

# BMJ Open Effect of second child intent on delivery mode after Chinese two child policy implementation: a cross sectional and prospective observational study of nulliparous women in Chongqing

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## ABSTRACT

**Objectives** To assess the influence of second child intent on the delivery preferences and final delivery modes of nulliparous women, particularly caesarean delivery on maternal request (CDMR), after implementation of China's two child policy.

**Design** Cross sectional and prospective observational study.

**Setting** A tertiary teaching hospital in Chongqing, China.

**Participants** 1000 low risk nulliparous women were initially involved, and were divided into two groups based on their intent on having a second child. 814 women who completed all interviews were analysed.

**Main outcome measures** Preferred mode of delivery in second trimester and at admission; final delivery mode, CDMR.

**Results** 814 women who completed all interviews were analysed, in whom 51.2% intended to have a second child. The preference for caesarean delivery (CD) at the second trimester between the intent and no intent group was 6.2% versus 17.9% (adjusted RR 0.35, 95% CI 0.20 to 0.63) and increased to 24.2% versus 37.3% (adjusted RR 0.65, 95% CI 0.45 to 0.94) at admission, respectively. The overall CD rates between the two groups were 41.0% versus 50.4% (adjusted RR 0.84, 95% CI 0.60 to 1.18), and the CDMR rates were 16.7% versus 29.0% (adjusted RR 0.56, 95% CI 0.37 to 0.86), respectively.

**Conclusions** Women who intend to have a second child are less likely to request a CD, and high rates of CD and CDMR in nulliparous women may have decreased after implementation of China's two child policy.

## INTRODUCTION

The rate of caesarean delivery (CD) has increased dramatically in recent decades worldwide, particularly in developing countries.<sup>1</sup> WHO surveys showed that the average rate of CD in Latin America was 33% and in Asia 27.3%, of which China had a disproportionately high rate of CD of 46.2%.<sup>2-3</sup> Several studies have shown that China's caesarean rate exceeds 50%.<sup>4-6</sup> A multicentre study

## Strengths and limitations of this study

- To the best of our knowledge, this study is the first attempt to estimate the influence of second child intent on delivery preference and ultimately final caesarean delivery (CD), especially caesarean delivery on maternal request (CDMR), in nulliparous women, after implementation of China's new population control policy.
- It is a cross sectional and prospective study following a number of pregnant women from the second trimester of pregnancy to postpartum.
- Participants were selected from a tertiary hospital located in the centre of Chongqing district and the sample size was relatively small, both of which may affect the generalisability of the results.
- The study population was predominantly an urban population, with a higher education level, which may have led to a higher CD rate.
- Although we adjusted for various potential confounders, including age, given the nature of the observational study, in particular that the no intent group had a much higher proportion of mothers of advanced age ( $\geq 35$  years) than the intent group (9.8% vs 1.4%), residual confounding likely still existed that might have an effect on the association between exposure variables and outcomes.

conducted by Liu *et al*, including 39 hospitals in 14 provinces, showed that the overall CD rate in 2012 was 54.9%, and the caesarean delivery on maternal request (CDMR) rate was 28.43%.<sup>5</sup> Another analyses by Zhang *et al* showed that the overall caesarean rate in southeast China increased from 22% in 1994 to 60% in 2003, and moderated to 56% in 2006, and the rate of CDMR was 0.8%, 22%, and 20%, respectively.<sup>7</sup> Recently, a more detailed survey 'Geographic Variations in Caesarean use in China from 2008

to 2014', showed that the CD rate in Chongqing district was 43.0% in 2008 and increased to 49.5% in 2014.<sup>8</sup> Also, studies have indicated that excessive use of CD, particularly in the absence of clear surgical conditions, may increase maternal and infant long term morbidity and mortality.<sup>9–12</sup> Also, the risk of placenta praevia, placenta accrete and uterine rupture can increase significantly in the next pregnancy after a primary CD.<sup>13–16</sup>

China's population control policy was implemented 30 years ago which aimed at regulating family size and stipulated that the majority of women could deliver only once, resulting in few repeat CDs. An analysis of hospital discharge data, including 39 hospitals in 14 provinces of China in 2011, concluded that 81.4% of women were having their first birth, and less than 8% of deliveries were to women who had a previous CD.<sup>6</sup> Owing to the one child policy, women were not concerned about future pregnancies, creating a demand for a perfect outcome.<sup>4,7</sup> In addition, high coverage rate of medical insurance promoted by the Chinese government lowered out of pocket expenses for patients having a CD.<sup>4,17</sup> As a result, CD was viewed as a 'painless' and 'convenient' method to complete pregnancy for women. Also, more relaxed surgical criteria to avoid potential risks due to the tense doctor–patient relationship in China and extra payment from CD operations, combined with other factors, such as socioeconomic changes and new monitoring technologies, have contributed to the popularity of CD, particularly CDMR, in China.<sup>4,18–21</sup>

