Original Research

Factors influencing parental pregnancy decision-making due to fetuses with non-syndromic orofacial clefts: a study of Chinese couples

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Abstract

Background: When a fetus is diagnosed with facial deformities, most Chinese couples choose to terminate the pregnancy. However, these couples commonly regret their decision after the termination of the pregnancy, display a heavier degree of grief, and these feelings persist for a long time. The purpose of this study was to investigate factors that influence parental pregnancy decisions regarding fetuses diagnosed with a non-syndromic orofacial cleft (NSOFC), and to provide the preliminary basis for a formulation of interview outlines useful in further qualitative research in this area. **Methods**: We collected medical records of 400 couples from the obstetrical units of a women's hospital in China whose fetuses were diagnosed with Orofacial clefts (OFCs) from January 2013 to July 2019. After excluding those records reporting chromosomal or other abnormalities, 311 cases were included in this study. After univariate analysis, factors that may have affected the parental pregnancy decision were analyzed using binary classification regression analysis. **Results**: Among the 311 couples, 71.7% (223/311) decided to terminate the pregnancy, whereas 28.3% (88/311) decided to continue. The registered residence, family history of NSOFC, maternal high-risk factors that may lead to the fetus suffering from NSOFC, maternal age, paternal age, doctor's suggestion, prenatal diagnosis, and first diagnosed gestational week all influenced pregnancy decision makings ($p < 0.05$). Among these, the registered residence, family history of NSOFC, maternal high-risk factors, maternal age, prenatal diagnosis, and first diagnosed gestational week substantially affected the parental pregnancy decision. **Discussion**: The couples with registered residence in rural areas, no family history of NSOFC, no maternal high-risk factors, younger maternal age, younger gestational age at first diagnosis are at greater relative risk of pregnancy termination. Prenatal diagnosis is a protective factor.

Keywords: Fetus; Cleft lip; Cleft palate; Decision-making

1. Introduction

Orofacial clefts (OFCs) are the most common type of congenital facial dysplasia with a global average incidence of approximately 0.8% [1]. Native Americans have the highest prevalence (2.62/1000), followed by Japanese (1.73/1000), and Chinese (1.56/1000) [2]. The prevalence of NSOFC is approximately 1.20% in China [3,4]. OFC is more common in males than females, but cleft palate only (CPO) is twice as common in females [5]. OFC is closely associated with genetic and environmental factors [6–8], but may also be related to assisted reproductive technology, obesity and smoking, and hyperthermia during pregnancy [9,10]. Different types and severity of OFC can effect the patient's diet, appearance, language development, and tooth eruption and arrangement to varying degrees [11,12]. OFC may even lead to nasal fistula, hearing impairment, and mental and psychological disorders [13–15]. However, surgery, dental treatment, and psychosocial intervention can be applied after birth to provide multi-disciplinary care for children with NSOFC [15,16].

In some countries, a minority of couples whose fetuses are diagnosed with NSOFC choose to terminate their pregnancy [17,18]. In some resource-scarce areas, people with OFCs often suffer from social prejudice [13] and, in such cases, couples whose fetuses are diagnosed with NSOFC tend to terminate their pregnancies. In China, most mothers of a fetus with a cleft lip and palate choose to terminate the pregnancy, even if the diagnosis of the fetus is mild or inconclusive [19]. According to available literature [17,20–23], the pregnancy decision of a couple of a fetus diagnosed with non-syndromic cleft lip and palate is influenced by a variety of factors, including age, education, type and severity of the disorder, prenatal genetic screening, a gestational week at the time of first diagnostic imaging, the doctor's prognosis or advice, family history, history of miscarriage, whether this pregnancy is a precious child, pregnancy risk factors (e.g., assisted reproductive technology, infection, mental stress and negative emotions during pregnancy, prenatal body mass index, etc.). To understand why the rate of termination is so high in China, and to determine factors that influence these decisions, we analyzed the data of 311

Table 1. Difference analysis of continuous variables between two groups.

	Termination group	Delivery group	T	p
	M ± SD	M ± SD		
Maternal age (Years)	29.58 ± 4.601	32.50 ± 5.157	−4.871	0.000
Paternal age (Years)	31.26 ± 4.950	34.09 ± 5.674	−4.361	0.000
Maternal body mass index (kg/m^2)	21.07 ± 2.760	21.86 ± 3.741	−9.481	0.040
First diagnosed gestational week	24.40 ± 2.762	29.06 ± 5.785	−2.064	0.000

mothers whose fetuses were diagnosed with NSOFC. The purpose of this study was to gather data to provide a preliminary basis for the formulation of an interview outline useful in further qualitative research.

