

# Smoking during pregnancy: analysis of influencing factors using the Theory of Planned Behaviour

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**Aim:** To investigate factors affecting women's intention to smoke during pregnancy.

**Design:** A descriptive, correlational, cross-sectional study, employing the Theory of Planned Behaviour (TPB).

**Methods:** A questionnaire that was constructed based on a literature review of research on smoking during pregnancy and on the TPB was administered to 201 Israeli female smokers aged 19–46. Descriptive, correlational and linear regression statistics were calculated.

**Results:** Behavioural attitudes (women's total appraisal of smoking during pregnancy), subjective norms (women's perception of the opinion of significant others regarding the specific behaviour) and perceived behavioural control (women's total appraisal of their control of the behaviour and perceived ease or difficulty of quitting smoking during pregnancy) were found to predict women's intention to smoke during pregnancy.

**Conclusions:** Nursing interventions guided by the TPB constructs may help Israeli women quit smoking during pregnancy and reduce the prevalence of smoking during pregnancy.

**Keywords:** Israel, Pregnancy, Smoking, Theory of Planned Behaviour

## Introduction

Smoking during pregnancy is a risk for both mothers and their fetuses. Prenatal risks include extra-uterine pregnancy, premature rupture of membranes, placental abruption, placenta previa, miscarriage, genetic deformities and preterm birth. The risks during labour are neonatal or perinatal mortality, low birth weight, cleft lip and/or palate (particularly among women considered heavy smokers). Newborn infections resulting from smoking may include respiratory infections and middle ear infection. In addition, smoking might cause changes in pulmonary functioning, as well as asthma aggravation, lung cancer and sudden infant death (Hannover et al. 2008).

According to data provided by the World Health Organization, nearly 250 million women are smokers, of whom 10.7% are childbearing women who reported smoking while pregnant (Crawford et al. 2008). In Israel, approximately 20% of all Jewish women are smokers (Report of the Minister of Health on Smoking 2008). A survey performed in Israel by the National Center for Disease Control in 2003 indicated that 12.4% of all pregnant women report having smoked while pregnant (Report of the Minister of Health on Smoking 2003).

Women avoid smoking while pregnant if they recognize that the health of the fetus is mostly dependent on their behaviour. Pregnancy and labour are good opportunities to change smoking habits (Hannover et al. 2008). According to the Report of the Minister of Health on Smoking (2008), the distribution of Jewish women who smoke, by level of schooling, shows that the proportion of smokers decreases with years of schooling, with a

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small exceptional increase in the proportion of smokers among women with 12 years of schooling. Smoking during pregnancy was found to be more prevalent among non-working women, mothers of four or more children and unmarried or single mothers (Penn & Owen 2002).

Many women are strongly motivated to stop smoking during pregnancy when learning of the effects of smoking while pregnant (Johnson et al. 2000). In addition, women who are exposed to and deal with various stressors, such as problematic relationships with friends and family, are more liable to be smokers or to continue smoking while pregnant (Edwards & Sims-Jones 2002). Gilman et al. (2008) have shown that nicotine addiction is a significant predictor of continuing to smoke while pregnant. According to this study, nicotine addiction is the most decisive mental barrier to quitting smoking while pregnant.

The purpose of the current research was to examine whether the Theory of Planned Behaviour (TPB) succeeds in predicting the intention of Israeli women of reproductive age to stop smoking during pregnancy.

### Theoretical framework

The TPB (Ajzen 1991) was selected as a theoretical setting for the current study, since it is one of the most frequently applied models for predicting health and social behaviours (Armitage & Conner 2001), including smoking (Baker 2001; Gantt 2001; Higgins & Conner 2003). However, to date, no studies have utilized the TPB to predict factors affecting women's smoking during pregnancy.

According to the model, the most crucial factor influencing actual behaviour is the individual's intentions. In addition, human behaviour is guided by behavioural beliefs, attitude towards the behaviour, normative beliefs, subjective norm and perceived behavioural control. Behavioural beliefs are an individual's assumption that a certain behaviour will lead to certain results. In other words, the individual assumes that if he acts in a certain way, this will have certain results, to which he attributes a certain value. Normative beliefs reflect the individual's subjective evaluation (i.e. belief) of how 'significant others' would wish him to act in order to perform or avoid a specific behaviour, considering his motivation to act as they wish him to. An individual's intention to act in a certain manner is affected by two main factors: their attitude towards the behaviour – a personal component; and subjective norms – which reflect social leverage. Behavioural attitudes stem from the individual's judgment, whether performing the behaviour would be 'good' or 'bad' for him. Thus, attitudes are a function of the individual's beliefs concerning the personal results expected to follow from realization of their intentions. This subjective norm is the individual's personal perception of the positive or negative social pressures