On 15 November 2013, China relaxed the population control policy, and a more universal policy, which allows all families to have two children, was subsequently announced on 29 October 2015.<sup>22,23</sup> Before the new policy, many women received an elective CD because they believed that they would have no further pregnancies. Morbidity and mortality associated with subsequent pregnancies after a primary CD are not frequently observed by obstetricians, but conditions will change following relaxation of the policy. It is estimated that 90 million couples can have a second child, of whom 25% will decide to have a second child, and many will have had a CD for the first delivery.<sup>24</sup> However, because of the lack of experience, skills and resources necessary to manage a safe vaginal birth after CD, most women with a scarred uterus will have a repeat CD for their second delivery, with increased risks of postpartum haemorrhage, severe adhesion, uterine rupture and even hysterectomy.<sup>25</sup> A study showed that if a woman has a placenta previa and one prior CD, the risk of placenta accreta is 11–24%.<sup>26</sup> The Chinese hospital and obstetricians will be challenged as more women have repeat CDs or vaginal births after CD. Therefore, policies aimed at the safe prevention of primary CD in China may become a priority for both doctors and the government.

The new policy will not only make obstetricians begin to consider the consequences caused by the high rates of primary CDs, but may change women's perceptions about CD, especially those who intend to bear two children. Therefore, we performed this study to preliminarily

address issues of whether preferences for CD and CDMR would be decreased in those nulliparous women who want two babies. This information will be useful for identifying new strategies to lower China's high CD rate.

## METHODS

### Study design and data collection

This study was conducted in a university based tertiary care centre in southwest urban China from 1 January 2016 to 31 July 2016. Pregnant women who received their antenatal care and met the inclusion criteria were asked if they would be willing to participate in the study. Inclusion criteria were: (1) older than 20 years; (2) nulliparous woman with singleton pregnancy; (2) no history of severe heart, liver, lung, kidney, endocrine or psychiatric diseases resulting in hospitalisation at recruitment; (3) no severe pregnancy complications in the first interview (mainly including early onset pre-eclampsia, severe intra-hepatic cholestasis of pregnancy); and (4) planning to give birth at the hospital. Those who (1) did not respond to the first interview or missed the second interview, (2) had a multiple pregnancy, (3) had a previous uterine scar before pregnancy (mainly from myomectomy), (4) delivered at <36<sup>+0</sup> weeks' gestation or (5) had existing medical indications for CD at the first interview were excluded before the analyses.

We performed the first interview at 24<sup>+0</sup>–28<sup>+6</sup> weeks' gestation (second trimester), during which the women received system ultrasonography to exclude fetal congenital abnormalities. Nurses were trained to explain the objectives of the study. Women who consented to the study were given a self-administered questionnaire, including general characteristics and preferred mode of delivery (CD/vaginal delivery/no preference). The intent to have a second child as an exposure variable was also listed as a choice question, in a yes/no format, and the women were then divided into two groups based on the intent. Those who did not want a second child were asked a multiple choice question to determine the reason. For those women who chose vaginal delivery as their first option in the intent group, another multiple choice question was asked to determine the reason. The questionnaires were designed by experts from the Chongqing Medical University (epidemiology experts, health education experts and obstetric experts).

After attending the first interview, women were given a second interview at admission, and those who did not eventually deliver at our hospital and whose delivery age was <36<sup>+0</sup> weeks were also excluded at this stage. During the second interview, their preferred mode of delivery was obtained again. Types of information that were abstracted from the medical record included obstetric complications, reproductive and prenatal history, labour and delivery records, postpartum and neonatal information, and history of pre-existing conditions before pregnancy. Women whose medical history included a previous uterine scar before pregnancy (mainly from myomectomy) were

excluded. The interview information and discharge data were then merged and de-identified prior to the analyses. The main outcomes of the study were delivery preference in the second and third trimesters and the final CD, especially CDMR, between the two groups.

### Definitions

Labour was defined as regular uterine contractions and cervical dilation of 2 cm. CD performed before labour was categorised as an antepartum CD, whereas intrapartum CD was defined as an operation performed after labour. As there are no internationally recognised indications for CD,<sup>27</sup> we used the national caesarean delivery consensus compiled by the Chinese Medical Association in 2014 to assess if the cases had justified indications for CD.<sup>28</sup> Moreover, we grouped the indications for CD into four categories following the criteria of Liu *et al*: CDMR before labour without any medical indications; antepartum CD with borderline indications; antepartum CD with medical indications; and intrapartum CD after a trial of labour.<sup>29,30</sup> Furthermore, combined with the specific circumstances in this hospital, we added mild intrahepatic cholestasis of pregnancy, failed induction of labour, fetal growth restriction and marginal placenta previa to the group of antepartum CD with borderline indications.

