

# Effect of smoking cessation intervention for pregnant smokers

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## Abstract

This study retrospectively evaluated the effect of smoking cessation intervention in pregnant women with smoking.

A total of 176 pregnant smokers were included in this study. Ninety-five participants received smoking cessation intervention plus physical activity, and were assigned into a treatment group. Eighty-one participants underwent physical activity only, and were assigned into a control group. Primary outcomes included the number of participants quit smoking, daily cigarettes consumption, and quit attempts. The secondary outcomes included infant outcomes. All primary outcomes were measured after 12-week treatment and at delivery. Secondary outcomes were measured at delivery only.

After 12-week treatment, participants in the treatment group did not significantly reduce the number of participants quit smoking; decrease daily cigarettes consumption, and quit attempts in pregnant smokers, compared with subjects in the control group. At delivery, the comparison also did not show significant differences in the number of participants quit smoking, decreasing daily cigarettes consumption, and quitting attempts in pregnant smokers, as well as all infant outcomes between 2 groups.

The results of this retrospective study did not found that smoking cessation intervention may help to quit smoking for pregnant smokers.

**Abbreviation:** 5 As = ask, advise, asses, assist, arrange.

**Keywords:** counseling, physical activity, pregnancy, smoking cessation intervention

## 1. Introduction

Maternal smoking in pregnant women is regarded as the main preventable factor of morbidity and death for both women and infants.<sup>[1,2]</sup> It is often associated with several adverse events for both pregnancy women (miscarriage and prematurity) and infants (still birth, low birth weight, birth defects, and infant death).<sup>[3–9]</sup>

The prevalence of maternal smoking ranges considerably with the smokers' maternal age and their educational levels.<sup>[10–12]</sup> It has been reported that the prevalence was 17% in England, and 14% in the USA, 18.3% in Latin American, 15% in Romania, 3% in Pakistan, 1.3% in South East Asia, and 2% in China among pregnant women.<sup>[13–19]</sup>

Smoking cessation during pregnancy either can reduce risks of fetal and mothers, or can improve birth outcomes.<sup>[20–22]</sup> Previous studies have reported that smoking cessation intervention is effective in promoting smoking cessation.<sup>[23,24]</sup> However, other

study found that smoking cessation intervention cannot help pregnant smokers to quit smoking.<sup>[25]</sup> Moreover, physical activity is also recommended to pregnant smokers to help them quit smoking.<sup>[26,27]</sup> Thus, it is still necessary to investigate the effect of smoking cessation intervention for the treatment of pregnant smokers.

In this retrospective study, we assessed the effect of smoking cessation intervention for the smoking cessation in pregnant smokers among Chinese female population.

## 2. Methods and patients

### 2.1. Ethics

This retrospective study was approved by the Ethical Committee of Mudanjiang Medical University. All pregnant smokers provided the written informed consent.

### 2.2. Design

This study was conducted between January 2014 and May 2017 at Mudanjiang Medical University. We included 176 smokers of pregnant women in this study. Of those, 95 participants were assigned to a treatment group, while the remaining 81 subjects were assigned to a control group. All participants in both groups received physical activity for a total of 12 weeks. In addition, subjects in the treatment group also received individualized cognitive-behavioral counseling also for a total of 12 weeks.

### 2.3. Inclusion and exclusion criteria

This study included pregnant smokers aged from 18 to 40 years old. All participants were at 12 to 24 weeks of gestation with current cigarette consumption of more than 1 cigarette daily. Additionally, they all wanted to stop smoking, or required help

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with quit smoking. Moreover, all subjects could walk continuously for more than 20 minutes daily. They all completed a computerized baseline survey before the study. Participants were excluded if they had drug, alcohol dependence, nicotine replacement intervention, any advised exercises from doctors that may affect the effect of physical activity in this study. In addition, the cases were also excluded if the participants did not have sufficient information for the evaluation of all characteristics and all outcome measurements. Furthermore, participants with severe diseases, such as a variety of cancers, mental health conditions, hypertension, gestational diabetes mellitus, and infection with HIV were also excluded from this study.

#### 2.4. Treatments

All participants in both groups received physical activity. It presented as a moderate intensity exercise, and was tailored to help participants quit their smoking.<sup>[26,27]</sup> It was applied 20 minutes each session, 1 session daily, twice weekly, for a total of 12 weeks.

