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Is age and socioeconomic status associated with preference for birth mode in nulliparous women in China?

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Abstract

Purpose To examine the association between sociodemographic factors and preference for birth mode in nulliparous women in China.

Methods A total of 4606 women before or in early pregnancy were recruited from 2013 to 2016 in the Shanghai Birth Cohort Study. Generalized linear regression was used to examine the association of sociodemographic characteristics with preferred birth mode and actual cesarean section (CS) without clinical indications in 2713 nulliparous women, and the changes from preference of vaginal birth to actual CS without clinical indications in 2369 nulliparous women.

Results After controlling for potential confounders, preference for CS was associated with older maternal age [31–34 years: adjusted risk ratio (ARR) 2.73, 95% confidence interval (CI) 1.56–4.78; ≥ 35 years: 6.27, 3.28–12.01, p for trend < 0.0001] and lower level of education (below junior college vs college or above: 1.51, 1.10–2.09). Older maternal age (≥ 35 years: 3.37, 1.74–6.50), born in city or township (city vs countryside: 3.18, 1.93–5.24; township vs countryside: 1.97, 1.06–3.66), and lower level of education (below junior college vs college or above: 1.38, 1.01–1.88) were significantly associated with a CS without clinical indications. Women who preferred vaginal birth but had an actual CS without clinical indications were more likely to be older (≥ 35 years: 4.30, 1.44–12.83) and born in city (city vs countryside: 2.89, 1.33–6.30).

Conclusions Older age, lower education level, and being born in city or township were risk factors for CS without clinical indication in China.

Keywords Cesarean section without clinical indications · Preference for birth mode · Sociodemographic factors

Introduction

Cesarean sections (CS) are intended to be used in specific conditions where one believes that the vaginal route will offer more risks to the fetus, to the mother or to both, but it is common even in mothers without clinical indications in China. Ample evidence showed that CS without clinical indications was associated with higher risks for maternal and infant morbidity and mortality, including maternal bleeding, infections, admission to intensive-care unit (ICU), hysterectomy, death, and infant respiratory distress [1, 2]. Delivery by CS was also associated with an increased odds of childhood asthma, autism spectrum disorders (ADS), and attention-deficit/hyperactivity disorder (ADHD) [3, 4]. A recent study found that during the period from 1990 to 2014, the worldwide average CS rate increased by 12.4% (from 6.7 to 19.1%) with an average annual rate of increase being 4.4%, and Asia was the region with the highest average annual

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rate of increase (6.4%) [5]. CS rate has also been increasing in China with the most rapid increase since the 1990s. The CS rate was reportedly as high as 54.5% in 2011 [6], and 54.9% and 58.5% in 2014 in some regions [7, 8]. A recent systematic review reported that the national CS rate in China was nearly 40% [9].

The previous studies suggest that the high CS rate in countries accepting elective CS could be driven by both patients and physicians, and associated with advanced economic development of the region [10, 11]. For example, Zhang et al. found that the dramatic increase of CS rate from 22% in 1994 to 56% in 2006 was mainly due to maternal request [10]. A meta-analysis study also reported that the increased cesarean section rates have been partly attributed to maternal request [12]. However, our understanding on why women choose CS over vaginal birth is still incomplete, and the reasons are likely to be culture-specific.

Several studies from China, Chile, and Italy examined socio-demographic factors influencing the preference of birth mode [11, 13–15] and a meta-analysis study reviewed women's preferences for cesarean section [12]. This meta-analysis of 38 observational studies concluded that women preferred vaginal birth to CS in general [12]. Studies from China and Chile reported that older women were more likely to prefer CS [11, 14]. This was in contrast to the results from Italy where the opposite was found [13]. In addition, the Italian study found that more educated women were more likely to prefer vaginal birth [13], while the Chilean and Chinese studies found no associations between income and education level and women's preference of birth mode [11, 14]. However, a meta-analysis study reported that women living in a relatively low-income country were more likely to prefer CS [12].

In addition to the inconsistent findings, our understanding on factors that changed women's preference of vaginal birth to having actual CS without clinical indications at birth is even more limited. Therefore, this study aimed to examine the association of socio-demographic factors with preference for CS, actual CS without clinical indications, and the changes from preference of vaginal birth to actual CS without clinical indications in a Chinese population where the CS rate is very high.