The medical history included the presence of chronic diseases and/or reproductive surgery before pregnancy, including chronic hypertension without superimposed pre-eclampsia/eclampsia, type I or type II diabetes with or without macrosomia, asthma requiring medical intervention, arrhythmia requiring intervention during pregnancy, thalassaemia with mild or moderate anaemia, hyperthyroidism or hypothyroidism, chronic kidney disease (stages 1 and 2), connective tissue disease without severe organ damage, polycystic ovary syndrome with assisted reproduction, epileptic seizure occurring during pregnancy, malignancy requiring surgery or chemotherapy before pregnancy, infectious disease which required medication such as hepatitis B virus, cervical conisation before pregnancy, tubectomy due to ectopic pregnancy, and unilateral or bilateral adnexectomy. Pregnancy complications included diseases occurring in pregnancy, including gestational diabetes mellitus with macrosomia, late onset pre-eclampsia/eclampsia, mild intrahepatic cholestasis of pregnancy, overt hyperthyroidism or hypothyroidism, thrombocytopenia requiring platelet transfusion, thrombosis with inferior vena cava filter placing, fetal growth restriction and placenta previa. Maternal and neonatal outcome were collected but not considered in the analyses.

### Statistical analysis

Statistical analysis was performed using the SPSS V.20 (IBM; Armonk, New York, USA). Categorical data were evaluated with the  $\chi^2$  test or Fisher's exact test when the expected cell count was  $<5$ . Continuous variables were compared using two sample t tests. A series of logistic regressions were used to estimate the magnitude of

influence of the intent to have a second child on outcome using RR by adjusting potential explanatory variables that were ascertained as variables with an association of  $p < 0.1$  at the univariate analysis. We added educational level, average income of the family, medical history, pregnancy complications, and maternal and neonatal morbidity into all of the models that were associated with delivery mode,<sup>19</sup> even if there were no significance differences between the two groups: 95% CI were also calculated for all outcomes. All analyses were two sided, and a probability value  $< 0.05$  was considered significant.

### RESULTS

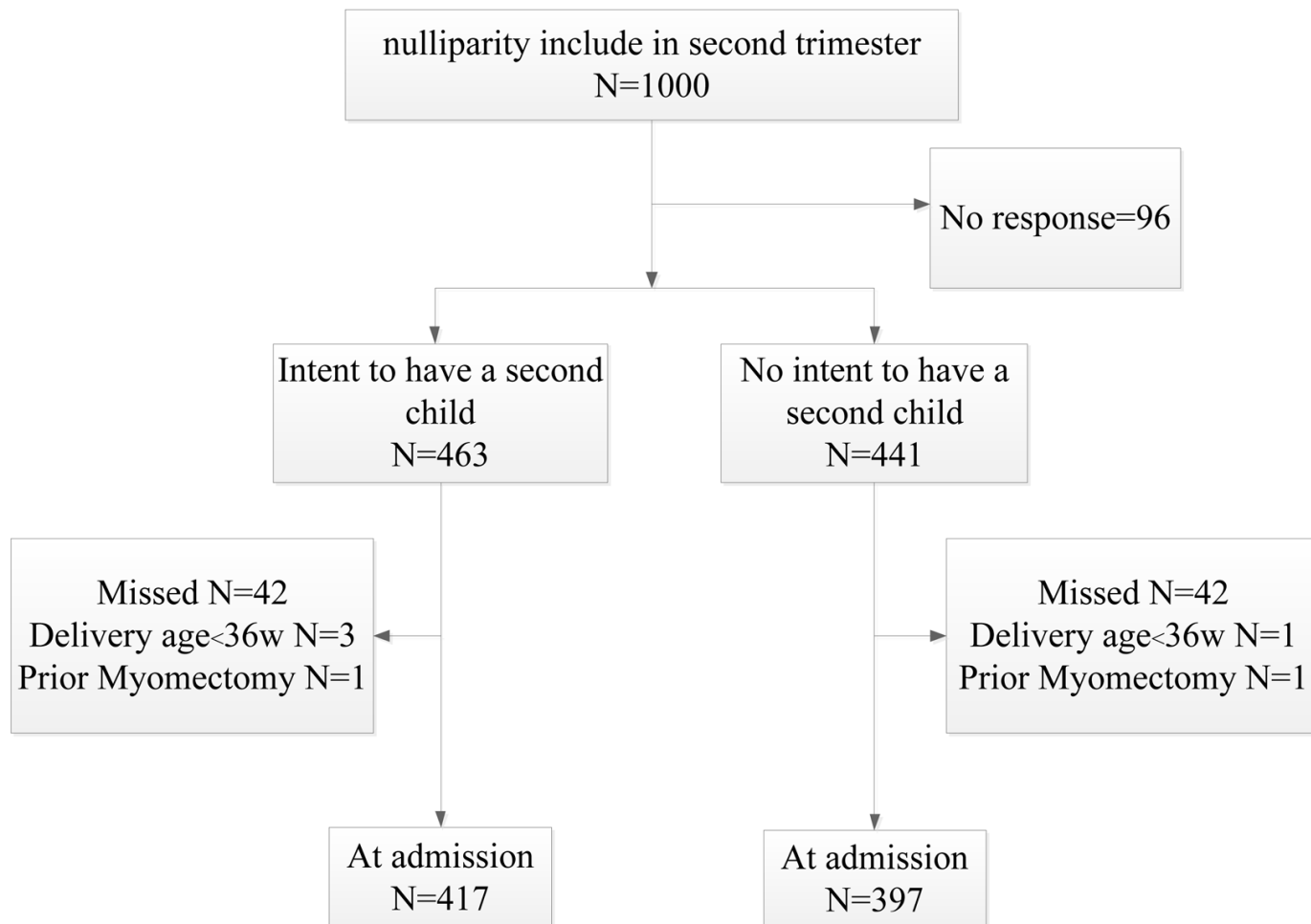
A total of 1000 women who satisfied the inclusion criteria were initially enrolled in their second trimester. Of these, 904 women (90.4%) completed the first interview, of whom 51.2% (463/904) intended to have a second child. We then divided the women into two groups based on their intent to have a second child. A total of 84 women did not deliver in our hospital, including 42 women in the intent group and 42 women in no intent group. For these women, we did a follow-up postpartum by telephone, and most delivered in a hospital near their home for emergency reasons. As they did not know the specific indications for their CD, we asked for their final mode of delivery (vaginal delivery or CD). Their baseline characteristics were collected from the questionnaire acquired in the first interview. The final CD rates between the two groups were 42.9% and 45.2%, which were close to the rates in the analysis groups (41.0% and 50.4%), and other characteristics also showed no difference (detailed information can be found in the online supplementary file). Four women had a gestational age  $< 36^{+0}$  weeks and two women had uterine scars; these women were excluded before the analyses. Finally, 814 women were enrolled in the final analysis. A flowchart of the study design is shown in [figure 1](#).