Additionally, participants in the treatment group also underwent individualized cognitive-behavioral counseling, 30 minutes each session, once daily, twice weekly for a total of 12 weeks. The tailored counseling was delivered by 3 professional trained health care experts and also a self-help manual for subjects to quit their smoking. The counseling was recommended by “5 As” (ask, advise, assess, assist, arrange) from American College of Obstetricians and Gynecologists.<sup>[28,29]</sup>

#### 2.5. Outcome measurements

The primary outcomes were measured by the number of participants quit smoking, daily cigarettes consumption, and quit attempts. The secondary outcomes included infant outcomes. The infant outcomes consisted of the birth-weight, stillbirth, miscarriage, neonatal death, preterm birth, Apgar score, and other complications during pregnancy). The maternal outcomes were measured after 12-week treatment, and at the delivery. All the infant outcomes were measured at delivery only.

#### 2.6. Statistical analysis

All data were analyzed by a professional statistician with SPSS Statistics 18.0 (IBM Corp, Armonk, NY). Continuous outcome data was analyzed by the Student *t* test, while categorical outcome data was analyzed by the Pearson chi-square test. The statistical significance was defined as  $P < .05$ .

### 3. Results

The characteristics of all participants before the study are shown in Table 1. No significant differences were found regarding the age, race, weight, body mass index, gestational age, duration of smoking, smoking consumptions, previous smoking quit attempts, partner smoking conditions, parity, previous preterm birth, and alcohol consumption between 2 groups.

After 12 weeks treatment, there were not significant differences in number of smokers quit smoking by self-report ( $P = .26$ , Table 2) and urine cotinine verified ( $P = .37$ , Table 2), as well as the daily cigarettes consumption ( $P = .30$ , Table 3), and quit attempts ( $P = .32$ , Table 3) between 2 groups.

At delivery, the comparison of the number of smokers quit smoking by self-report ( $P = .25$ , Table 2), urine cotinine verified

**Table 1**

#### Characteristics before the study.

Characteristics	Treatment group (n = 95)	Control group (n = 81)	P value
Age, y	28.3 (5.9)	27.9 (6.4)	.67
Race (Chinese)	95 (100.0)	81 (100.0)	—
Han ethnic group	89 (93.7)	77 (95.1)	.69
Korean ethnic group	6 (6.3)	4 (4.9)	—
Weight, kg	68.7 (12.1)	69.5 (13.3)	.68
BMI, kg/m <sup>2</sup>	25.8 (4.6)	26.0 (5.1)	.79
Gestational age, wk	14.9 (4.2)	14.3 (4.7)	.38
Days of smoking in past 30 d			
<10 d	69 (72.6)	58 (71.6)	.88
11–25 d	25 (26.3)	22 (27.2)	.90
25–30 d	1 (1.1)	1 (1.2)	.91
Daily cigarettes	7.2 (5.9)	7.8 (6.2)	.92
Duration of smoking, y	3.9 (2.5)	4.3 (2.9)	.33
Previous quit advice			
Yes	63 (66.3)	57 (70.4)	.57
No	32 (33.7)	24 (29.6)	.57
Quit attempts in past 1 y			
Yes	80 (84.2)	68 (84.0)	.96
No	15 (15.8)	13 (16.0)	.96
Married or living with partner	92 (96.9)	77 (96.3)	.55
Partner smokers	49 (51.6)	40 (49.4)	.77
Parity			
0	35 (36.8)	27 (33.3)	.63
1	46 (48.4)	42 (51.9)	.65
2	9 (9.5)	7 (8.6)	.85
3	5 (5.3)	5 (6.2)	.80
Previous preterm birth	16 (16.8)	13 (16.0)	.89
alcohol consumption weekly (time)			
1	31 (32.6)	27 (33.3)	.92
2	6 (6.3)	8 (9.9)	.39
≥3	1 (1.1)	0 (0)	.56

Data are present as mean ± standard deviation or number (%).

BMI = body mass index, Parity = number of previous pregnancies progressing beyond 18 weeks.

( $P = .33$ , Table 2), daily cigarettes consumption ( $P = .09$ , Table 3), and quit attempts ( $P = .44$ , Table 3) did not differ significantly neither between 2 groups.

