

## Original Research Article

# Relationship between traditional Chinese medicine constitution and pregnancy outcome in elderly primiparae

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### Abstract

**Purpose:** To investigate the correlation between traditional Chinese medicine (TCM) constitution and pregnancy outcomes in elderly primiparae.

**Methods:** A cross-sectional case-control study was conducted on 113 elderly primiparae who were delivered in Jinshan Hospital of Fudan University, Shanghai, China from January 2019 to December 2019. The elderly primiparae was the study group. Using a random ratio of 1:3, 393 primiparous women of suitable age who were delivered in the hospital at the same period were selected as the control group. A traditional Chinese medicine (TCM) questionnaire was used to collect clinical data, and differences between the two groups were compared.

**Results:** The incidence of gestational diabetes mellitus was significantly higher in the study group (elderly primiparae) with phlegm dampness constitution and qi stagnation constitution than in control group (appropriate-age primiparae) ( $p < 0.05$ ). The incidence of hypertension was significantly higher in the study group with yin deficiency constitution and special constitution than in control group ( $p < 0.05$ ). The frequency of selective cesarean section in study group with a biased qi-deficiency constitution, yang-deficiency constitution, and yin-deficiency constitution were significantly higher than control group ( $p < 0.05$ ).

**Conclusion:** There is a correlation between pregnancy outcomes in old age and TCM constitution. Individualized diet and exercise programs may be formulated in early pregnancy (based on the type of physique) to improve pregnancy outcomes in elderly primiparae.

**Keywords:** Elderly primiparae, TCM constitution, Pregnancy outcome

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## INTRODUCTION

In recent years, increases in social competition and work pressure have led to an improvement in women's social status making them postpone child-bearing age, and this has led to an increase in the number of advanced maternal age (AMA) [1]. Advanced maternal age (AMA) is identified

as child-bearing in women aged 35 years and above [2]. With an increase in gestational age, the physical and biological functionalities of pregnant women are in a state of decline. A large number of studies have shown an increased risk of pregnancy complications and a significantly increased rate of cesarean section in AMA, relative to pregnant women within normal child-

bearing ages [2-6]. Indeed, AMA is a risk factor for adverse pregnancy outcomes. It is said in Suwen Ancient Innocence Theory that the woman's five-seven, Yangming pulse declines, the face begins to burn, and hair begins to fall. This means that the physical and biological functionalities of a 35-year-old woman are on the decline due to a decrease in the *qi* of the spleen and kidney, manifesting as a haggard appearance, dry skin, and hair loss. This is consistent with the results of research in Western medicine. Therefore, prior intervention for pregnant women of AMA will have important clinical significance in reducing pregnancy complications in the mother and baby, thereby improving pregnancy outcomes.

The constitution theory of traditional Chinese medicine embodies the academic idea of "preventive treatment of disease". By improving traditional Chinese medicine (TCM) constitution and adjusting the functional state, it is possible to prevent diseases from the perspective of the population constitution [7,8]. In pregnancy, it is essential to choose medicines that are not harmful to the fetus. As a result, it is recommended that guidance should be sought from professional physicians during treatment. As a precautionary measure, pregnant women should pay attention to appropriate dietary adjustments and exercise to avoid excessive fatigue and physical discomfort. Therefore, this study was carried out to investigate the distribution characteristics of TCM constitution types of pregnant women of AMA, and their correlation with pregnancy complications, vis-à-vis pregnant women of appropriate child-bearing age. The aim was to determine the appropriate TCM constitution for pregnant women of AMA to provide a scientific basis for effectively reducing pregnancy complications and improving pregnancy outcomes through targeted prevention and treatment.

## METHODS

### Patients

One hundred and thirteen (113) elderly primiparae who were delivered in the hospital from January 2019 to December 2019 were enrolled as study group. Using a random ratio of 1:3, a total of 393 primiparous women of appropriate child-bearing age who delivered in the hospital at the same period were enrolled as the control group. Both groups were long-time residents of Shanghai, China. The subjects were investigated using a TCM questionnaire, and their clinical data were recorded and compared.

### Inclusion criteria

Singleton registered pregnant women who had hospital cards, and who regularly came for antenatal care in Jinshan Hospital of Fudan University, Shanghai, China; primiparae with clear consciousness and capacity for reading and comprehension, and those who submitted informed consent for voluntary participation.

### Exclusion criteria

Pregnant women with cardiovascular, cerebrovascular, liver, kidney, and hematopoietic system diseases, and those suffering from mental illnesses, were excluded from the study. This study was approved by the Ethics Committee of International Peace Maternal and Child Health Hospital, Shanghai Jiaotong University School of Medicine, China (approval no. GKLW 2019-48). Procedures were in accordance with the declaration of Helsinki [9].