Methods

Study design and participants

This study used data from the Shanghai Birth Cohort Study. Briefly, from 2013 to 2016, six university affiliated teaching hospitals and one district maternal and child health care hospital participated in a prospective cohort study. Women who came for preconception care or prenatal care during the first trimester (before 16 weeks of gestation) and planned to give birth at the participating hospitals were invited to participate in this study. Women were informed of the purpose of the study and their right to withdraw from the study at any time and for any reason. A written consent was obtained from each participant.

The following women were eligible to participate: ≥ 20 years old, married, with at least one of the couple being registered Shanghai resident, and no intention to move out of Shanghai in the next 2 years. Women were interviewed by trained research staff for sociodemographic information such as age, ethnicity, place of birth, education, occupation, social support, and financial situation. A telephone follow-up survey was conducted to collect information on women's preferred birth mode (vaginal birth, CS, or no preference). Information on actual birth mode and indications for CS was abstracted from the hospital records. Ethical approval was obtained from the Ethics committee of Xinhua Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai, China (Protocol no. XHEC-C-2013-001-2).

A total of 4606 women were initially enrolled in our study before pregnancy or in the first trimester. Figure 1 illustrates the sample selection process. A total of 3142 mothers were followed till delivery. As multiparity is an important factor affecting the choice of birth mode [12, 13], and history of uterine surgery, including previous CS and other types of uterine surgery, was a common indication for repeat CS in China [6]. Thus, we decided to exclude 382 multipara and 47 women with a history of uterine surgery, leaving 2713 nulliparous women for analyses on the association of sociodemographic factors with preferred birth mode and actual CS without clinical indications. After excluding subjects with missing data in either preferred birth mode or actual birth mode, 2369 nulliparous women were included to examine the association between sociodemographic factor and changes from preferring vaginal birth to actual CS without clinical indications (Fig. 1).

Measures

Sociodemographic factors included age, place of birth, education, and family financial situation. Family financial situation, an indicator of socioeconomic status (SES), was collected by asking mothers "What is your family financial situation?" with responses recorded as good (well-off/just enough money), poor (pinch pennies/a little difficult/burdened with debts), or refused to answer. Due to lack of variability or missing data, we did not include ethnicity and occupation. In a telephone interview in late pregnancy (between 32 and 36 gestational week), mothers were asked: "How do you plan to give birth?" with choices of "vaginal birth", "cesarean section", "try vaginal birth first; if not

