Effect of Smoking Cessation at Different Trimesters on Pregnancy Outcome

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Objective: To investigate the effect of smoking cessation at various trimesters on pregnancy outcome.
Methods: Pregnant smokers who were followed up at two public hospitals in Hong Kong between April 2011 and May 2015 were retrospectively reviewed. Based on their self-reported smoking status, women were categorised as having quit smoking in the (1) first trimester, (2) second trimester, or (3) third trimester, or (4) having continued to smoke throughout pregnancy. The four groups were compared in terms of maternal characteristics and pregnancy outcomes.
Results: During the study period, among 18,816 pregnant women, 314 (1.7%) still smoked. Of them, 275 were included: 147 (53.5%) continued to smoke throughout pregnancy and 74 (26.9%), 38 (13.8%), and 16 (5.8%) quit smoking in the first, second, and third trimester, respectively. The four groups were comparable in terms of maternal characteristics. Women who smoked fewer cigarettes were more likely to quit smoking at an earlier trimester ($p<0.001$). Women who smoked ≤5 cigarettes per day were more likely to quit smoking during pregnancy. Baby birthweight was 7% lower in women who continued to smoke throughout pregnancy than in women who quit smoking during the first trimester (2915 g vs. 3118 g, $p=0.048$).
Conclusion: Baby birthweight was lower in women who continued to smoke throughout pregnancy. Healthcare professionals should actively advise women about smoking cessation to improve pregnancy outcome, particularly those who smoke ≥6 cigarettes per day.

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Keywords: Cigarette smoking; Pregnancy outcome; Pregnancy trimesters; Smoking cessation

Introduction

According to the Hong Kong Census and Statistics Department in 2016, the percentage of female daily cigarette smokers aged 20 to 49 years was about 4.9%[1]. In a local cohort study of pregnant women between 1988 and 1990, the percentage of ever and current smokers was 1.57%; the baby birthweight of these ever and current smokers was 6.3% lower than that of non-smokers[2]. A Hong Kong study in 2004 reported that 60% of women who were ever-smokers stopped smoking during pregnancy[3]. Current local data on smoking cessation in pregnant women are lacking. This study aimed to investigate the effect of smoking cessation at various trimesters on pregnancy outcome.

Methods

This retrospective study was approved by the Kowloon Central/Kowloon East Clusters Research Ethics Committee of the Hospital Authority. Patient characteristics and pregnancy outcome from United Christian Hospital and Tseung Kwan O Hospital between April 2011 and May 2015 were retrieved from the Hospital Authority Obstetrics Clinical Information System, a part of the Clinical Data Analysis and Reporting System.

During universal Down syndrome screening, pregnant women were asked about their current smoking status and the number of cigarettes smoked per day, as maternal smoking affects levels of pregnancy-associated plasma protein-A, free beta human chorionic gonadotropin (in the first trimester), and inhibin-A (in the second trimester) and hence risk calculation[4,5]. Most women underwent first-trimester screening between 11 and 13+6 weeks. If they presented late, second-trimester screening was arranged between 16+0 and 19+6 weeks. During subsequent antenatal follow-up, the attending obstetrician enquired about current smoking status, time of cessation if any, and receipt of smoking cessation advice. On admission to the delivery suite, current smoking status was again recorded. Women who had a miscarriage or termination of pregnancy were excluded, as were those with missing smoking information. Women were considered lost to follow-up if they delivered at a private hospital with pregnancy outcome unknown.

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Based on the self-reported smoking status, women were categorised as having quit smoking in the (1) first trimester (before 14 weeks of gestation), (2) second trimester (between 14 and 28 weeks of gestation), or (3) third trimester (after 28 weeks of gestation), or (4) having continued to smoke throughout pregnancy. The four groups were compared in terms of baseline characteristics and pregnancy outcomes including gestation at delivery, mode of delivery, birthweight, Apgar score, and baby admission location.

Statistical analysis was performed using SPSS (Version 20.0; IBM Corp, Armonk [NY], US). Continuous variables were compared using an analysis of variance, and dichotomous variables were analysed using the Chi squared test. A p value of <0.05 was considered statistically significant.

Results

During the study period, 18,816 pregnant women underwent Down syndrome screening. Among them, 314 (1.7%) still smoked. Of them, 275 were included: 147 (53.5%) continued to smoke throughout pregnancy and 74 (26.9%), 38 (13.8%), and 16 (5.8%) quit smoking during the first, second, and third trimester, respectively (Figure 1). 205 women received advice on smoking cessation during pregnancy. Of whom, 29 were offered referral to a smoking cessation clinic but 16 declined.

