

Reduced Nicotine Content Cigarette Knowledge, Attitudes, and Practices of Patients at a Perinatal Substance Abuse Treatment Center

Allan Andersen, MD,* Margaret S. Chisolm, MD,*
Betha A. Kleykamp, PhD, † Fabd N. Yunus, BA, ‡
Cheri Smith, MLS, § and Mishka Terplan, MD, MPH || ¶

Abstract

Objectives:

Maternal cigarette smoking is the leading modifiable risk factor for adverse pregnancy outcomes, and yet approximately 14% of women in the United States smoke cigarettes during pregnancy. This study examines cigarette smoking and cessation and reduced nicotine content (RNC) cigarette knowledge, attitudes, and practices in patients at an outpatient perinatal substance abuse treatment center.

Methods:

Consenting patients who were smokers (N = 26) completed the 11-item survey instrument.

Results:

Eighty-eight percent of participants reported current interest in quitting smoking. Four percent endorsed smoking RNC cigarettes before the survey, and 60% reported interest in trying them in the future. Sixty-nine percent reported interest in learning more about RNC cigarettes and 68% believed that they were at least as safe as regular cigarettes.

Conclusions:

Under the 2009 Family Smoking Prevention and Tobacco Control Act, the Food and Drug Administration has the authority to mandate reduction in the nicotine content of cigarettes. Results show the potential for pregnant smokers to perceive RNCs as relatively safe and appealing alternatives to regular cigarettes. Further study of the efficacy and safety of RNC cigarettes in pregnancy is needed to minimize the risk of any unintended maternal and child public health consequences of a national policy to reduce the cigarette nicotine content.

Key Words: nicotine, tobacco, smoking, pregnancy, policy

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Maternal cigarette smoking is the leading modifiable risk factor for adverse pregnancy outcomes, including spontaneous abortion, preterm delivery, low birth weight, and sudden infant death syndrome.¹ Despite this known

health burden, approximately 14% of all United States women² and up to 95% of substance-dependent women smoke cigarettes during pregnancy.^{3–5} These numbers have changed very little over the past 20 years² despite efficacious behavioral treatments^{6–8} now recommended as part of prenatal care for smokers.^{8,9}

Medication treatments are not currently recommended for all pregnant smokers because of the inadequate evidence regarding their safety or efficacy during pregnancy.¹⁰ Nicotine replacement therapy (NRT) has been studied in pregnant populations, but because of the lack of demonstrated efficacy and concern about nicotine's harmful fetal effects,^{11–16} NRT is currently recommended only for pregnant women smoking 20+ cigarettes daily.^{8,9,17–21}

The use of reduced nicotine content (RNC) cigarettes has been proposed as an alternative strategy to decrease the prevalence of cigarette smoking in the overall population.^{22–25} With the signing into law of the 2009 Family Smoking Prevention and Tobacco Control Act (FSPTCA), the Food and Drug Administration (FDA) was given the authority to regulate tobacco products. This authority extends to mandating a reduction in cigarette nicotine content, if such a reduction is demonstrated to improve public health.

Some studies have suggested that RNC cigarettes may increase compensatory smoking behavior [smoking more cigarettes per day (CPD) to make up for the lack of nicotine].^{26,27} This behavior

From *The Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine; §Johns Hopkins Bayview Medical Center; Departments of ||Obstetrics/Gynecology and Reproductive Sciences; ¶Epidemiology and Preventive Medicine, University of Maryland School of Medicine, Baltimore, MD; †Hayes Incorporated, Lansdale, PA; and ‡New York Medical College, Valhalla, NY.

The authors declare no conflict of interest.

Reprints: Margaret S. Chisolm, MD, 5300 Alpha Commons Drive, Suite 446B, Baltimore, MD 21224 (e-mail: mchisol1@jhmi.edu).