exerted on him to perform or avoid a certain behaviour. A person who believes that 'significant others' support a certain behaviour will perceive the social pressures as supporting the behaviour, and vice versa. Thus, the subjective norm applies pressure facilitating performance or avoidance of the behaviour independently of the individual's attitude towards this behaviour. Perceived behavioural control is defined by the individual's belief regarding how easy or difficult it is for him to perform a certain behaviour. This belief is related to the presence or absence of resources for dealing with behaviour (Ajzen 2006).

According to Ajzen (1991), the model of the TPB may be supplemented by other predictors, if these are found to predict a significant part of the diversity in behavioural intention or actual behaviour, after considering the primary constructs of the model. Conner & Armitage (1998) reviewed research supporting a possible expansion of the TPB to other predictors, for example past behaviour. Past behaviour was found to be a significant predictor of the intention to stop smoking and of smoking per se in several studies that investigated smoking using the TPB (McMillan et al. 2005).

There are few studies that have discussed intention to smoke and actual smoking using the TPB. Most of them found that attitudes, subjective norms and perceived behavioural control are significant predictors of intention to smoke. A longitudinal study by Godin et al. (1992) on smoking among adolescents (in: Hanson 1997) and a study by Gantt (2001) examined whether it is possible to use TPB to predict recurrence of smoking among postnatal women. However, all studies on smoking using TPB found that intention is the most direct and strongest predictor of smoking cessation (Hanson 1997; Higgins & Conner 2003).

The current study used the variables of the TPB together with other predictive variables – past behaviour and sociodemographics – in order to best predict the condition under consideration.

### Method

In this descriptive, correlational, cross-sectional study, women's attitudes, subjective norms, perceived behavioural control, intentions regarding smoking during pregnancy and self-reported smoking behaviour in the past were examined. In addition, demographic and descriptive variables were included in the model to ensure a more holistic understanding of smoking women's intentions and behaviour. This study, approved by the Ethics Committee of the Pat Matthews Academic School of Nursing, was conducted from August 2008 to March 2009.

### Sample

The sample consisted of smoking women aged 19–46, identified at social events in central Israel. A total of 236 questionnaires

were distributed, and 201 questionnaires were returned, for a response rate of 85%.

### Measure

The research data were gathered by means of a structured questionnaire. The questionnaire, which consisted of 77 items, was constructed based on the literature review and on Ajzen's TPB, and it examined the effect of the theory's constructs on the intention of smoking women to continue smoking while pregnant, and the effect of intention on actual smoking behaviour.

Table 1 describes the level of data and scoring for all questionnaire items as well as the range of possible scores tabulated for each construct of the TPB and sample questions. In order to examine internal consistency, the questionnaire was administered to five clinical nurses specializing in women's health who work in hospital maternity units. Minor adjustments were made as a result (e.g. typographical errors). The overall alpha coefficients of the instrument are ( $0.60 \leq \alpha \leq 0.92$ ).

### Data collection

The subjects were identified by convenience sampling through personal appeals and referrals. Assurance was given that the subjects would remain anonymous and that research findings would be used for research purposes only. The questionnaire

was approved by the Ethics Committee of the Pat Matthews Academic School of Nursing.

### Data analysis

Data analysis was performed with the Statistical Package for Social Sciences (SPSS-PC, version 14, SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to describe the demographic characteristics of the sample and the responses to the TPB and its subscales. Means and standard deviations (SD) of the responses were calculated. Pearson correlation, chi-square, *t*-tests and linear regression were used to determine the relationship between demographic characteristics and TPB.