The four groups were comparable in terms of age, body mass index, marital status, education level, drinking status, history of recreational drug use, plan of pregnancy, parity, history of termination of pregnancy, history of preterm delivery, chronic hypertension, preeclampsia or pregnancy-induced hypertension, and pre-existing and gestational diabetes mellitus (Table). Women who smoked fewer cigarettes were more likely to quit smoking at an earlier trimester ($p<0.001$, Figure 2a). Women who smoked ≤5 cigarettes per day were more likely to quit smoking during pregnancy.

Baby birthweight was 7% lower in women who continued to smoke throughout pregnancy than in women who quit during the first trimester (2915±562 g vs. 3118±450 g, $p=0.048$, Figure 2b). Nonetheless, the four groups were comparable in terms of gestation at delivery, mode of delivery, Apgar score of <7 at 1 and 5 minutes, and neonatal admission location.

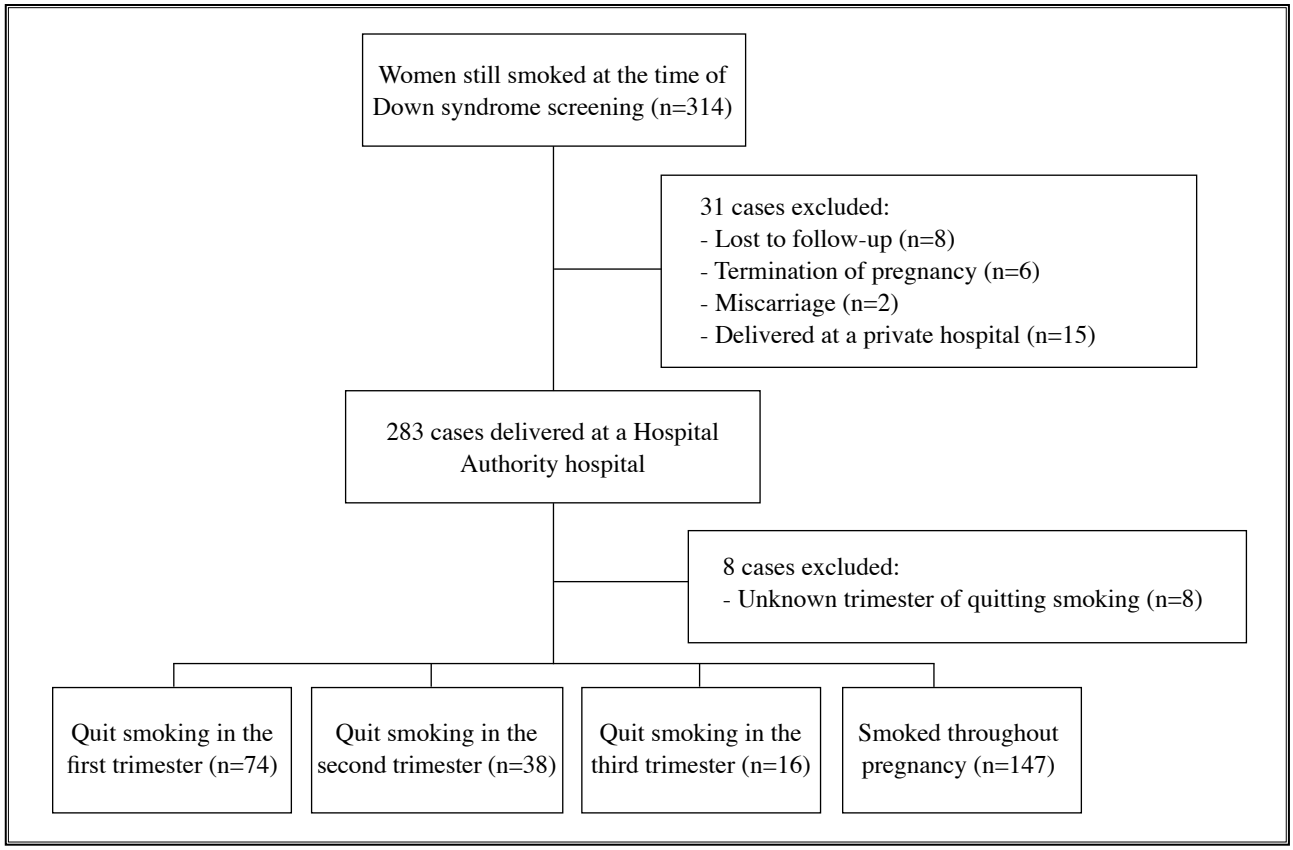

Figure 1. Flowchart of case selection

Table. Baseline maternal characteristics and pregnancy outcomes

	Quit smoking during			Continued to smoke throughout pregnancy (n=147)*	p Value
	First trimester (n=74)*	Second trimester (n=38)*	Third trimester (n=16)*		
Mean age, y	29.05±5.5	29.05±6.23	28.8±7.23	29.0±5.85	0.650
Body mass index, kg/m^2	21.8±4.7	22.0±4.4	22.2±6.3	21.9±4.9	0.992
No. of cigarettes per day	2.88±1.99	4.5±4.04	5.00±2.73	6.01±3.83	<0.001
Marital status					0.172