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would pose special concern for pregnant smokers for whom compensatory smoking may lead to increased fetal exposure to non-nicotine toxins found in cigarette smoke that are associated with adverse pregnancy outcomes.^{28,29} Although the potential health benefits of switching a pregnant smoker to RNC cigarettes may outweigh the risks, very little research has examined the risks or benefits of maternal RNC cigarette use to women and children, consistent with a general lack of integration of sex considerations in tobacco control research.³⁰

Further study of RNC cigarettes in pregnancy is necessary to minimize the risk of any unintended maternal and child public health consequences of a national policy to reduce the cigarette nicotine content. In this preliminary inquiry, we examined cigarette smoking and cessation and RNC cigarette knowledge, attitudes, and practices (KAP) among patients attending an outpatient perinatal substance abuse treatment center.

MATERIALS AND METHODS

Surveys were administered to substance-dependent smokers (N = 26) at the Johns Hopkins Center for Addiction and Pregnancy (CAP). All CAP patients are substance-dependent and either pregnant or <9 weeks postpartum. All patients who were self-reported smokers were eligible for study participation.

CAP is a comprehensive, multidisciplinary perinatal substance abuse treatment program located at the Johns Hopkins Bayview Medical Center. CAP provides intensive outpatient substance abuse treatment to pregnant and postpartum women and their children.³¹

The RNC cigarette KAP instrument was developed by the lead author of this study specifically for CAP patients. It includes demographics and background characteristics (3 items), cigarette smoking and cessation attitudes and practices (3 items), and RNC cigarette KAP (5 items). Demographics and background items include pregnancy versus postpartum status, opioid-agonist use, and duration of CAP treatment. Cigarette smoking and cessation items

include self-report of average CPD, interest in quitting, and any use of cessation medications. RNC cigarette KAP items include perception regarding RNC cigarette safety and interest in trying RNC cigarettes. Item response choices vary: yes/no, multiple choice, fill-in-the-blank, and Likert score.

All study procedures were approved by the local institutional review board. Surveys contained no identifying information. Participants received no compensation and participation was completely voluntary. All surveys were brief, self-administered, and anonymous. They were distributed by and returned to a member of the study team between November 6, 2009 and November 20, 2009. All analyses were performed using the 2007 version of Microsoft Office Excel.

RESULTS

The completion rate was 43% (26 of 60), on the basis of an average daily CAP census during the study period. Most participants were pregnant (85%) and opioid-agonist maintained at the time of survey completion (92%). The average number of days in CAP treatment was 73 (SD 75).

Patients reported smoking an average of 12.3 (SD 7.5) CPD. Eighty-eight percent endorsed at least being "somewhat" interested in trying to quit smoking, and 44% endorsed being "a lot" or "extremely" interested in trying to quit smoking. Less than half (42%) reported any past or present use of any pharmacological smoking cessation method, the most common (38%) being nicotine patch or gum. Fewer still reported any use of bupropion (15%), a nicotine inhaler (4%), and varenicline (0%).

Only 1 patient (4% of sample) endorsed having tried RNC cigarettes before the survey. Sixty-nine percent endorsed being "somewhat," "a lot," or "extremely" interested in learning more about RNC cigarettes. Sixty-eight percent endorsed perceiving RNC cigarettes as being "just as safe," "safer," or "much safer" for their baby compared with regular cigarettes. Sixty percent endorsed being "somewhat" or "extremely"

likely to try RNC cigarettes if they knew that RNC cigarettes would not cause them to crave or smoke more cigarettes and might be safer for their baby.