### Findings

Research participants consisted of 201 female smokers aged 19–46 from central Israel. Table 2 shows that approximately 41% are aged 26–35 and that about half are Israeli born. Most of the subjects are Jewish (91%), and two-thirds of the women are secular (approximately 67%). Most of the immigrant women came from the Soviet Union during 1990–1999 (approximately 76%). Most of the subjects are married (approximately 86%); 40% of the women have no children or are currently pregnant; and 60% have children. Thirty-six per cent of the subjects

**Table 1** Data type, level of data, scoring, and sample questions

<i>Data</i>	<i>Level of data</i>	<i>Scoring</i>	<i>Sample questions</i>
Demographic	Categorical or continuous	Descriptive	Sex Age Country of birth Marital status Level of education
Current state of maternal smoking	Categorical or continuous	Descriptive	Do you smoke now? If yes, how many cigarettes do you smoke per day?
Intentions	Continuous	Likert scale (1–6)	I'll quit smoking before becoming pregnant. I will make every effort to quit smoking the moment I discover that I am pregnant.
Behavioural beliefs	Continuous	Likert scale (1–6)	Smoking during pregnancy can cause harm to the fetus. Smoking during pregnancy is one of the risk factors to premature birth.
Normative beliefs	Continuous	Likert scale (1–6)	My partner thinks I should quit smoking during pregnancy. My mother thinks I should quit smoking during pregnancy.
Behavioural attitudes	Continuous	Likert scale (1–6)	For me, quitting smoking before becoming pregnant is . . . For me, smoking during pregnancy is . . .
Subjective norms	Continuous	Likert scale (1–6)	Most of those whose opinion I appreciate smoked during pregnancy. My mother smoked when pregnant.
Perceived behavioural control	Continuous	Likert scale (1–6)	I believe that when I discover that I am pregnant I will be able to quit smoking. I believe that I am in full control of my ability to quit smoking when pregnant.
Perceived level of knowledge	Continuous	Likert scale (1–6)	I feel that I have all the necessary knowledge about smoking during pregnancy.
Past behaviour	Categorical	Descriptive	Have you smoked during a previous pregnancy/ies? Did you quit smoking during a previous pregnancy/ies?

**Table 2** Descriptive characteristics of the sample

	Variable	N	%
Age	19–25	77	38.3
	26–35	83	41.2
	36–46	40	20
Country of birth	Israel	100	49.8
	Former Soviet Union	90	44.8
	Europe	7	3.5
	Other	4	2
Year of immigration	1971–1989	7	7.1
	1990–1999	74	75.5
	2000–2004	17	17.3
Marital status	Single	13	6.5
	Married	173	86
	Divorced	13	6.5
	Widowed	0	0
Children	None	80	40
	Yes	121	60
Schooling	Less than 12 years	5	2.5
	12 years of schooling	73	36.3
	Advanced studies	55	27.4
	Academic	68	33.8
Occupation	Non-working	16	8
	Partial	77	38.3
	Full-time	108	53.7
	Maternity leave	0	0
Religion	Jewish	183	91
	Muslim	5	2.5
	Christian	8	.4
	Other	5	2.5
Religiosity	Secular	134	66.7
	Traditional	48	23.9
	Religious	19	9.5
	Ultra-orthodox	0	0

completed their secondary education (12 years of schooling) and about half of the subjects are employed in a full-time job (approximately 54%).

### Smoking habits

All the subjects are smokers and 57% of the women smoke 1–10 cigarettes per day. Approximately 40% of the women smoked while pregnant and 60% stopped smoking while pregnant. Of those who stopped smoking while pregnant, 58.5% quit upon discovering that they were pregnant and 35.5% quit in the first trimester. Sixty-four per cent of the subjects have a smoking spouse. Most of the subjects agree that during their next pregnancy they plan to stop smoking before becoming pregnant (65.7%) or at the beginning of the pregnancy (72%). A *t*-test for independent samples found a significant difference between women who stopped smoking in their previous pregnancy/ies

**Table 3** Linear regression findings for predicting maternal intention to quit smoking in next pregnancy

Variable	Beta	Standard error	<i>t</i>	<i>P</i>
Behavioural beliefs	0.16	0.35	-1.73	0.03*
Behavioural attitudes	0.51	0.07	0.77	0.00**
Normative beliefs	0.22	0.08	0.36	0.04*
Subjective norms	0.17	0.06	3.10	0.00**
Perceived behavioural control	0.38	0.05	6.93	0.00**

$R^2 = 61$ . % F = 61.6.

\* $P < 0.05$ ; \*\* $P < 0.01$ .

and those who did not stop smoking in their previous pregnancy/ies [ $t(76.47) = 9.96$ ,  $P < 0.05$ ]. Women who stopped smoking in their previous pregnancy/ies had a greater intention of quitting when pregnant ( $M = 5.0$ ,  $SD = 0.88$ ) than women who did not stop smoking in their previous pregnancy/ies ( $M = 2.99$ ,  $SD = 1.2$ ). A significant correlation ( $\chi^2(10) = 48.13$ ,  $P < 0.01$ ) with a medium effect strength ( $V_c = 0.49$ ,  $P < 0.01$ ) was found between women's smoking in previous pregnancies and whether their mothers smoked when pregnant.