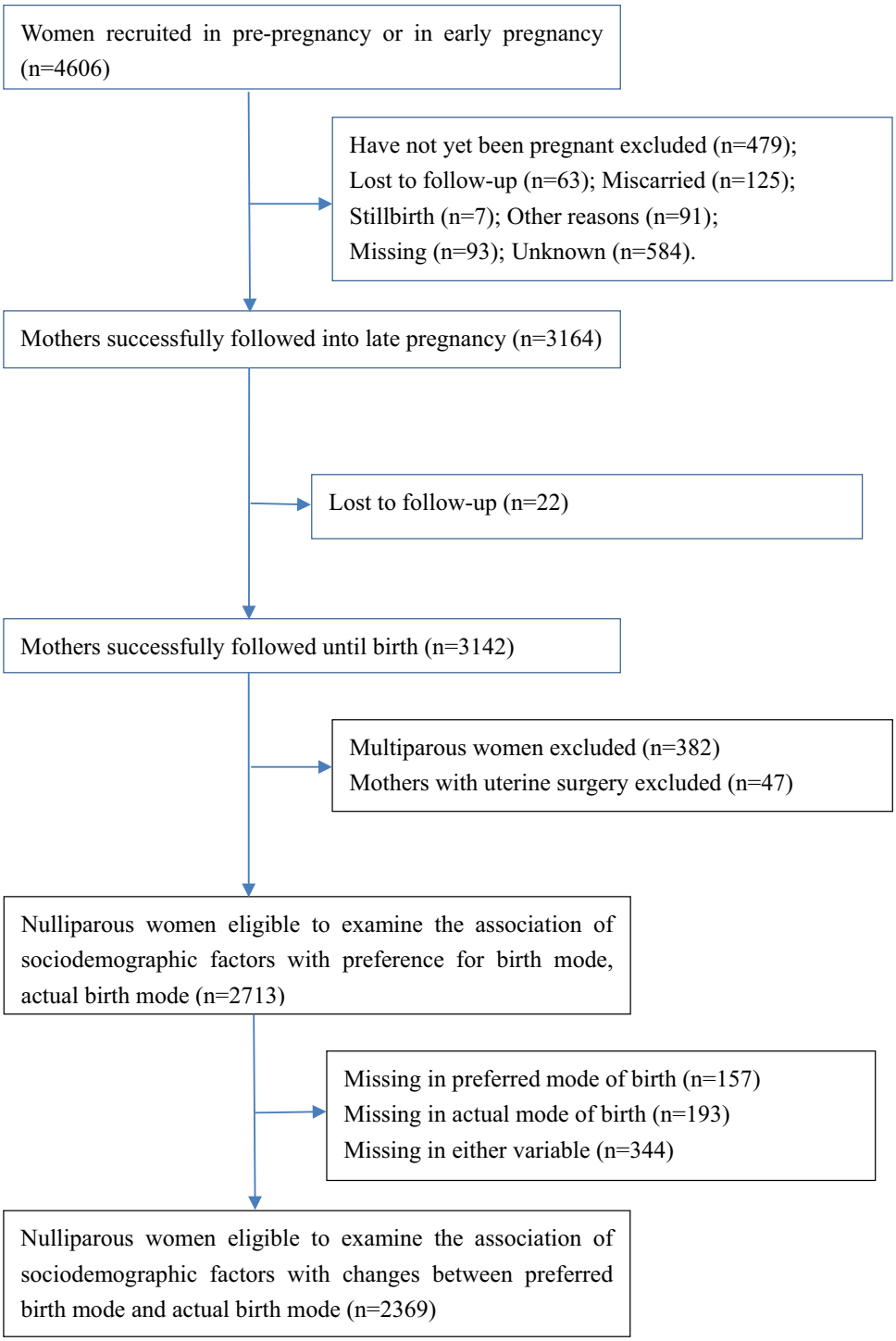

Fig. 1 Flowchart of the study design

working, then cesarean section", and "no preference". The response of "vaginal birth" and "try vaginal birth first, if not working, and then cesarean section" were combined as the preference for vaginal birth group.

The actual birth mode obtained from hospital records was categorized as: "vaginal birth", "forceps", "vacuum suction", "breech extraction", "assisted breech birth", and "cesarean section". "Forceps", "vacuum suction" and "breech extraction", and "assisted breech birth" are all included in "vaginal birth" as the reference group. The clinical indications for CS obtained from hospital records were categorized as: "without clinical indications", "fetal growth retardation", "preeclampsia/eclampsia", "fetal distress", "post-term birth", "vaginal bleeding in late pregnancy", "cephalopelvic disproportion/dystocia/bradytocia/birth failure by forceps or suction", "multiple pregnancy", "suspected

uterine rupture", "fetal death", "breech or other malposition", "failed induction of labor", "tubal ligation/sterilization", "HIV", "Genital herpes/extensive condyloma acuminata", and "others (including other maternal obstetric and medical complications, and other fetal health problems)".

Statistical analysis

Descriptive analyses were performed to describe sociodemographic characteristics. Generalized linear regression was used to examine the association of sociodemographic factors with preferred birth mode and actual CS without clinical indications separately. We also compared women (1) preferring vaginal birth and having a CS without clinical indications and (2) having no preference and having a CS without clinical indications, respectively, with women preferring vaginal birth and having a vaginal birth or having a CS with clinical indications by sociodemographic characteristics. Relative risks (RRs) and corresponding 95% confidence intervals (CIs) were generated.

Missing values were observed in 14.9% of the subjects mainly due to missing information on actual birth mode (7.1%) and preferred birth mode (5.8%). All statistical analyses were conducted using SAS software, version 9.4 (SAS Institute, Inc., Cary, NC, USA).

Results

Most nulliparous women were aged 26–30 years (58.0%) with a mean age of 28.9 years (SD: 3.4 years), born in city (64.1%), and had at least college education (65.9%). Our nulliparous women overwhelmingly preferred vaginal birth (69.5%) to CS (8.1%), and 22.4% showed no preference. However, 43.9% of the women delivered by CS, finally, of which 23% of the women delivered without clinical indications (Table 1).

In the adjusted model, compared with women aged 20–25, those aged 31–34 years [adjusted RR (ARR) 2.73, 95% CI 1.56–4.78] were more likely to prefer CS. The corresponding risks were 6.27 (3.28–12.01) for women aged ≥ 35 years. Women with lower education level (below junior college vs college or above, ARR 1.51, 95% CI 1.02–2.09) were more likely to prefer CS. In general, women who were older, born in city, had less education, or perceived relatively good family financial situation were more likely to report no preference than vaginal birth (Table 2).