#### Baseline and obstetric characteristics

Only age and insurance status were statistically different between the two groups ([table 1](#)). Those who did not intend to have a second child were older and had a higher ratio of insurance.

#### Reasons for no intent to have a second child and preferring vaginal delivery at first interview

For those who stated they did not intend to have a second child, a follow-up multiple choice question asked why, and 441 women responded to the question. The most commonly cited reasons were time famine (56.0%) and economic pressures (55.7%) ([figure 2](#)). In the intent group for those who stated they preferred a vaginal delivery, a follow-up multiple choice question asked why, and 417 women responded to the question. The most commonly cited reasons were rapid recovery (82.2%) and beneficial for the next delivery (76.7%) ([figure 3](#)).



**Figure 1** Flowchart of the study design.

### Preferred mode of delivery at the second trimester and at admission

The overall preference for CD was 11.9% (97/814) in the second trimester, which significantly increased to 30.6% (249/814) at admission (table 2). Consistent with this, the preference rates for CD among those who did and did not desire a second child were 6.2% and 17.9% (crude RR (cRR) 0.31, 95% CI 0.19 to 0.49,  $p < 0.05$ ) in the second trimester, which increased to 24.2% and 37.3% (cRR 0.54, 95% CI 0.40 to 0.73,  $p < 0.05$ ) at admission, respectively. These results showed significant differences between the two groups, regardless of the stage of pregnancy. Those who only wanted one child were more likely to select CD compared with those who wanted a second child.

### Overall CD and CDMR rates

The overall CD rates for those who did and did not desire a second child were 41.0% versus 50.4% (cRR 0.69, 95% CI 0.52 to 0.90,  $p < 0.05$ ), and the CDMR rates were 16.7% versus 29% (cRR 0.48, 95% CI 0.33 to 0.71,  $p < 0.05$ ), respectively. Although there was a slight increase in antepartum CD with borderline indication, no statistically significant difference was noted. No significant differences between other indications were apparent.

### Independent strength of second child intent on delivery preference and final mode of delivery

Confounders that were found to have an association with outcomes were entered into a series of logistic regressions to determine the independent influence of intent status on outcomes (table 2). Reductions in the prefer CD in second trimester (adjusted RR (aRR) 0.35, 95% CI 0.20 to 0.63,  $p = 0.001$ ), prefer CD at admission (aRR 0.65, 95% CI 0.45 to 0.94,  $p = 0.02$ ) and CDMR (aRR 0.56, 95% CI 0.37 to 0.86,  $p = 0.008$ ) remained significant after adjustment, although the overall CD (aRR 0.84, 95% CI 0.60 to 1.18,  $p = 0.31$ ) was no longer significantly different after accounting for the influence of potentially confounding variables.

### DISCUSSION

This observational study found that nulliparous women who intended to have a second child were less likely to request CD. To the best of our knowledge, this study is the first attempt in China to estimate the influence of second child intent on nulliparous women's delivery preference and final CD, particularly CDMR, after China's two child policy implementation.