Single	28 (38)	12 (32)	7 (44)	40 (27)	
Married	45 (61)	26 (68)	9 (56)	94 (64)	
Divorced	1 (1)	0	0	10 (7)	
Education level					0.095
Tertiary	5 (6)	1 (3)	3 (19)	6 (11)	
Secondary	67 (91)	34 (89)	13 (81)	137 (93)	
Primary	2 (3)	3 (8)	0	3 (2)	
Drinking status					0.453
Drinker	1 (1)	2 (6)	0	5 (3)	
Non-drinker	67 (91)	33 (86)	16 (100)	137 (93)	
Ex-drinker	6 (8)	3 (8)	0	5 (3)	
Previous recreational drug use	11 (15)	6 (16)	2 (13)	35 (24)	0.313
Unplanned pregnancy	32 (43)	19 (50)	10 (63)	65 (44)	0.492
Nulliparity	41 (55)	20 (53)	10 (63)	66 (45)	0.321
History of termination of pregnancy	49 (66)	24 (63)	9 (56)	98 (67)	0.849
Chronic hypertension	0	0	0	2 (1)	0.760
Pre-eclampsia/pregnancy-induced hypertension	0	4 (11)	0	6 (4)	0.051
Pre-existing diabetes mellitus	1 (1)	1 (3)	0	1 (1)	0.836
Gestational diabetes mellitus	11 (15)	2 (5)	0	16 (11)	0.385
Gestation of delivery, w	38.57±2.06	38.61±1.93	39.25±1.29	38.3±2.12	0.260
Mode of delivery					0.651
Spontaneous vaginal delivery	48 (65)	25 (66)	9 (56)	107 (73)	
Instrumental delivery	8 (11)	3 (8)	3 (18)	11 (7)	
Caesarean section	18 (24)	10 (26)	4 (25)	29 (20)	
Baby birthweight, g	3118±450	3047±527	3007±413	2915±562	0.048
Apgar score					
<7 at 1 min	1 (1)	1 (3)	0	3 (2)	0.904
<7 at 5 min	0	1 (3)	0	1 (1)	0.462
Fetal admission location					0.246
Postnatal ward	43 (58)	13 (34)	8 (50)	71 (48)	
Special care baby unit	27 (36)	24 (63)	8 (50)	68 (46)	
Neonatal intensive care unit	3 (4)	1 (3)	0	7 (5)	