2. Materials and methods

2.1 Data sources

We collected medical records of 400 couples from the obstetrical units of a women's hospital in China whose fetuses were diagnosed with OFCs from January, 2013 to July, 2019. The inclusion criteria of maternal medical records included two points: (1) The fetus was diagnosed with NSOFC with no other deformities except cleft lip and palate, including cleft lip with or without cleft palate (CL/P) and CPO [24]; (2) The mother's medical information was complete, including maternal education degree, registered residence, family history of NSOFC, gravidity, parity, history of abortion, maternal high-risk factors that may lead to the fetus suffering from NSOFC (including assisted reproductive technology, infection, mental stress and negative emotions during pregnancy, etc.), maternal age, paternal age, doctor's suggestion, prenatal diagnosis, first diagnosed gestational week, and maternal body mass index (BMI). Couples lost to follow-up were excluded from the study.

2.2 Data collection

In a digital medical record retrieval system (Unionnet Version 7, Shanghai Unionnet Network Information Co., Shanghai, China), the cases of mothers whose fetus was diagnosed with NSOFC from January, 2013 to July, 2019 were searched. The following information was extracted: maternal education degree, registered residence, family history of NSOFC, gravidity, parity, history of abortion, maternal high-risk factors that may lead to the fetus suffering from NSOFC (including assisted reproductive technology, infection, mental stress, and negative emotions during pregnancy, etc.), maternal age, paternal age, doctor's suggestion, prenatal diagnosis, first diagnosed gestational week, and maternal body mass index (BMI).

2.3 Statistical analysis

Data was compiled using MS Excel 2017 (Microsoft Corp., Redmond, MA, USA) and analyzed using the SPSS 23.0 (version 23.0, IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was applied to test for normal data distribution. If the data distributed normally, a T-test for comparison between the two groups of data was used and mean and standard deviation were calculated. Otherwise, correlation analysis of continuous data using the Mann-Whitney U test was performed by Pearson correlation analysis. We utilized numbers and percentages to described categorical variables and used the Chi-square test or Fisher's exact test (FET) to assess the relationships between categorical variables. The statistical significance at $p < 0.05$ was considered significant.

3. Results

Continuous variables in this study such as parental age, first diagnosed gestational week, and prenatal maternal BMI distributed normally. The mean maternal age, paternal age, first diagnosed gestational week, and prenatal maternal BMI in the termination (i.e., aborted pregnancy) group were 29.58 ± 4.601, 31.26 ± 4.950, 24.40 ± 2.762, 21.07 ± 2.760, respectively. In the delivery group, these values were 32.50 ± 5.157, 34.09 ± 5.674, 29.06 ± 5.875, 21.86 ± 3.741. T-test results showed the very existence of relationships ($p < 0.05$) between parental age, the first diagnosed gestational week, and pregnancy decisions (Table 1).

Among mothers below 35 years of age, the clear majority (77.3%) chose to terminate the pregnancy while only 22.7% of chose to continue with the pregnancy. While our data set contained only a relatively small number of mothers over 35 years of age, 48.3% of these decided to terminate the pregnancy and the remainder of these mothers chose to continue. 72% of the mothers included in this study were university educated. Most of the couples (66.2%) resided within an urban area while 33.8% resided in rural areas. Very few of those included in the study (8.4%) had a family history of NSOFC. Approximately 75% of fathers were under 35 years old. The diagnosis of OFC was made during the second trimester in the majority (83.6%) of fetuses, and the reminder were diagnosed in the third trimester. More than half of doctors (65.9%) did not believe it indispensable to terminate the pregnancy; nevertheless, 74.5% of physicians supported the decision to terminate the pregnancy.

Table 2 indicates that statistically significant relationships ($p < 0.05$) exist between the registered residence, family history of NSOFC, maternal high-risk factors that may lead to the fetus suffering from NSOFC, maternal age,

Table 2. Relationship between possible factors and pregnancy decision makings (n = 311).