DISCUSSION

This report measured cigarette smoking and cessation and RNC cigarette KAP among cigarette smoking patients attending a perinatal substance abuse treatment program. Although less than half of the patients in this study reported any use of pharmacologic smoking cessation treatments, most were at least somewhat interested in trying to quit smoking. As expected, the pharmacologic agents most commonly used were those available over the counter. Despite a lack of knowledge about RNC cigarettes, a majority of patients perceived RNC cigarettes to be at least as safe for their baby as regular cigarettes and reported interest in trying them. These results suggest that, despite limited knowledge regarding the efficacy and safety of RNC cigarettes, substance-dependent pregnant women are favorably inclined towards them. Thus, if the FDA were to introduce RNC cigarettes to the general population, pregnant women may be likely to use these cigarettes, potentially exposing women and their fetuses to increased levels of non-nicotine ingredients and byproducts found in cigarette smoke because of compensatory smoking behavior.

To our knowledge, RNC cigarette use by pregnant women has not been studied previously. In addition, no reports have examined KAP about RNC cigarettes among nonpregnant women or in the general population. As reviewed in Table 1, there have been 4 studies regarding the use of reduced nicotine yield (RNY) cigarettes in pregnancy: 1 intervention trial of pregnant and nonpregnant individuals³² and 3 correlational studies of pregnant women.³³⁻³⁵ However, because of the differences in the construction of RNY cigarettes and RNC cigarettes, these studies may not be directly relevant. In contrast to RNC cigarettes, which contain less nicotine than regular ciga-

rettes, RNY cigarettes have levels of nicotine similar to regular cigarettes. In addition, reduced-yield cigarette filters can be easily manipulated by the smoker to provide desired doses of nicotine. Nonetheless, some potential benefits of smoking lower-yield cigarettes among pregnant women were reported among these studies, including higher neonate birth weights in some,^{32,35} but not all, studies.³³

Although no studies were identified examining RNC cigarette use among pregnant women, 3 studies in nonpregnant populations suggest their use (1) is not associated with significant compensatory increases in smoking behavior or exposure to nicotine or other tobacco smoke toxins, such as carbon monoxide; and (2) may be able to facilitate smoking cessation. Studies by Benowitz et al^{36,37} found minimal evidence of compensatory smoking, no increase in systemic carbon monoxide exposure, and no change in cardiovascular risk factors during the study. Although tobacco cessation was not a primary endpoint of the 2007 study, 25% of subjects spontaneously quit smoking 4 weeks after completion of the cigarette taper. A study specifically designed to assess the potential of RNC cigarettes as an aid for smoking cessation³⁸ included an examination of compensatory smoking and carbon monoxide levels between participants who smoked RNC cigarettes with nicotine yields of 0.3 and 0.05 mg. Smokers of the 0.3-mg cigarettes exhibited compensatory increases in CPD and carbon monoxide level, whereas the 0.05 mg group smoked fewer cigarettes, had lower carbon monoxide levels, and had higher rates of abstinence at 12 weeks.

In sum, although it is plausible to suggest beneficial effects of RNC cigarettes in pregnant women on the basis of the above studies, more systematic, well-controlled, and adequately powered research studies are needed to determine whether there would be any unintended maternal and child public health consequences of a national policy reducing the level of nicotine in cigarettes. Ideally, studies of RNC cigarettes in pregnant women would be designed to assess for both short-term and long-term compensatory smoking,

TABLE 1. An Overview of the Studies Examining Reduced-yield Cigarettes and Pregnant Women