### Data collection

The medical records of the study subjects were obtained through the electronic medical record system. The records revealed age at delivery, educational status, residential area, mode of conception, gestational weeks, delivery time, mode of delivery, and fetal condition.

### Determination of TCM constitution and medication treatment measures

The identification of TCM constitution was performed based on the classification and judgment of the Constitution of TCM Society [10]. The constitution was divided into nine types: peaceful constitution, qi-deficiency constitution, yang-deficiency constitution, yin-deficiency constitution, phlegm-dampness constitution, damp-heat constitution, blood-stasis constitution, qi-stagnation constitution, and special constitution. The medication used for treatment was prescribed, based on TCM diagnostic results. The treatment options were Chinese herbal medicine, acupuncture, and moxibustion. The treatment was administered once or twice a week from the second trimester to delivery.

### Treatments

#### Qi-deficiency constitution

Herbal formulas that modify *qi* and *nourish* the lungs, such as *Yu Ping Feng San* and *Si Jun Zi Tang*, may be used. Additionally, diet is controlled by giving foods such as honey, Chinese yam, fu ling berries, and longan which

have beneficial *qi-nourishing* properties are prioritized.

### **Yang-deficiency constitution**

Herbal formulas such as *Jin Gui Shen Qi Wan* and *You Gui Wan* which *warm yang* and tune the kidneys may be used. Additionally, an appropriate level of exercise and avoiding excessive fatigue, while maintaining a positive mindset is also required. Diet can intake mutton, cinnamon, walnuts and leeks to achieve the effect of warming kidney *yang*.

### **Yin-deficiency constitution**

Herbal formulas such as *Liu Wei Di Huang Wan* and *Sha Shen Mai Dong Tang* are used. These formulas nourish *yin* and *clear heat*. Additionally, diet is controlled by avoiding spicy and stimulating foods, and consuming foods such as sesame, lily bulbs, and goji berries which possess *yin-nourishing* properties.

### **Phlegm-dampness constitution**

Herbal formulas that *resolve phlegm* and *transform dampness*, such as *Er Chen Tang* and *Ban Xia Xie Xin Tang*, may be used. Diet is controlled by avoiding *cold-* and *damp-inducing* foods, and consuming foods such as white radish, lotus seeds, and coix seeds which have *phlegm-resolving* and *dampness-transforming* properties.

### **Damp-heat constitution**

Herbal formulas such as *Long Dan Xie Gan Tang* and *Si Miao Wan* which *clear heat* and dispel dampness may be applied. Diet is controlled by avoiding spicy and stimulating foods, and consuming foods with *heat-clearing* and toxin-eliminating properties, such as mung beans, lotus root, winter squashe, pears, and cucumber.

### **Blood-stasis constitution**

The herbal formulas used are those that promote blood circulation and dispel blood stasis. These include *Tao Hong Si Wu Tang* and *Xue Fu Zhu Yu Tang*. Additionally, diet is controlled by giving foods with blood-activating and stasis-dispersing properties, such as red dates, hawthorn, peach kernel, and brown sugar. In addition, appropriate exercise should be done to improve blood circulation and alleviate symptoms of *blood stasis*.

### **Qi stagnation constitution**

The treatment for this type of constitution involves using Chinese herbal formulas that regulate *qi* and promote digestion, such as *Chai Hu Shu Gan San* and *Xiao Yao San*. In addition, diet is controlled by avoiding greasy foods, and consuming foods such as kiwifruit, chayote, and celery, which relieve the liver and regulate *qi*.

### **Allergic constitution**

The treatment for this type of constitution involves using Chinese herbal formulas that *clear heat*, detoxify the body, and combat allergies. These Chinese herbal formula are *Xiao Feng San* and *Fang Feng Tong Sheng San*. In addition, diet is controlled by avoiding spicy and irritating foods, giving foods that have anti-allergic properties, such as chrysanthemum, carrot, purple perilla, and mung beans.

### **Diagnostic criteria**

The pregnancy outcomes were gestational diabetes mellitus, gestational hypertension, and cesarean section, all of which were diagnosed in line with the International Classification of Diseases, 10<sup>th</sup> edition (ICD-10).

### **Data analysis**

Data were analyzed using SPSS 25.0 software. Frequency and percentages were used to describe counting data, and chi-square ( $\chi^2$ ) test was used for comparison between groups. All *p*-values were tested bilaterally, and the difference was statistically significant at *p* < 0.05.

## **RESULTS**

### **Pregnancy outcomes between elderly group and appropriate-age group**

The mean age of the elderly primiparae was  $37.37 \pm 2.41$  years. The control group had a mean age of  $29.58 \pm 2.57$  years. There was a statistically significant difference in age between the groups. Incidence of gestational diabetes mellitus (43.3 %), gestational hypertension (15.9 %), and cesarean section (75.2 %) in study group were significantly higher than control group (*p* < 0.05). The frequency of spontaneous delivery (24.8 %) was significantly lower in study group than control group (*p* < 0.05). There were no significant differences in the frequencies of acute cesarean section and postpartum hemorrhage between the two groups (Table 1).