**Table 1** Baseline and obstetric characteristics of participating women (n=814)

Characteristic	Intent to have a second child (n=417)	No intent to have a second child (n=397)	P value
Age (y)	27.61±3.02	28.97±3.81	<0.001*
20–24	59 (14.1)	37 (9.3)	<0.001†
25–29	267 (64.0)	217 (54.7)	
30–34	85 (20.4)	104 (26.2)	
≥35	6 (1.4)	39 (9.8)	
Educational level‡			
Primary or below	13 (3.1)	8 (2.0)	0.14†
Secondary	42 (10.1)	56 (14.1)	
Tertiary	362 (86.8)	333 (83.9)	
Insurance	314 (75.3)	325 (81.9)	0.02†
Average income of the family(¥)			
<3000	19 (4.6)	22 (5.5)	0.09†
3000–4999	69 (16.5)	92 (23.2)	
5000–6999	103 (24.7)	89 (22.4)	
≥7000	226 (54.2)	194 (48.9)	
Occupation			
Unemployed/household	66 (15.8)	58 (14.6)	0.05†
Workers in factory/commercial enterprise/ services	166 (39.8)	199 (50.1)	
Professional/government staff	125 (30.0)	96 (24.2)	
Individual business	37 (8.9)	28 (7.1)	
Other	23 (5.5)	16 (4.0)	
BMI <sup>£</sup> at first prenatal visit (kg/m <sup>2</sup> )	20.7±2.7	20.6±2.5	0.5*
Abortion rate ≥2	75 (18.0)	83 (21.0)	0.33†
Medical history	75 (18.0)	65 (16.4)	0.59†
Pregnancy complications	128 (30.7)	139 (35.0)	0.24†
Gestational week at delivery	39.6±1.1	39.5±1.0	0.15*
Birth weight	3387.2±415.7	3328.4±387.0	0.06*
Maternal morbidity§	23 (5.5)	24 (6.0)	0.75†
Neonatal morbidity¶	20 (4.8)	25 (6.3)	0.35†

Data are mean±SD or n (%).

\*Two sample t test.

† $\chi^2$  test.

‡Education level was categorised as primary (primary school, junior middle school) or below, secondary (a senior high school, vocational/technical secondary school and junior college) and tertiary (senior college and university).

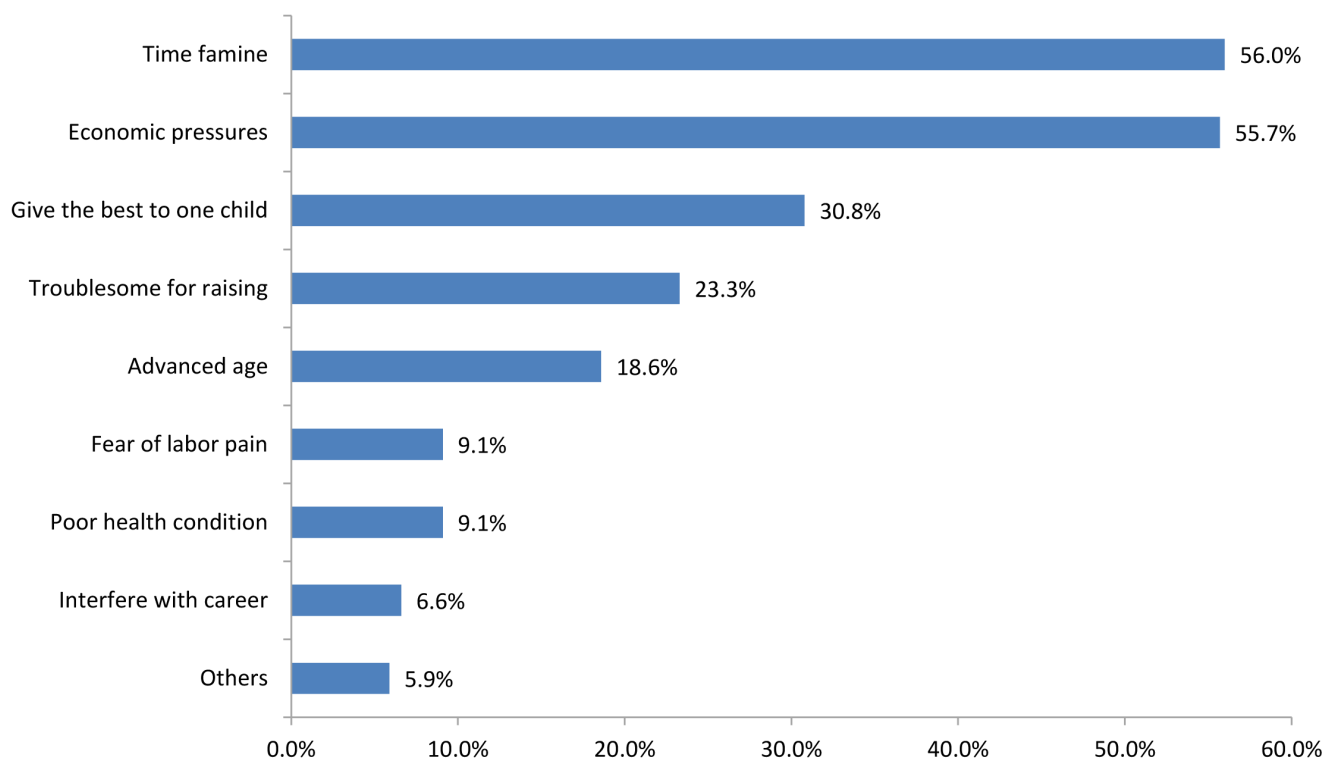
§Including postpartum haemorrhage, puerperal infection, maternal organ injury and intensive care unit admission.