Mean of scores on behavioural beliefs ( $M = 5.5$ ,  $SD = 1.4$ ) and behavioural attitudes ( $M = 5.5$ ,  $SD = 1.4$ ) indicate that this sample of women had relatively positive attitudes about stopping smoking during pregnancy. Mean scores on the scales of normative beliefs ( $M = 3.9$ ,  $SD = 1.2$ ) and subjective norms ( $M = 5.5$ ,  $SD = 1.4$ ) indicate that they valued the beliefs and behaviours of those close to them (i.e. physician, spouse, and family) regarding quitting smoking, and the mean score on the scale of perceived behavioural control ( $M = 4.5$ ,  $SD = 1.3$ ) indicates a high personal sense of empowerment regarding quitting smoking in the future.

However, 80% agree that if their spouse would stop smoking and they would not be in a smoking environment (70%) they would have much higher self-control. Another barrier to women's self-control, affecting their decision to stop smoking, is the fact that over 76% of the subjects stated that smoking is an addiction and that it is particularly difficult to stop this addiction in times of stress.

Pearson product moment correlations among the TPB variables revealed significant correlations ranging from normative beliefs ( $r = 0.53$ ,  $P < 0.01$ ) to perceived behavioural control ( $r = 0.65$ ,  $P < 0.01$ ).

In order to predict mothers' intention to stop smoking in their next pregnancy through the research model variables, a multiple linear regression analysis was carried out using the Stepwise Method, as presented in Table 3. Based on the findings mentioned, the variables of behavioural beliefs, behavioural

attitudes, normative beliefs, subjective norms and perceived control were entered. These variables were found to affect intention to stop smoking in the next pregnancy. This model accounted for 61% of the variance in intention to stop smoking.

## Discussion

The purpose of this study was to understand the factors affecting the behaviour of Israeli women on the issue of smoking during pregnancy, with the aim of examining possible interventions for reducing smoking among pregnant women. The study was based on the TPB (Ajzen 1991). Thus, the present study attempted to examine whether the theory variables, together with other factors identified in other studies, succeed in predicting the intention of Israeli women to stop smoking during pregnancy. The research findings confirm the validity of the TPB. Significant correlations were found between the variables of the basic theory. The major factor affecting women's intention to smoke while pregnant is their feeling of being able to overcome barriers to quitting smoking while pregnant (perceived control).

Some of the conspicuous barriers confronting Israeli women grappling with the decision of whether to stop smoking while pregnant are addiction to cigarettes, identified by Gilman et al. (2008) and the habit of smoking when under pressure, identified by Edwards & Sims-Jones (2002). Various stressful situations are a barrier to women's decision to stop smoking while pregnant. The need for spousal support is significant, as difficulties in the familial sphere might serve as a deterrent.

A prominent finding of this study, identified in most studies based on the TPB, such as Higgins & Conner (2003), Gantt (2001) and Hanson (1997), is the fact that women who have more negative attitudes towards smoking during pregnancy will have a greater intention to stop smoking. Indeed, the current study indicates that most women agree that smoking while pregnant is detrimental and that it is very important to stop smoking before becoming pregnant.

The research findings show that most women believe that their significant others (spouse, family, friends and primary physician) think that they should stop smoking when pregnant; however, the most conspicuous finding is the significance of the physician's opinion. Women are attentive to the opinions of their primary physician, and when making a decision, they tend to act as prescribed by these professionals on the subject of smoking during pregnancy. Israeli society is paternalistic, and physicians' opinions are considered important and significant. Fadlon (2004) showed that patients did not wish to participate in decisions regarding their care and to be informed of possible alternatives; they preferred to rely on and comply with the physician's opinion. The women investigated in the current study

who perceive their fetus' health as important and feel that they do not have all the necessary information concerning smoking when pregnant perceive their physician as sufficiently knowledgeable and tend to agree with his or her opinion on smoking.

Most women in this study perceive themselves as capable of controlling their smoking habit when pregnant and think that smoking during pregnancy depends mainly on themselves. Perceived behavioural control is the strongest predictor of intention in this study. However, the study indicates a factor that reduces women's perceived control, and this is the issue of exposure to a smoking environment, such as spouse and friends, over which women usually do not have any control, influencing women's reduced perceived control of smoking while pregnant.