	Pregnancy decision makings		χ^2/FET	p value
	Termination group (%)	Delivery group (%)		
Maternal education degree				
Below college	67 (77.0)	20 (23.0)		
College or above	156 (69.6)	68 (30.4)	1.677	0.210
Registered residence				
Rural areas	86 (81.9)	19 (18.1)		
Urban areas	137 (66.5)	69 (33.5)	8.130	0.005
Family history				
NO	211 (74.0)	74 (26.0)		
YES	12 (46.2)	14 (53.8)	9.129	0.005
Gravidity				
Primigravida	88 (77.2)	26 (22.8)		
Multigravida	135 (68.5)	62 (31.5)	2.672	0.117
Parity				
Primiparous	135 (73.8)	48 (26.2)		
Multiparous	88 (68.8)	40 (31.3)	0.936	0.371
History of abortion				
NO	113 (72.9)	42 (27.1)		
YES	110 (70.5)	46 (29.5)	0.219	0.706
Maternal high-risk factors				
NO	119 (81.5)	27 (18.5)		
YES	104 (63.0)	61 (37.0)	13.033	0.000
Maternal age (Years)				
Younger maternal age (<35)	194 (77.3)	57 (22.7)		
Advanced maternal age (≥35)	29 (48.3)	31 (51.7)	20.013	0.000
Paternal age (Years)				
Younger paternal age (<35)	184 (78.3)	51 (21.7)		
Advanced paternal age (≥35)	39 (51.3)	37 (48.7)	20.607	0.000
First diagnosed gestational week				
The second trimester (12–28)	211 (81.2)	49 (18.8)		
The third trimester (≥29)	12 (23.5)	39 (76.5)	69.780	0.000
Prenatal genetic diagnosis				
Normal or low risk	194 (70.0)	83 (30.0)		
Critical or intermediate risk	7 (87.5)	1 (12.5)		
High risk	8 (88.9)	1 (11.1)	2.029	0.331
Prenatal diagnosis				
Normal	0 (0.0)	47 (100.0)		
CL	16 (50.0)	16 (50.0)		
CPO/CLP	207 (89.2)	25 (10.8)	162.972	0.000
Maternal body mass index (BMI) (kg/m^2)				
<18.49	39 (70.9)	16 (29.1)		
18.5–24.99	164 (73.5)	59 (26.5)		
≥25	20 (60.6)	13 (39.4)	2.437	0.292
Doctor's suggestion				
Termination	17 (85.0)	3 (15.0)		
Delivery	205 (74.5)	70 (25.5)		
No suggestions	1 (6.3)	15 (93.8)	32.597	0.000

Significant at 0.05, χ^2 Chi-Square test. FET, Fisher Exact Test; NA, Normal; CL, cleft lip; CPO, Cleft palate only; CLP, Cleft lip with cleft palate.

Table 3. Regression analysis of factors influencing parental pregnancy decision makings.

	B	SEE	OR	95% CI	*p* value
Registered residence	1.262	0.526	3.531	1.260–9.896	0.016
Family history	2.717	0.697	15.139	3.859–59.397	0.000
Maternal high-risk factors	1.385	0.497	3.994	1.507–10.588	0.005
Maternal age	2.355	0.526	10.533	3.757–29.531	0.000
Prenatal diagnosis	–3.436	0.493	0.032	0.012–0.085	0.000
First diagnosed gestational week	0.270	0.060	1.310	1.164–1.474	0.000

The factors in the model included the registered residence, family history of NSOFC, maternal high-risk factors that may lead to the fetus suffering from NSOFC, maternal age, maternal age (years), paternal age, paternal age (years), doctor's suggestion, prenatal diagnosis, first diagnosed gestational week, first diagnosed gestational week (weeks). B, Beta; SEE, Standardized error of estimate; significant at 0.05.

paternal age, doctor's suggestion, prenatal diagnosis, first diagnosed gestational week and pregnancy decision making. However, no statistically significant relationship (*p* > 0.05) were observed between the maternal education degree, gravidity, parity, history of abortion, genetic diagnosis, and parental decisions.

Table 3 indicates significant correlation (*p* < 0.05) between the registered residence, family history of NSOFC, maternal high-risk factors, maternal age, prenatal diagnosis, and first diagnosed gestational week, and parental decisions.

4. Discussion

In China, universal health insurance coverage has been continually expanded and now includes vulnerable populations, such as such as elderly people [25]. Nevertheless, disparities still exist between rural and urban locations at the economic level, within the social security system, and within health resources [26]. The urban employee basic medical insurance (UEBMI) is more generous and comprehensive than either the urban resident basic medical insurance (URBMI) or the new rural cooperative medical scheme (NRCMS) as both with URBMI and NRCMS have limited outpatient service coverage. Medical expenses associated with disease have become one of the major components of Chinese people's debt, which can plunge a family into poverty and reduce the quality of life of family members [27]. In this study, rural area couples were approximately 3.5 times more likely than urban couples in choosing termination of pregnancy. Relatively underdeveloped rural economic levels, weak protection of social medical insurance, and a lack of health resources resulted in rural couples tending to terminate the pregnancy following the diagnosis of a facial abnormality. Reduction of costs in inpatient service should be a key intervention strategy, and this was previously reported in the literature [28].