¶Neonatal morbidity was defined as including any of the following outcomes: shoulder dystocia, birth injury, 5 min Apgar score <7, umbilical artery pH <7.0, umbilical artery base deficit >12, requiring antibiotics for >48 hours and neonatal intensive care unit admission. Neonatal birth injury was defined as cephalohaematoma, fracture, intracranial haemorrhage or brachial plexus injury associated with delivery.

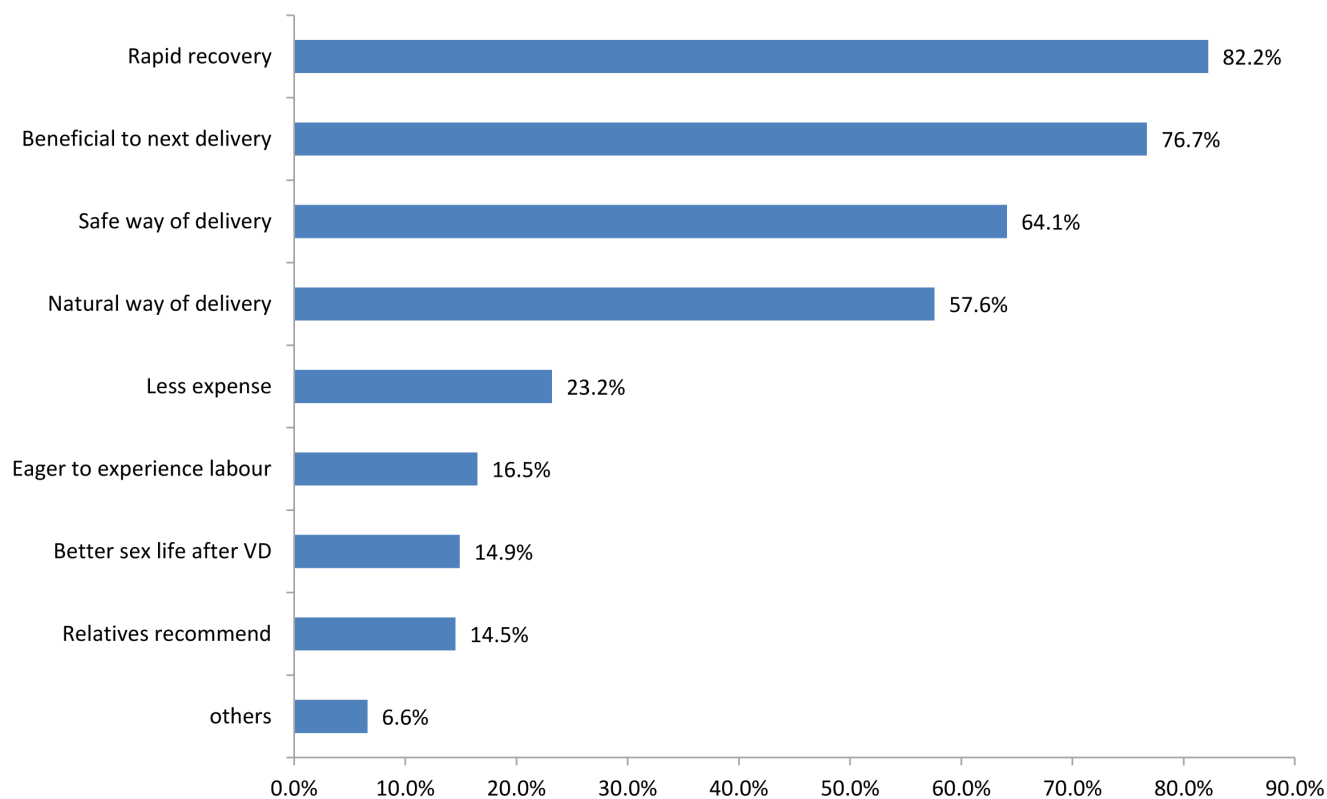
£BMI, body mass index.

