancy caused by scars in the uterus, the increased incidence of placental implantation, and the increased risk of massive haemorrhage during labour and the postpartum period.

1. In this study, there was an increase in the number of elderly mothers, especially the proportion of women aged over 40 years. The number of parturient women increased significantly, from 47.8–67.8%. The reason is that after the full implementation of the “two-child policy”, many women who did not plan to have another child during childbearing age chose to have a second child. According to the research results of HongXia Zhang et al[7], after the “two-child policy” was fully implemented, the percentage of pregnant women over the age of 40 increased from 2.2–3.6%, and the percentage of pregnant women aged over 40 increased from 17.0–30.0%. The cases we collected were all critical cases transferred to the ICU, and there were more cases of patients with advanced age. Most of these cases had a longer time interval than the previous delivery, and there might be many physiological problems associated with reproduction, such as increased complications such as pre-eclampsia and gestational diabetes [8–9].

2. Postpartum haemorrhage was the primary disease resulting in transfer to the ICU from the obstetrics department, accounting for 52.3% (139/266). This prevalence was followed by 32.3% (86/266) of pregnancies complicated by medical diseases, including preeclampsia/eclampsia and HELLP syndrome (14.7%) (39/266). In the control group, postpartum haemorrhage was also the main disease resulting in transfer to the ICU, accounting for 45.9% (96/209). This prevalence rate was followed by 35.9% (75/209) of pregnancies with medical conditions, with preeclampsia/eclampsia and HELLP syndrome accounting for 19.6% (41/209). In the multicentre study of Zhiling Zhao et al[10], during the nine-year study period from 2008 to 2016, the major diagnoses associated with obstetric transfer to the ICU were postpartum haemorrhage (170/491, 34.6%), gestational hypertension (156/491, 31.8%) and cardiovascular and cerebrovascular diseases (78/491, 15.9%). Relevant foreign studies also suggested that the major diseases associated with the transfer from the obstetrics department to the ICU were “postpartum haemorrhage” and “gestational hypertension” [11–13]. In our early investigation and evaluation of critical obstetric

diseases [14], 25.7% of the cases had medical or surgical diseases, 23.8% had postpartum haemorrhage, and 23.8% had gestational hypertension. According to a study by Sultan et al. [15], preeclampsia/eclampsia and HELLP syndrome were the main reasons for obstetric transfer to the ICU, followed by postpartum haemorrhage. In this study, the proportion of postpartum haemorrhage was significantly higher, which was related to the significant increase in cases of elderly puerpera, placental implantation and scarred uterus after the comprehensive implementation of the "two-child policy". Such cases were more prone to uterine contraction weakness and postpartum haemorrhage caused by placental factors. In addition to the abovementioned three diseases, acute pancreatitis, AFLP, acute appendicitis, acute peritonitis and other pregnancy complications including surgical diseases, infection and perinatal cardiomyopathy were the common causes of critical illness among pregnant women in this study.

3. After the full implementation of the "two-child policy", an especially high rate of caesarean section was observed in China more than 10 years ago, and the serious complications related to caesarean section associated with these pregnant women's second birth have attracted increasing attention, especially the risk of placental implantation. Many studies have shown [16–18] that scarred uterus is an independent risk factor for placental implantation. In this study, of the 146 cases of postpartum haemorrhage, 90 were placental implantation (90/146, 61.6%) and 46 were hysterectomy (46/146, 31.5%). Among the 88 cases of postpartum haemorrhage in the control group, 42 cases were placental implantation (42/88, 47.7%), and 23 cases underwent hysterectomy (23/88, 26.1%). In this study, the proportion of individuals with postpartum haemorrhage who were transferred to the ICU was high, including 112 cases of postpartum haemorrhage (112/266, 42.1%), which may be related to placental implantation in Peking University Third Hospital [19], and placenta previa and placental implantation are one of the common causes of postpartum haemorrhage [20]. Our study found that 90 (90/146, 61.6%) of the 146 cases of postpartum haemorrhage in the study group were mainly caused by placental implantation. Although the prevalence increased, the operation difficulty was greater, but the prevalence of bleeding more than 5000 ml decreased significantly. The prevalence of a blood transfusion amount greater than 2000 ml was significantly lower than that in the control group. The difference was statistically significant ($P < 0.05$). The operation skill and experience was improved, and we standardized the antenatal examination, health education, and government to develop critical maternal referral standards and reduced the level of bleeding emergency rescue referral of patients.

4. After the full implementation of the "two-child policy", the incidence of placenta previa and placental implantation was greatly increased in women who had undergone caesarean section who had a second pregnancy. Studies have suggested that placenta previa is an independent risk factor for active total hysterectomy [21], especially for placenta previa with placental implantation [22]. In patients with placental blood circulation of 700 ml/min (500 ~ 1 200 ml/min), when the uterus treatment result is bad, hysterectomy has become the main measure of postpartum haemorrhage treatment for placenta increta merger [23–25], especially when the placenta extends through the uterine serosa layer and adjacent tissues (including broad ligament, rectum and bladder); a whole hysterectomy should be timely and decisively performed to reduce maternal postpartum haemorrhage-related complications [26]. For this type of situation, we performed a retrospective study [4]. The use of our prenatal ultrasonic examination predicted the placenta increta rating scale, assessment of the severity of placenta increta, and prediction of the risk of intraoperative bleeding and hysterectomy. A score of 5 or more was used to predict adhesion type, and heavy-type (including implant and penetrating) placenta implants were indicated by a score of 0 or 1. The possibility of the penetrative implant type is high. In this study, the hysterectomy rate of postpartum haemorrhage patients in the two groups was elevated (31.5% vs 26.1%), and the difference was statistically significant ($P < 0.05$).