* Data are presented as mean±standard deviation, No., or No. (%) of subjects

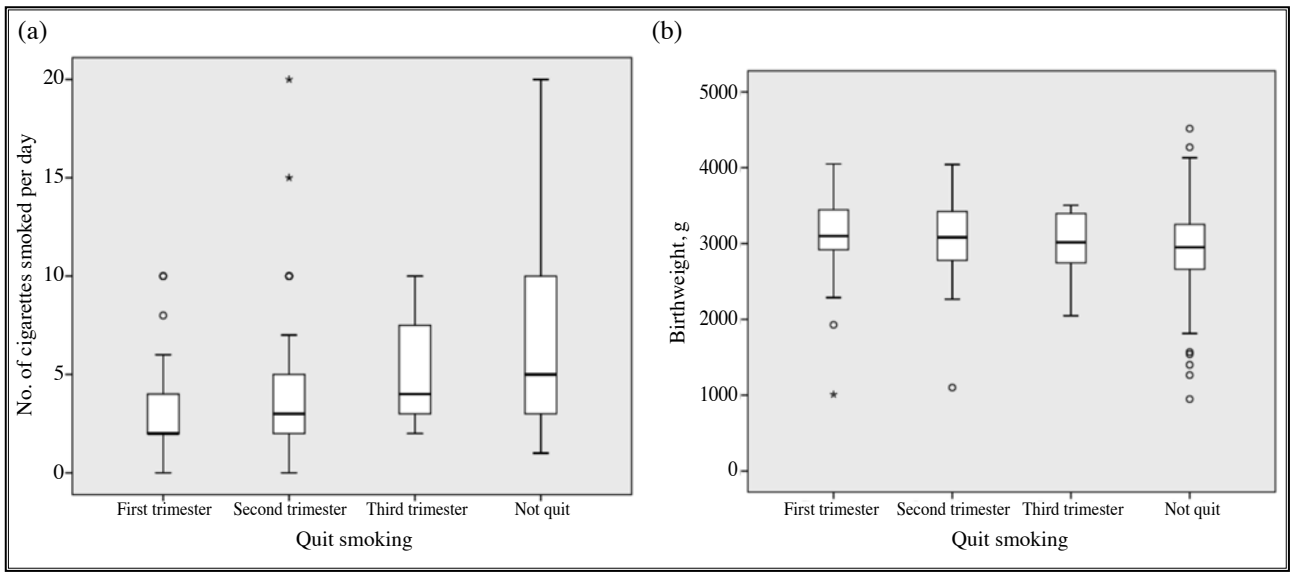

Figure 2. Box-and-whisker plot showing distribution of (a) the number of cigarettes smoked per day and (b) baby birthweight in the four groups

Discussion

In Hong Kong, 4.9% of the female population aged 20 to 49 years were smokers[1]. In our study, 1.7% of pregnant women still smoked at 11 weeks of gestation. This figure is comparable with the 1.57% reported in a local study in 1992[2]. The percentage of active smokers is likely to have increased, as the 1992 study also included ex-smokers. In our study, the overall smoking cessation rate during pregnancy was 46.5%, which was higher than the 35% reported in Australia[6] and 38.8% in the United States[7], but was lower than the 61.9% in Japan[8] and 65.6% in Taiwan[9]. Self-reported smoking status is usually underestimated when it is cross-checked with the urinary cotinine level, which is the gold standard[10]. Our subjects tended to be honest about their smoking status when they were told that this would affect the Down syndrome screening results. Nonetheless, self-reported cessation was not verified by urinary cotinine level.

In a local study in 1992, the baby birthweight of ever and current smokers was 6.3% lower than that of non-smokers[2]. In our study, baby birthweight was 7% lower in women who continued to smoke throughout pregnancy than in those who quit smoking during the first trimester. There appeared to be an exposure-response relationship in which earlier smoking cessation resulted in heavier baby birthweight. Baby birthweight may be comparable between women who quit smoking in the first trimester and non-smokers. This would have important implications for counselling. 87% of Hong Kong Chinese women agree that smoking is hazardous to the fetus[11]. Pregnant women should be counselled that smoking cessation at any gestational age can reduce adverse effects on birthweight.

Predictors of smoking cessation during pregnancy have been reported to be older maternal age, being married or living with partner, primiparity, higher socio-economic status (income, education, housing, employment), lower number of cigarettes smoked per day, and lower levels of depression, stress, and anxiety[12-16]. In our study, the number of cigarettes smoked per day was a predictor of smoking cessation. Women who smoked ≥6 cigarettes per day in early pregnancy were more likely to continue smoking throughout pregnancy. Extra efforts should be made to target these women such as active referral to a smoking cessation clinic, distribution of pamphlets, discussion of progress in terms of reduced number of cigarettes smoked or cessation of smoking and difficulties encountered in antenatal visits.

Cigarette smoking is a modifiable risk factor for pregnancy outcome, but only 23.1% of Hong Kong Chinese women strongly agree or agree that smoking will lead to pregnancy complications[11]. In our study 75% of women were advised by clinicians to quit smoking, compared with only 33% of antenatal clinicians in Pakistan who routinely enquire about smoking habit[17]. Brief advice from a physician can increase the chance of smoking cessation compared with no advice[18]. The NICE guideline recommends lifestyle advice, including smoking cessation, at the first contact of a pregnant woman with a

healthcare professional[19]. Psychosocial interventions to support women to quit smoking during pregnancy increase the smoking cessation rate and hence baby birthweight[20]. A maternity-specific smoking cessation service should be provided; in our study it is disappointing that only about 10% of women were offered referral to a smoking cessation clinic. Prioritisation of resources and patient care to heavy smokers is suggested; healthcare professionals should actively advise patients to quit smoking.