Lindqvist & Aberg (2001) found that women who smoke while pregnant are usually the offspring of parents who smoke and who are therefore negative role models. This information is compatible with the findings of the current study that show that most women who claim that their mother smoked when pregnant indicated that they themselves smoked during previous pregnancies as well (in: Edwards & Sims-Jones 2002).

The TPB has emerged in the literature as superior to other models (i.e. Health Belief Model) for explaining behavioural intentions despite claims by some researchers that the TPB is not empirically adequate for the study of some ethnic groups (Jennings-Dozier 1999) and that perceived behavioural control is not predictive of behavioural intentions (Bish et al. 2000). In the current study, all the TPB variables were significantly related to women's intentions to stop smoking during pregnancy, suggesting that the TPB is a good theoretical framework for exploring factors that influence women's smoking behaviours during pregnancy.

## Limitations

The sampling method employed in the current study is a convenience sample and not a random sample. Thus, the study's main limitation is the lack of heterogeneity among the research population, as the sociodemographic ratio between the women in the sample regarding religion, religiosity, ethnic origin and schooling is disproportionate to their ratio in the general population. Thus, the findings do not accurately reflect the population and it is impossible to assess the differences between the various groups.

Another limitation is the fact that the study was based on subjects' self-reports of smoking behaviour while pregnant and these findings cannot be objectively confirmed. In addition, the study attempted to predict women's intention to stop smoking while pregnant using the TPB, but it does not examine whether women who declared that they intend to stop smoking when pregnant indeed did so.

### Nursing implications

The current research findings indicate the crucial effect of women's social environment on their decision to avoid smoking while pregnant. This implies nurses' significant role in using childbirth preparation courses to impart to women's spouses and family the significance of avoiding active and passive smoking during pregnancy. In addition, nurses must prepare plans for promoting health and avoiding smoking among the general population as well in order to prevent smoking in public places and particularly near pregnant women, emphasizing risks for mothers and babies, specifically among women's spouses.

In light of the fact that Israeli women are particularly cognizant of the opinions of their primary physicians on smoking, it is necessary to increase the awareness of primary physicians regarding their major influence on women's decisions concerning smoking behaviour while pregnant and to include them in programs for promoting health and preventing smoking.

In addition, perceived control was found to best predict intention to stop smoking while pregnant. Thus, it is possible to enhance Israeli women's perception of being capable of overcoming barriers to quitting smoking during pregnancy by transmitting this message in the media, for example through newspaper articles, radio and television broadcasts, and in various ads, which will emphasize the significance of Israeli women's self-perception as capable of overcoming these obstacles. This may help raise the proportion of women who stop smoking when pregnant.

The present study is the first of its kind in Israel and therefore provides a more general reflection of the behaviour of Israeli women regarding quitting smoking during pregnancy and related factors. Thus, many questions have remained unanswered. For example, it would be necessary to sample all of Israel's unique population groups in order to best and most objectively assess Israeli women's smoking behaviour during pregnancy. In order to reach a thorough evaluation of this conduct among Israeli women, there is need for further research to detail and expand existing knowledge on various groups not currently included, such as women from the Ethiopian community, religious and ultra-orthodox women, Christian women, and Israeli Arab women. Qualitative research will facilitate identification of reasons for existing differences between the various groups.

Since the current study indicated that most women believe that their significant others (particularly the primary physician and spouse) think that they should stop smoking during pregnancy and that they are attentive to these opinions, there is need for more comprehensive research examining the behaviour and different ways of encouragement employed by Israeli physicians and men on the issue of women's avoidance of smoking during

pregnancy. In addition, there is room for prospective research among smoking women in order to assess the effect of variables from the TPB on women's actual behaviour.

### Conclusion

Smoking during pregnancy is a risk both for mothers and for their fetuses. The findings of the current study indicate the effect of attitudes towards smoking on smoking during pregnancy, the effect of significant others and women's perceived control over their ability to stop smoking during pregnancy.

As revealed in this study, the TPB is a useful model for predicting factors influencing intentions to stop smoking during pregnancy. As such, strategies designed to prevent smoking among pregnant women should consider the effect of social norms and perceived barriers on their intentions. An opportunity also exists for researchers and practitioners to identify segments of this population who have smoked during pregnancy and to develop and test innovative strategies that will motivate women to stop smoking during pregnancy.

### Author contributions

All authors were involved in study conception/design, data collection/analysis, drafting of manuscript, critical revisions for important intellectual content, statistical expertise and administrative work.

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