5. Nosocomial infection is positively correlated with length of stay; the longer the stay, the greater the chance of infection [27]. After the full implementation of the "two-child policy", the fertility rate increased. Methods to shorten the average length of hospital stay are of great significance to alleviate the contradiction between the supply and demand of medical resources and to improve the turnover rate of beds and the quality of medical services. It has been reported in the literature [28] that the length of hospital stay may be affected by various factors, such as the medical expense payment method, delivery method, operation, pregnancy complications, perinatal pregnancy outcome, transfer from other departments to the maternity ward and so on. All cases in this study were critical cases transferred from the obstetrics department to the ICU. The average length of ICU stay in the two groups decreased from 4 days to 2.8 days, and the total length of ICU stay decreased from 15 days to 12 days, all of

which were significantly different. The difference was statistically significant, and this difference was related to the strengthened health care awareness of the pregnant women and their families and the improved efficacy of multi-disciplinary joint diagnosis and treatment. A study [29] on multiple factors of maternal hospitalization costs showed that the length of hospital stay, delivery mode, postpartum and postpartum pathological conditions, age, and presence of pregnancy complications all affect maternal hospitalization costs. In this study, although the length of hospital stay in the study group was shortened, the average hospital stay cost did not decrease but rather increased (38,700 yuan vs 34,300 yuan), which may be related to the increase in the number of elderly puerpera, parturient women and placental implantation after the implementation of the "two-child policy".

6. With the full implementation of the "two-child policy", the rapid development of assisted reproductive technology, older age, and maternal populations at risk, critically ill obstetric patients increased year by year [10], and severe maternal outcomes during pregnancy and birth are more likely to result in emergencies and accidents; these women are prone to multiple organ failure, and the ICU can perform early recognition and intervention in patients with critical obstetric conditions and perform comprehensive rescue and provide organ function protection and support therapy, thus improving the critical maternal treatment success rate. However, methods to integrate the diagnosis and treatment of critically ill pregnant women into the effective monitoring and management system to reduce maternal deaths are of great significance. Medical institutions in different countries lack uniform standards for the assessment of critically ill pregnant women. Different regions and hospitals in China have different diagnostic standards for critically ill pregnant and inpatient women, making it difficult to evaluate and compare the medical quality received by critically ill pregnant and inpatient women as a whole. This research adopted the WHO near-miss scoring criteria [30] for critical degree evaluation. In 2009, the WHO combined clinical indications, organ dysfunction, inspection index and clinical treatment in three aspects, such as content distribution, and in 2011 formulated the near-miss guide, and the critical maternal interventions to evaluate the proposed system process intend to look forward through the analysis of serious maternal medical process, medical measures to implement, and whether there is a problem; the transfer process improves the level of critical maternal treatment [31]. Lima H M P[32] et al conducted a secondary analysis of data collected in a multicenter cross-sectional study in Brazil and found that the diagnostic criteria of the WHO near miss were highly effective in the diagnosis and treatment of critically ill pregnant women and could effectively reduce maternal deaths. Skandarupan J et al[33] conducted a prospective study in three Australian hospitals using the WHO near miss scoring standard and found that this standard could be more effective for evaluating critical obstetric diseases such as postpartum haemorrhage and preeclampsia and effectively reduce maternal mortality. In this study, 83.5% (222/266) and 76.6% (160/209) of the study group and the control group met the critical care score standard, respectively, which was consistent with a previous study in our hospital (74.3%) [14]. Combined with our earlier studies and evaluation of the validity of the WHO diagnostic criteria, the WHO near-miss criteria have a higher diagnostic validity for patients with critical obstetric diseases and is more effective for reducing maternal deaths.

Conclusions

Our results revealed that, with the full implementation of the "two-child policy", super-multipara cases obviously increased dangerous sex placenta previa, placenta increta, and postpartum haemorrhage; additionally, the prevalence of other critical maternal pregnancies with local diseases significantly increased, and the field of obstetrics is under pressure and is facing challenges to strengthen the treatment of such critically ill patients in the ICU. According to the WHO near-miss critical scoring system, more effective and reasonable assessment of critical maternal illness, disease risk prediction, improvement of the efficiency of diagnosis and treatment, reduction in the amount of blood loss, assessment of blood transfusion patients, maintenance of the uterus, and the improvement of the quality of postpartum survival are necessary. The ICU stay for critical obstetric patients need to be reduced, and health resources need to be used in a more scientific and effective manner.

Declarations

Author contributions

LF: data collection, data analysis and writing. QG: data collection, data analysis. XK: collection. SY collection. XY collection. XZ collection. YW: conceptualization, writing and validation

Compliance with ethical standards

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Conflict of interest

The authors Lanyong Fu, Qinggang Ge, Yongqing Wang, Xunke Gu, Shenglong, Xin Yan and Xueqing Zhao declare that they have no conflict of interest.

Human and animal rights statement

This study was approved by the ethics committee of medical science research at Peking University Third Hospital (No. IRB 00006761-m2018219), and informed consent was obtained from all patients.

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