As noted previously, with the one child policy, typical families in China with four grandparents and two parents waited for a ‘perfect’ baby which, combined with the belief that they would deliver only once, made CDMR the most common reason for CD in most areas of China. The new two child policy will not only increase the decreasing fertility rate in China but may alter the misconceptions about CD and CDMR, which will impact on the overall

CD rate. Our results indicate that women who intend to have two children are less likely to choose CD as their first choice, and the difference remained significant after adjusting for confounding bias. Furthermore, multiple choices questions were used to determine why women selected vaginal delivery as their first delivery preference in the intent group, and the results showed that 76.7% of women thought vaginal delivery was beneficial



**Figure 2** Frequency distribution of the reasons why women did not intend to have a second child.



**Figure 3** Frequency distribution of the reasons why women chose vaginal delivery (VD) in intent group at first interview.

**Table 2** Preferred mode and final mode of delivery of participating women (n=814)

Outcome	Intent to have a second child (n=417)	No Intent to have a second child (n=397)	Crude RR (95%CI)	Adjusted RR (95%CI)	P value
Preference in second trimester					
Caesarean delivery	26 (6.2%)	71 (17.9%)	0.31 (0.19 to 0.49)‡	0.35 (0.20 to 0.63)	<b>0.001</b>
Vaginal delivery or no preference (ref)*	391 (93.8%)	326 (82.1%)	1	1	
Preference at admission					
Caesarean delivery	101 (24.2%)	148 (37.3%)	0.54 (0.40 to 0.73)‡	0.65 (0.45 to 0.94)	<b>0.02</b>
Vaginal delivery or no preference (ref)†	316 (75.7%)	249 (62.7%)	1	1	
Final mode of delivery					
overall cesarean delivery	171 (41.0%)	200 (50.4%)	0.69 (0.52 to 0.90)‡	0.84 (0.60 to 1.18)	0.31
Cesarean delivery on maternal request	70 (16.7%)	115 (29.0%)	0.48 (0.33 to 0.71)‡	0.56 (0.37 to 0.86)	<b>0.008</b>
Antepartum cesarean delivery with borderline indications	66 (15.8%)	52 (13.1%)	1 (0.64 to 1.55)	1.14 (0.71 to 1.82)	0.6
Antepartum cesarean delivery with medical indications	27 (6.5%)	21 (5.3%)	1.04 (0.54 to 2.02)	1.33 (0.64 to 2.75)	0.45
Intrapartum cesarean delivery	8 (1.9%)	12 (3.0%)	0.56 (0.21 to 1.51)	0.73 (0.26 to 2.09)	0.56
Vaginal delivery (ref)	246 (59%)	197 (49.6%)	1	1	

Data expressed as n (%).

Adjusted for age, educational level, insurance, average income of the family, occupation, medical history, pregnancy complications, birth weight, maternal and neonatal morbidity.

\*Seven women had no preference in the intent group and 13 women had no preference in no intent group.

†No women chose no preference in both groups.

‡P<0.05.

for the next delivery, which indicates a more cautious and rational view of CD in nulliparous women who want two children after implementation of China's two child policy.

It should be noted that there was a rapid increased preference for CD in both groups (6.2% to 24.2% in the intent group and 17.9% to 37.3% in the no intent group), which was different from other studies. A survey conducted by Karlstrom *et al* found that preference for CD in Sweden was stated by 7.6% of women during mid pregnancy and by 7.0% in late pregnancy.<sup>31</sup> Pang *et al* reported that 17.2% of women chose CD at 20 weeks' gestation which decreased to 12.7% at 37 weeks' gestation in nulliparous Hong Kong Chinese women.<sup>32</sup> These two studies concluded that a decreasing proportion of women preferred CD with increasing gestational weeks. However, more recent studies have shown different conclusions, which are consistent with our results. Ji *et al* reported that the proportion of CD preference increased from 13.2% in the second trimester to 17.0% in the third trimester.<sup>18</sup> Deng's survey also showed the same increase (25.1% women preferred CD in in early pregnancy which increased to 28.4% in late pregnancy).<sup>33</sup> It is difficult to clarify the underlying reasons for such results, because whether a pregnant woman prefers a vaginal delivery or CD is ultimately determined by a variety of socioeconomic, medical, obstetric and neonatal factors. Nevertheless, there were some differences among these studies by comparing baseline and obstetric characteristics, which could partially explain the difference. First,

the ratio of tertiary education was 51.5% and 39.3% in Karlstrom's and Pang's survey, and it was 71.9% and 68.2% in Ji's and Deng's study. However, the proportion in our study was >80% (86.8% in the intent group and 83.9% in the no intent group), ranking the highest in these four studies. It seems that a higher education level was a strong exposure factor associated with increasing CD preference and final CD, and has been proved in several studies.<sup>7 19 34</sup> Second, a relatively high proportion of women of advanced age (1.4% of women in the intent group and 9.8% of women in the no intent group were >35 years of age) may also have resulted in the increase.<sup>19</sup> Moreover, as the largest obstetric care and high risk pregnancy centre in Chongqing, many pregnant women with severe complications were transferred to our hospital; they may have had a negative influence when they chatted with other women. Also, nearly one-third of participating women were diagnosed with pregnancy complications (30.7% in the intent group and 35.0% in the no intent group), leading to excessive worry about their delivery, even though most of these complications were not indications for CD.