In the adjusted model, compared with actual vaginal birth or cesarean section with clinical indications, actual CS without clinical indications was positively associated with older maternal age (≥ 35 vs 20–25 years of age, ARR 3.37, 95% CI 1.74–6.50), born in township (ARR 1.97, 95% CI 1.06–3.66), born in city (ARR 3.18, 95% CI 1.93–5.24), and lower education level (ARR 1.38, 95% CI 1.01–1.88). We found that good family financial situation was non-significantly associated with actual CS without clinical indications (ARR 1.54, 95% CI 0.89–2.67) (Table 3).

After mutual adjustment, the changes from preferring vaginal birth to actual CS without clinical indications in nulliparous women were positively associated with older maternal age (≥ 35 vs 20–25 years of age, ARR 4.30, 95% CI 1.44–12.83) and born in city (ARR 2.89, 95% CI 1.33–6.30). The changes from no preference to actual CS without clinical indications were positively associated with older maternal age (≥ 35 vs 20–25 years of age, ARR 9.61, 95% CI 2.72–33.93), born in city (ARR 2.75, 95% CI 1.19–6.33), lower education level (ARR 1.93, 95% CI 1.11–3.33), and good perceived family financial situation (ARR 4.21, 95% CI 1.01–17.51) (Table 4).

Table 1 Background characteristics of nulliparous women

Variables	Number of mothers	Percent
Age (years)		
20–25	372	13.9
26–30	1556	58.0
31–34	592	22.1
≥ 35	162	6.0
Place of birth		
Countryside	568	21.2
Township	395	14.7
City	1716	64.1
Education		
College or above	1784	65.9
Below junior college	922	34.1
Family financial situation		
Poor	288	10.7
Good	2361	87.3
Refused to answer	55	2.0
Preferred mode of birth		
Vaginal birth	1777	69.5
Cesarean section	206	8.1
No preference	573	22.4
Actual birth mode		
Vaginal birth	1413	56.1
Cesarean section	1107	43.9
Clinical indications for cesarean section		
No	215	23.0
Yes	718	77.0

Due to missing data, the valid number by each variable may not be consistent throughout variables

Table 2 Sociodemographic factors that were associated with preference for cesarean section and no preference compared with preference for vaginal delivery in nulliparous women in China

	No preference		Preference for cesarean section	
	Crude RR (95% CI)	Adjusted RR (95% CI)[a]	Crude RR (95% CI)	Adjusted RR (95% CI)[a]
Age (years)				
20–25	1	1	1	1
26–30	1.61 (1.17–2.21)	1.55(1.11–2.16)	1.17 (0.71–1.94)	1.33 (0.79–2.25)
31–34	1.74 (1.22–2.49)	1.58 (1.08–2.30)	2.37 (1.40–4.02)	2.73 (1.56–4.78)
≥35	3.74 (2.35–5.95)	3.20 (1.97–5.18)	5.74 (3.06–10.75)	6.27 (3.28–12.01)
p for trend	<0.0001	<0.0001	<0.0001	<0.0001
Place of birth				
Countryside	1	1	1	1
Township	1.22 (0.86–1.75)	1.22 (0.84–1.76)	0.96 (0.59–1.56)	0.94 (0.57–1.55)
City	2.13 (1.64–2.77)	2.14 (1.62–2.83)	1.15 (0.81–1.65)	1.05 (0.72–1.54)
Education				
College or above	1	1	1	1
Below junior college	1.26 (1.03–1.53)	1.60 (1.29–1.98)	1.34 (0.99–1.81)	1.51 (1.10–2.09)
Family financial situation				
Poor	1	1	1	1
Good	2.11 (1.46–3.05)	2.06 (1.41–3.02)	0.83 (0.54–1.26)	0.79 (0.51–1.21)
Refused to answer	1.08 (0.45–2.61)	1.11 (0.45–2.73)	1.73 (0.76–3.93)	1.55 (0.66–3.62)

Reference group: women who preferred vaginal, $n = 1777$

RR relative risk

[a]Mutually adjusted for all variables in the table

Discussion

Our study found that approximately seven in ten mothers preferred vaginal birth, while less than one in ten women preferred CS. However, more than 40% of women had an actual CS at birth. Women who were older or had a lower education level preferred CS to vaginal birth. In general, women who were older, born in city/township, and had a lower education level were more likely to have actual CS without clinical indications. Women who were older and born in city were more likely to change from preferred vaginal birth to actual CS without clinical indications.