**Table 1:** Pregnancy outcomes of study and control groups n (%)

Pregnancy outcome	Control group (n=393)	Study group (n=113)	P-value
Gestational diabetes mellitus	74(18.8)	49(43.4)	<0.001*
Gestational hypertension	18(4.6)	18(15.9)	<0.001*
Natural birth	192(48.9)	28(24.8)	<0.001*
Cesarean section	201(51.1)	85(75.2)	<0.001*
Selective cesarean section	146(37.2)	76(67.3)	<0.001*
Acute cesarean section	55(14.0)	9(8.0)	0.124
Postpartum hemorrhage	9(2.3)	3(2.7)	1.000

Significance level:  $p < 0.05$ **Table 2:** Gestational DM and TCM constitution in control and study groups {n (%)}

TCM Constitution	Control group (n=74)	Study group (n=49)	P-value
Balanced and peaceful	11/57(19.3)	5/11(45.5)	0.138
Qi deficiency	8/36(22.2)	4/10(40.0)	0.468
Yang deficiency	5/35(14.3)	4/13(30.8)	0.377
Yin deficiency	23/106(21.7)	11/31(35.5)	0.118
Phlegm-dampness	8/53(15.1)	6/10(60.0)	0.007*
Damp-heat	4/20(20.0)	3/5(60.0)	0.221
Blood stasis	6/30(20.0)	6/17(35.3)	0.419
Qi stagnation	7/37(18.9)	8/11(72.7)	0.003*
Allergy	2/19(10.5)	2/5(40.0)	0.179

Significance level:  $P < 0.05$ **Table 3:** Gestational hypertension and TCM constitution (n=18 in each group)

TCM constitution	Control group	Study group	P-value
Balanced and peaceful	2/57(3.5)	0/11(0.0)	1.000
Qi deficiency	2/36(5.6)	2/10(20.0)	0.201
Yang deficiency	1/3 (2.9)	0/1 (0.0)	1.000
Yin deficiency	7/106(6.6)	9/31(29.0)	0.002*
Phlegm-dampness	0/20(0.0)	1/5(20.0)	0.200
Damp-heat	5/53(9.4)	3/10(30.0)	0.203
Blood stasis	0/3 (0.0)	1/1 (5.9)	0.362
Qi stagnation	1/3 (2.7)	0/1 (0.0)	1.000
Allergy	0/1 (0.0)	2/5(40.0)	0.036*

Significance level:  $P < 0.05$ 

### Incidence of gestational diabetes mellitus and TCM constitution

In the classification of TCM constitution, frequencies of gestational diabetes mellitus were significantly higher in study group with phlegm-dampness constitution (60 %) and qi-stagnation constitution (72.7 %) than in control group of similar constitutions ( $p$ -value  $< 0.05$ ; Table 2).

### Incidence of hypertension in pregnancy and TCM constitution

Incidence of hypertension during pregnancy in study group with *yin* deficiency (29 %) and allergy constitution (40 %) was significantly higher than control group with same type of constitution (Table 3).

### Selective cesarean section rate and TCM constitution

Results of the classification of TCM constitution showed that cesarean section rates in qi deficiency (80 %), yang deficiency (84.6 %), and yin deficiency (71 %) in study group were significantly higher than control group ( $p < 0.05$ ) (Table 4).

## DISCUSSION

Physiological functionality of pregnant women gradually declines with an increase in age and their reproductive and endocrine functions are reduced to varying degrees, resulting in various risks. There are also increases in complications during pregnancy when compared with appropriate-age pregnant women. According to the Royal Society of Obstetrics and Gynecology

survey, the golden age for women's pregnancy and delivery is 20 – 29 years.

The older the age, the higher the risks associated with pregnancy [11]. The idea of TCM constitution originates from the Internal Classic.