In accordance with the decreased CD preference, the final CD rate decreased by nearly 10% and the CDMR rate decreased by more than 12% compared with the no intent group, and the decreases remained significant for CDMR after adjustment, even though the decrease in final CD was no longer significant. From this observational study, we concluded that the desire for a second

child had a significant impact on nulliparous women choosing CD, particularly CDMR.

Notably, there remained a high CD rate (45.6%) for nulliparous women, despite a large proportion of women who chose vaginal delivery (85.6%) as their first choice at the first interview, or on admission (68.8%). Several studies have shown similar findings.<sup>18 35 36</sup> A study conducted by Ji *et al* aiming at identifying factors contributing to the rapid rise in CD in Shanghai among nulliparous women reported that the CD preference was 13.2% and 17% in the second and third trimesters, respectively, but 58.1% of women finally underwent CD, including 34.9% of women who underwent surgery without any medical indications or based on maternal request.<sup>18</sup> They concluded that doctor judgement plays an important role in the decision making. Similarly, our study showed the same result: 33.7% (125/371) of women who underwent CD had borderline indications, indicating that nearly one-third of women underwent CD without definite surgery criteria, and instead had only borderline indications based on the obstetrician's judgement. In addition to the tense doctor–patient relationship in China, a shortage of obstetricians and midwives to meet the demand for labour is also a key factor, and this shortage will become worse after implementation of the new policy.<sup>24</sup> Therefore, any efforts to decrease this category of CD should focus on solving these issues in the next few years. On the one hand, enriched professional knowledge to appropriately use policies and guidelines should be developed. Also, strengthening communication skills with patients and their family members and paying more attention to labour are key to relieving the tensions in the doctor–patient relationship.<sup>37–39</sup> On the other hand, reforming payments and the malpractice system, and increasing the number of nurses and midwives will be necessary to solve these shortages in the next few years.<sup>4</sup>

Interestingly, in our study, nearly half of participating women (48.8%) did not intend to have a second child, which was contrary to the new population policy. This is common in China, particularly urban China, after over 30 years of the population control policy. Yi noted that only 13.2% of eligible couples and a lower ratio of urban residents applied for permission to have a second child. Economic pressures and time shortages were likely the main reasons for such low application rates.<sup>40</sup> The results of a multiple choice question in our survey on reasons why women do not intend to have a second child also support Yi's conclusion. However, as the local government initiated the policy gradually, more women might change their mind, and a baby boom will likely occur.

Several limitations are worth mentioning. As a teaching hospital in the centre of Chongqing, 89.2% of women enrolled in our observation were from the urban population (data not shown). Also, in 85.4% of women, educational level was tertiary, which may have led to their lower intention of having a second child (only 51.2% of participating women intended to have a second child). It is widely known that women with higher levels of education

have fewer children.<sup>41</sup> Data from the Demographic and Health Surveys for 26 countries confirmed that higher education is consistently associated with lower fertility.<sup>42</sup> Another study including 35 212 Finnish women born in 1940–1950 found that women's education and socioeconomic position of the family were negatively associated with fertility.<sup>43</sup> All of these studies indicated that women with a higher education level had a lower fertility intent. However, there were relatively small numbers of women with a primary or secondary educational level. Combined with this, fertility intent was ultimately determined by a variety of other factors, indicating that our data did not accord with this tendency (the rates of intent to have a second child were 61.9%, 42.9% and 52.1% in the primary or below, secondary and tertiary education groups).

As the largest obstetric care and high risk pregnancy centre in Chongqing, many pregnant women with severe complications are transferred to our hospital, resulting in a relatively high CD rate. Therefore, the results of our study may not reflect the preferences and conditions among Chinese nulliparous women living in other regions of China. Furthermore, given the relatively small sample size and the potential researchers' influences on the women's choices, there are limitations of generalisability when extrapolating the results of the present study to other regions. Although we performed a series of logistic regressions and calculated the adjusted RR to minimise this bias, the researchers' influence still existed because there was information bias. Also, the nature of the observational study, in particular that the no intent group had a much higher proportion of mothers at advanced age ( $\geq 35$  years) than the intent group (9.8% vs 1.4%), residual confounding likely still existed that might have an effect on the association between exposure variables and outcomes.

## CONCLUSIONS

In conclusion, this study confirms that women who intend to have a second child are less likely to demand CD at our institution after implementation of the new two child policy. The observed decrease was both statistically and clinically significant, and we believe that our findings will help policy makers promote better strategies to lower the high CD rate in mainland China.

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**Competing interests** None declared.

**Patient consent** Obtained.

**Ethics approval** This project was approved by the institutional research ethics committee of Chongqing Medical University.

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