We found that older age was an important and general risk factor for CS. This is consistent with reports from Chinese, Chilean, and Italian mothers where 60–80% preferred vaginal birth [11, 13–15]. However, Torloni et al. showed that younger age was associated with preference for CS in Italian women of child-bearing age [13]. The inconsistent results may be due to the fact that the study by Torloni involved multiparous women and reported crude rates of preference for birth mode only without taking into account maternal education level, parity, and previous experiences of CS. Mothers who are older, especially over 35, are generally considered as having increased risks for more pregnancy-related complications, such as perineal lacerations, preeclampsia, gestational diabetes mellitus, prematurity, placenta previa, antepartum, and postpartum hemorrhage [16, 17]. It has been reported that older women might have more psychological stress to undergo a vaginal birth [14]. In China, many people regarded 35 years as the turning point for fertility and beyond 35 years was classified as a high-risk pregnancy [15]. Therefore, these women may not only prefer CS at the first place, but also have increased likelihood of actual CS and changing from preference for vaginal birth to actual CS without clinical indications.

We found that, compared with women who were born in countryside, those born in city or township were more likely to have actual CS without clinical indications. The previous research found that advanced socioeconomic status was a more important driver of CS than personal economic status [18]. In 2008, 64.1% of women in urban area and 11.3% of women in the poorest rural region reported giving birth by CS in China [18]. Therefore, we speculate that, in our study, women who were born in city were more likely to accept CS as a way of giving birth, since they lived in urban areas for a longer time and affected by the mode of care in these areas. Further qualitative studies are warranted for explore the underlying reasons.

A lower education level was positively associated with preferred CS and actual CS without clinical indications. Our results were consistent with those of other studies, reporting that a higher education would reduce the likelihood of CS in

Table 3 Sociodemographic factors that were associated with actual cesarean section without clinical indications compared with actual vaginal birth or cesarean section with clinical indications in nulliparous women

	Cesarean section without clinical indications ($n=215$)	
	Crude RR (95% CI)	Adjusted RR (95% CI)[a]
Age (years)		
20–25	1	1
26–30	1.42 (0.87–2.33)	1.21 (0.72–2.02)
31–34	2.09 (1.23–3.55)	1.66 (0.95–2.91)
≥35	4.19 (2.22–7.93)	3.37 (1.74–6.50)
p for trend	<0.0001	<0.0001
Place of birth		
Countryside	1	1
Township	1.91 (1.05–3.45)	1.97 (1.06–3.66)
City	3.14 (1.97–5.00)	3.18 (1.93–5.24)
Education		
College or above	1	1
Below junior college	1.10 (0.82–1.48)	1.38 (1.01–1.88)
Family financial situation		
Poor	1	1
Good	1.76 (1.02–3.02)	1.54 (0.89–2.67)
Refused to answer	0.35 (0.04–2.73)	0.31(0.04–2.42)

Reference group: women who had actual vaginal birth or cesarean section with clinical indications, $n=2131$

RR relative risk

[a]Mutually adjusted for all variables in the table

Italy, Taiwan, and South Korea [13, 19, 20]. However, our results were contrary to some other studies in China and Brazil, which reported that higher education was associated with CS [10, 20]. Besides, no association between higher maternal education and CS was found in Southern Italy [21]. Other than differences in statistical methods, study design and sample selection, and different cultural, religious, and social environments might be attributable to such a discrepancy. In developed countries and regions, such as Italy, Taiwan, and South Korea, the quality of prenatal health education might be higher than that in developing countries. Therefore, women with higher education might have different choices between different countries and regions. It is possible that mothers with lower education level might have less knowledge on potential risks of CS and prefer CS.

Good family financial situation was positively non-significantly associated with the preference to CS and actual CS without clinical indications after adjusting for age and other socioeconomic status (SES) indicators. Our results were consistent with that of a previous study, reporting that none of the socioeconomic status (SES) variables was associated with CS in urban area in China [18]. However, our results were contradictory to those of other studies, reporting that CS was positively associated with higher SES [21–23]. Our findings indicated that the economic burden of CS might not be a major concern for mothers from relatively poor family financial status.