Conclusion

Baby birthweight was lower in women who continued to smoke throughout pregnancy. Healthcare professionals should actively advise women about smoking cessation to improve pregnancy outcome, particularly those who smoke ≥6 cigarettes per day.

Declaration

All authors have no conflicts of interest to disclose.

References

1. Thematic Household Survey Report, Report No. 59: Pattern of smoking. Hong Kong: Census and Statistics Department; 2016.
2. Lam SK, To WK, Duthie SJ, Ma HK. The effect of smoking during pregnancy on the incidence of low birth weight among Chinese parturients. *Aust N Z J Obstet Gynaecol* 1992; 32:125-8.
3. Kong GW, Tam WH, Sahota DS, Nelson EA. Smoking pattern during pregnancy in Hong Kong Chinese. *Aust N Z J Obstet Gynaecol* 2008; 48:280-5.
4. Kagan KO, Wright D, Spencer K, Molina FS, Nicolaides KH. First-trimester screening for trisomy 21 by free beta-human chorionic gonadotropin and pregnancy-associated plasma protein-A: impact of maternal and pregnancy characteristics. *Ultrasound Obstet Gynecol* 2008; 31:493-502.
5. Huttly W, Bestwick J, Wald N. Effect of smoking status on inhibin-A in second-trimester prenatal screening for Down syndrome. *Prenat Diagn* 2014; 34:406-7.
6. Havard A, Jorm LR, Preen D, et al. The Smoking MUMS (Maternal Use of Medications and Safety) Study: protocol for a population-based cohort study using linked administrative data. *BMJ Open* 2013; 3:e003692.
7. Moore E, Blatt K, Chen A, Van Hook J, DeFranco EA. Relationship of trimester-specific smoking patterns and risk of preterm birth. *Am J Obstet Gynecol* 2016; 215:109 e1-6.
8. Kaneita Y, Tomofumi S, Takemura S, et al. Prevalence of smoking and associated factors among pregnant women in Japan. *Prev Med* 2007; 45:15-20.
9. Wen CP, Cheng TY, Lin CL, et al. The health benefits of smoking cessation for adult smokers and for pregnant women in Taiwan. *Tob Control* 2005; 14(Suppl 1):i56-61.
10. Spencer K, Cowans NJ. Accuracy of self-reported smoking status in first trimester aneuploidy screening. *Prenat Diagn* 2013; 33:245-50.
11. Lau EM, Lee P, Lynn H, Sham A, Woo J. The epidemiology of cigarette smoking in Hong Kong Chinese women. *Prev Med* 2003; 37:383-8.
12. Miyazaki Y, Hayashi K, Imazeki S. Smoking cessation in pregnancy: psychosocial interventions and patient-focused perspectives. *Int J Womens Health* 2015; 7:415-27.
13. Leung LW, Davies GA. Smoking cessation strategies in pregnancy. *J Obstet Gynaecol Can* 2015; 37:791-7.
14. Massey SH, Compton MT. Psychological differences between smokers who spontaneously quit during pregnancy and those who do not: a review of observational studies and directions for future research. *Nicotine Tob Res* 2013; 15:307-19.
15. Murphy DJ, Dunney C, Mullally A, Adnan N, Deane R. Population-based study of smoking behaviour throughout pregnancy and adverse perinatal outcomes. *Int J Environ Res Public Health* 2013; 10:3855-67.
16. Schneider S, Huy C, Schutz J, Diehl K. Smoking cessation during pregnancy: a systematic literature review. *Drug Alcohol Rev* 2010; 29:81-90.
17. Ghazal S, Akhter S, Ali U, Rizvi N. Knowledge of female doctors about smoking risks and their attitude toward cessation in antenatal clinics - perspective from tertiary care hospitals in Karachi. *J Pak Med Assoc* 2017; 67:1809-13.
18. Stead LF, Buitrago D, Preciado N, Sanchez G, Hartmann-Boyce J, Lancaster T. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2013; 5:CD000165.
19. National Institute for Health and Clinical Excellence. Quitting smoking in pregnancy and following childbirth. NICE Public Health Guideline; 2010.
20. Chamberlain C, O'Mara-Eves A, Porter J, et al. Psychosocial interventions for supporting women to stop smoking in pregnancy. *Cochrane Database Syst Rev* 2017; 2:CD001055.