**Table 4:** Selective cesarean section and TCM constitution n (%)

TCM constitution	Control group (n=146)	Study group (n=76)	P-value
Balanced and peaceful	18/57(31.6)	9/11(81.8)	0.002*
Qi deficiency	16/36(44.4)	8/10(80.0)	0.046*
Yang deficiency	16/35(45.7)	11/13(84.6)	0.016*
Yin deficiency	35/106(33.0)	22/31(71.0)	0.000*
Phlegm-dampness	11/20(55.0)	2/5(40.0)	0.548
Damp-heat	19/53(35.8)	6/10(60.0)	0.152
Blood stasis	13/30(43.3)	10/17(58.8)	0.307
Qi stagnation	12/37(32.4)	4/11(36.4)	0.808
Allergy	6/19(31.6)	4/5(80.0)	0.051

Significance level:  $P < 0.05$

Professor Wang Qi, a contemporary scholar, defined a constitution as comprehensive and relatively stable inherent characteristics in the form, structure, physiological function, and psychological state formed based on the innate endowment, and acquired in the process of human life [12]. People have regular features of life such as growth, strength, and old age. The TCM constitution evolves with different stages of an individual's development. The rise and fall of viscera, essence, *qi*, blood, and body fluids also increase with age. Therefore, the identification of the individual's constitution and mitigation of biased constitution is crucial for preventing the occurrence of diseases.

Advanced age is an independent risk factor for Gestational diabetes mellitus (GDM). Studies have shown that pregnant women aged 35 years or more are 5.5 times more likely to have GDM than those younger than 25 [13]. In this study, the incidence of GDM in study group (elderly pregnant women) was significantly higher than control group (appropriate-age group). With an increase in age, the function of pancreatic islets decreases, sensitivity of cells to insulin reduces, and there is too much secretion of glucocorticoids such as placental prolactin, resulting in altered glucose metabolism [14]. In addition, since elderly pregnant women get too much attention from their families, they may easily come down with obesity, anxiety, and depression. Obese people have high-fat content and hypertrophy of adipocytes which lead to decrease in insulin receptors and raised blood glucose levels which further stimulate the islet beta cells, leading to GDM [15]. The main characteristics of obese people are excess fat, limb lethargy, and deficiency of yang for dissipating dampness. In this study, the 60 % incidence of GDM in study group with the phlegm-damp constitution was significantly higher than control group. Recent studies

suggest that anxiety and depression are related to fasting blood glucose levels, and may be risk factors for GDM [16,17]. Anxiety may increase the activity of the hypothalamic-pituitary-adrenal axis, affect glucose tolerance, and decrease glucose transport. This study showed that the incidence of GDM was 72.7 % in elderly primipara with qi stagnation. This is consistent with results obtained in studies in other countries.

Hypertensive disorder complicating pregnancy (HDCP), a common disease in pregnancy, with symptoms such as hypertension, edema, and proteinuria, may lead to preeclampsia and eclampsia, and seriously threaten the health of the mother and fetus [18]. Elderly pregnant women are prone to HDCP due to vascular endothelial cell injury, decreased diastolic factor secretion, and increased contractile factor secretion, resulting in peripheral vasospasm and lack of uterus and placenta [18]. In this study, the incidence of gestational hypertension in study group was significantly higher than that control group. According to TCM, the nature of hypertension is insufficiency of the essence, mostly yin deficiency of liver and kidney including the heart. A large number of studies in China have confirmed that syndromes of hypertension evolve from excess deficiency, with yin deficiency and hyperactivity of yang being more common with an increase in age [19]. Consistently, this study revealed that incidence of gestational hypertension in study group with yin deficiency syndrome was significantly higher than control group.

Studies have shown that old age increases the rate of cesarean section [20]. With the increase in age, the myometrium of the uterus becomes thinner, the elasticity of the uterus decreases, and the number of oxytocin receptors decreases, thereby decreasing the natural birth rate. On the other hand, the probability of advanced age

resulting in pregnancy hypertension and placenta previa is increased, resulting in an increased rate of cesarean section [22]. In this study, the rate of cesarean section in study group (elderly primipara) was significantly higher than control group. According to TCM, the child is in the abdomen, and the mother ventilates the qi. Maternal biased constitution leads to some pregnancy complications which are not conducive to the health of pregnant women and fetuses, thereby increasing the rate of cesarean section. In this study, the incidence of biased constitution in the study group was significantly higher than control group. This led to an increase in cesarean section rate. It is advised in 'Internal Classic' to "replenish fluids and nutrients lost in the body, indicating the adjustability of the constitution. The results from this study showed that qi deficiency was the main constitution of elderly pregnant women. The viscera was weak due to absence of pregnancy. As yin blood coagulates in chongren to nourish the fetus, and yin blood is partial deficiency, the constitution has the characteristics of yin deficiency.

## CONCLUSION

This study shows the need to identify TCM constitution and that applying the concept of TCM to health care during pregnancy may improve pregnancy outcomes.

## DECLARATIONS

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None provided.

### Ethical approval

Ethical approval for this study was obtained from the Ethics Committee of International Peace Maternal and Child Health Hospital, Shanghai Jiaotong University School of Medicine, China (approval no. GKLW 2019-48).

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Conflict of Interest

No conflict of interest associated with this work.

### Contribution of Authors

The authors declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by them. Junxin Qiu and Juan Zhao are equal contributors to this work.

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