Our study has four limitations. First, we recruited mothers who or their husband were Shanghai residents and did not intend to move out in the next 2 years. Shanghai is one of the most economically advanced cities in China. Therefore, our findings might be applicable to regions with relatively advanced economic development only. Second, SES is generally represented by education level, family income, and occupation. However, we observed different associations of SES with CS. The knowledge on birth mode and attitudes towards to it may help us to understand more on the associations assessed in this study, but were not measured in this study. It has been reported that both groups of women preferring vaginal birth and cesarean section thought that their preferred birth mode was safer for their baby [11]. Third, we have done the analysis without examining the role of the obstetrician, physician, or other health care professionals in making the clinical or preferred decision for a CS. It has been reported by Hellerstein et al. that the attitude of obstetrician and midwives towards CS without clinical indications was one of the main factors affecting the high CS rate in China [24]. Insufficient manpower in the obstetric care unit and the financial bonus from CS might promote CS without clinical indications in China [24]. Therefore, the role of obstetric health professional could be a confounder if it is also associated with the socio-demographic characteristics of mothers, and, thus, confounding the association of mothers' socio-demographic characteristics with preferred mode of birth and actual mode of birth. Further studies are warranted to explore the magnitude of the effects of the role of health professionals on CS without clinical indications and the preference of birth mode of mothers. Fourth, this study did not include young women less than 20 years old, single women, and women that had a late start of prenatal care (≥16 weeks of gestation) which limits its external validity.

Most women preferred vaginal birth and less than one in ten preferred CS in late pregnancy in Chinese nulliparous women. Older maternal age, lower education level, and being born in city or township were risk factors for CS without medical indication in China. These results indicated high-risk group for CS reduction.

Table 4 Sociodemographic factors that were associated with the changes from preferring vaginal birth/no preference to cesarean section without clinical indications compared with preferring vaginal birth and had vaginal birth/cesarean section with clinical indications in nulliparous women in China

	Preferring vaginal birth/no preference to actual cesarean section without clinical indications			
	Preferring vaginal birth to CS without clinical indications ($n=78$)		No preference to CS without clinical indications ($n=65$)	
	Crude RR (95% CI)	Adjusted RR (95% CI)	Crude RR (95% CI)	Adjusted RR (95% CI)[a]
Age (years)				
20–25	1	1	1	1
26–30	1.49 (0.66–3.38)	1.18 (0.50–2.78)	2.26 (0.79–6.46)	2.14 (0.72–6.33)
31–34	2.86 (1.21–6.74)	2.11 (0.85–5.26)	3.33 (1.10–10.10)	2.92(0.91–9.37)
≥35	5.93 (2.05–17.13)	4.30 (1.44–12.83)	11.67 (3.45–39.48)	9.61 (2.72–33.93)
p for trend	<0.001	<0.01	<0.001	<0.001
Place of birth				
Countryside	1	1	1	1
Township	2.02 (0.79–5.19)	1.91 (0.73–4.95)	1.62 (0.60–4.37)	1.52 (0.52–4.46)
City	3.43 (1.62–7.25)	2.89 (1.33–6.30)	2.85(1.33–6.07)	2.75(1.19–6.33)
Education				
College or above	1	1	1	1
Below junior college	0.92 (0.56–1.50)	1.24 (0.73–2.10)	1.29 (0.77–2.15)	1.93 (1.11–3.33)
Family financial situation				
Poor	1	1	1	1
Good	1.52 (0.69–3.36)	1.35 (0.61–3.02)	4.66 (1.13–19.20)	4.21 (1.01–17.51)
Refused to answer	NS	NS	3.02 (0.27–34.30)	3.19 (0.27–37.03)

4Reference group: women who preferred vaginal birth and had vaginal birth or cesarean section with clinical indications, $n=1517$

RR relative risk

[a]Mutually adjusted for all variables in the table

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Author contributions YHM analyzed the data and drafted the manuscript. RH and HPY conceptualized the study, made significant contribution to the data analysis, and critically revised the manuscript. WZ and BW coordinated the study and revised the manuscript. JZ critically revised the manuscript. All authors read and approved the final manuscript.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

Ethical approval Ethical approval was obtained from the Ethics Committee of Xinhua Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai, China (Protocol no. XHEC-C-2013–001-2).

Informed consent Informed consent was obtained from all individual participants included in the study.

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