The occurrence of NSOFC is also closely related to family history [29] as studies have shown that children have a higher risk of OFCs when parents have facial abnormalities [30]. In this study, the risk of termination of pregnancy in couples with a family history was approximately 15.1 times higher than couples with no family history and a correlation was observed with a negative experience following their decision. Children with OFCs in low-resource areas face social rejection and this brought about many harmful effects on their lives, studies, etc. [13]. Cleft lip and palate for those children brings a heavy burden to the economy of a family leading to a lower quality of life for both children and their family [31]. Consequently, couples with a family history of OFCs exhibit more reluctance to experience these effects again.

Early exposure to progesterone, hyperthermia, assisted reproductive technology, and other factors can increase the risk of NSOFC [32]. Our study showed that mothers without maternal high-risk factors leading to the fetus suffering from NSOFCs had an approximately 4 times higher risk of termination of the pregnancy than those with maternal high-risk factors. Furthermore, maternal age was an independent risk factor, and higher age is related to adverse pregnancy outcomes [33]. Women under 35 years were approximately 10.5 times more likely to terminate a pregnancy due to NSOFC when compared to women of more advanced maternal age. The results coincide with those observed by others [34]. Mothers under the age of 35, or those without maternal high-risk factors, were convinced of that they will have the opportunity to have a healthy child as they are young. These patients consequently showed a lower acceptance of NSOFC caused by sporadic factors, similar to another survey conducted in China [35].

Prenatal diagnosis is a protective factor. In this study, those with NSOFC noted in birth records but were deemed normal in prenatal diagnosis were placed into the "Normal group", the rest were "Cleft lip group" and "Cleft palate or Cleft lip palate group". The parents of children classified in the normal group chose to continue pregnancy but these parents lacked preparation for a child with NSOFC, including knowledge and care skills. Accordingly, accurate prenatal diagnosis is of great necessity as it is help-

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ful for parental preparation awareness and role adaptation, thus creating better conditions for the birth of children with NSOFC [20]. Couples with fetuses diagnosed with CPO or CLP showed a greater likelihood of pregnancy termination than the merely cleft lip group. This is principally related to the concern of fetal prognosis and spouse affection reported in the literature [35]. Facial abnormalities are usually diagnosed around 24 weeks, and some even later in the pregnancy. At this point in pregnancy the mother has established a relatively close relationship with her baby. The deeper the mother's feelings for the fetus, the more reluctant the mother is to abort that pregnancy. In addition, many believe that the greater the gestational age of induced labor, the more negative effects occur within the body [36]. Therefore, the greater the gestational age at first diagnosis, the more likely couples are to continue the pregnancy.

5. Conclusions

Registered residence within rural areas, no family history of NSOFC, no maternal high-risk factors, younger maternal age, younger gestational age at first diagnosis are the risk factors associated with the decision to terminate pregnancy. Prenatal diagnosis is a protective factor. This study represents a preliminary exploration of factors related to pregnancy decision-making, and the specific relationship among the factors requires further exploration.

Abbreviations

OFCs, Oro-facial clefts; NSOFC, non-syndromic orofacial cleft; CL, cleft lip; CPO, isolated cleft palate; CLP, cleft lip with cleft palate.

Author contributions

All authors have participated in the development of study design. XX and HD was responsible for grant applications for the study. WZ administered the data collection. BL and HD contributed to the statistical plan and sample size calculations. HD wrote the first draft of the manuscript. WZ, XX, and BL critically revised the final version of this manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The present study was approved by the Institutional Review Board, Women's Hospital, Zhejiang University (IRB-20200051-R). The study was a retrospective case study with scientific and social values, and the research objects were difficult to contact. The purpose is of great importance, and the research risk is not greater than the minimum risk. It does not involve personal privacy, and it will not adversely affect the research object. Researchers will strictly abide by the principle of confidentiality, and the relevant research information is only allowed to be viewed by researchers or ethics committees. Therefore, we have applied for informed consent and obtained the approval of the ethics committee.

Conflict of interest

The authors declare no conflict of interest.

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