There were not significant differences of all infant outcomes between 2 groups at delivery (Table 4). Of those, the comparison of each outcome is listed as follows: preterm birth ( $P = .76$ ), caesarean delivery ( $P = .07$ ), vaginal delivery ( $P = .07$ ), gestational age ( $P = .49$ ), birth weight ( $P = .22$ ), Apgar score <7 at 1 minute ( $P = .55$ ), Apgar score <7 at 5 minute ( $P = .53$ ), miscarriage ( $P = .84$ ), stillbirth ( $P = .44$ ), and neonatal death.

**Table 2**

#### Number of smokers quit smoking after 12-week treatment and at delivery.

Outcome measurements	Treatment group (n = 95)	Control group (n = 81)	P value
12-wk			
Self-reported	23 (24.2)	14 (17.3)	.26
Urine cotinine verified	19 (20.0)	12 (14.8)	.37
At delivery			
Self-reported	31 (32.6)	20 (24.7)	.25
Urine cotinine verified	26 (27.4)	17 (20.9)	.33

Data are present as n (%).

**Table 3****Daily cigarettes consumption and quit attempts after 12-week treatment and at delivery.**

Outcome measurements	Treatment group (n=95)	Control group (n=81)	P value
12-wk			
Daily cigarettes consumption	5.1 (4.8)	5.9 (5.3)	.30
Quit attempts	71 (74.7)	55 (67.9)	.32
At delivery			
Daily cigarettes consumption	4.0 (4.5)	5.2 (4.9)	.09
Quit attempts	95 (100.0)	80 (98.8)	.44

Data are present as number (%).

**4. Discussion**

Currently, there are no studies specifically investigating the effect of smoking cessation intervention for the smoking cessation in pregnant smokers among Chinese female population. Previous related studies have conducted in other countries and found that smoking cessation intervention still cannot help pregnant smokers to quit smoking.<sup>[24,25,30]</sup> One study operated in UK and did not demonstrate the promising effect of a brief “one-off” smoking cessation intervention by midwives in pregnant smokers.<sup>[24]</sup> The other study performed in Australia, and its results only showed that the weights of infants were much heavier when their mothers received smoking cessation intervention than those mothers did not undergo it.<sup>[25]</sup> Another study conducted in USA and found that peer-enhanced programming smoking cessation intervention had a limited effect in pregnant women.<sup>[30]</sup> However, the effect could not sustain beyond the postpartum.<sup>[30]</sup>

The results of our study are partly consistent with the previous study.<sup>[24]</sup> In our study, the results did not exert benefits neither in outcomes of pregnant women, nor in the infant outcomes. It indicated that smoking cessation intervention may be ineffective for pregnant women with smoking. Relative short-term and insufficient dose of intervention may account for this conclusion.

This study has several limitations. First, the period of the intervention is still relative short term and low dose of intervention, which may affect the effect of smoking cessation intervention. Second, the participants in this study did not receive additional interventions between the period of the treatment cessation and at delivery. Third, this study did not design as a randomized controlled trial. Therefore, all the patients and researchers were not blinded, because of the retrospective study, and all the data collection and analysis just based on the current

**Table 4****Infant outcomes at delivery.**

Outcomes	Treatment group (n=95)	Control group (n=81)	P value
Preterm birth	12 (12.6)	9 (11.3)	.76
Caesarean delivery	23 (24.2)	30 (37.0)	.07
Vaginal delivery	72 (75.8)	51 (63.0)	.07
Gestational age, wk	39.1 (1.8)	38.9 (2.0)	.49
Birth weight, g	3415.8 (593.6)	3299.6 (647.2)	.22
Apgar score <7 (1 min)	3 (3.2)	4 (4.9)	.55
Apgar score <7 (5 min)	2 (2.1)	3 (3.7)	.53
Miscarriage	3 (3.2)	3 (3.7)	.84
Stillbirth	0 (0)	1 (1.2)	.44
Neonatal death	0 (0)	0 (0)	—

Data are present as mean ± standard deviation or number (%).

available data of the completed patient cases. It may increase the risk of selection, performance, and detection in this retrospective study. Thus, future studies should be focus on the design of more strict randomized controlled trials with longer intervention term and higher dose to assess the effect of smoking cessation intervention for pregnant smokers.

**5. Conclusion**

The results of this study did not find that smoking cessation intervention may be efficacious for smoking quit in pregnant women among Chinese population.

**Author contributions**

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