References	Sample	Dependence (Mean)	Design/Data Type	Predictor Variables	Dependent Variables	Cigarette Manipulation	Results	Drawbacks	CPD, Nicotine	
									Sample	Dependence (Mean)
Kabela and Andrasik ³²	12 smokers (6 pregnant and 6 nonpregnant)	7.2, 7 (pregnant) and 8.3, 3.7 (nonpregnant)	Experimental/self-report; biochemical	1. Pregnancy status 2. Cigarette yields (tar/nicotine/CO)	Mother: smoking topography, carboxyhemoglobin (breath CO), salivary thiocyanate; child: none	Shift to lower-yield cigarettes over 6 wk	Shift to lower yield associated with duration of smoking (in laboratory) and lower CO. CO levels did not drop below the minimal cardiovascular risk level	Yields based on machine estimates; cigarette types not identified; volunteers not blinded to cigarette type; no control condition that included regular smoking; small sample; pregnant smokers were significantly more nicotine dependent than nonpregnant smokers	414 pregnant smokers	11.08 (at intake), not reported
Peacock et al ³⁵	414 pregnant smokers	11.08 (at intake), not reported	Descriptive/self-report	1. CPD 2. Cigarette yields across tar/nicotine/CO	Mother: amount and type of cigarettes smoked; child: birth weight (adjusted for gestational age)	Comparison of 4 groups: amount smoked (small vs. large) and cigarette yield (low vs. high)	Individuals that smoked <15 CPD of cigarettes with CO yields <12 mg had babies with birth weights similar to nonsmoker mothers. Smaller birth weights were associated with heavier smoking	Yields based on machine estimates; yields collapsed across tar/nicotine/CO; cigarette types not identified; dichotomized groups; descriptive; retrospective	414 pregnant smokers	11.08 (at intake), not reported

Olsen ^{3,4}	4400 pregnant women (4110 smokers)*	Overall means not reported (most smoked 5 or more), not reported	Descriptive/self-report	1. Smoking status 2. Cigarette nicotine content	Mother: weight gain during pregnancy; child: birth weight and length, placenta weight, head circumference	Comparison of 3 nicotine groups: <1.5, 1.5-1.9, >1.9 mg	Reduced nicotine content associated with increased birth weight and length, as well as head circumference	Yields based on machine estimates; cigarette types not identified; dichotomized groups; descriptive; retrospective
Mitchell et al ³	1714 pregnant women (844 smokers)†	Overall means not reported (most smoked 5 or more on average), not reported	Descriptive/self-report	1. Smoking behavior during pregnancy 2. Cigarette yields (tar/nicotine/CO) 3. Environmental tobacco smoke	Mother: none; child: size for gestational age (small or average)	Comparison of 4 nicotine groups: <1.2, 1.2, 1.3, >1.3 mg	No association between nicotine content and small-for-gestational-age infants	Yields based on machine estimates; cigarette types not identified; dichotomized groups; descriptive; retrospective

Articles were retrieved through a search of databases (PubMed, SCOPUS, Trip, ISI, Embase, PsycINFO, CINAHL, Cochrane, Evidence-based Mental Health, Clinicaltrials.gov, sample) using the search terms reduced nicotine, nicotine-free, denicotinized, lower, reduced, yield, or content AND pregnant, pregnancy, trimester.

*Sample size values were extrapolated from Table 1.

†Sample size values taken from abstract.

CO indicates carbon monoxide; CPD, cigarettes per day.

nicotine exposure, change in biomarkers such as carbon monoxide, and relevant clinical outcomes such as smoking cessation, premature delivery, birth weight, and sudden infant death syndrome. It is possible that RNC cigarettes could be combined with NRTs to minimize the risk of compensatory smoking, although results of a large study of nicotine patches in pregnant women suggest that this strategy may be limited by poor treatment adherence.¹¹ In contrast, the use of RNC cigarettes appears to be less likely to suffer from poor treatment adherence as they mimic the nontreatment condition of active smokers more closely. While the risks of pharmacologic intervention strategies in pregnant women should not be minimized, exclusion of pregnant women from studies of RNC cigarettes jeopardizes public health in the area of maternal-fetal medicine, and raises significant ethical concerns on the basis that this practice results in less benefit from such research for pregnant women.³⁹ Advances in health care for pregnant women with conditions such as cigarette use and nicotine dependence cannot be safeguarded and/or improved unless pregnant women are included in such clinical research.

There are several limitations to the present study. The study was conducted at only 1 perinatal substance abuse treatment center and its findings may not generalize to other similar treatment settings or general populations of pregnant smokers. In addition, there is a lack of reliability or validity data on the study instrument. Despite these limitations, this study is the first to assess RNC cigarette knowledge and attitudes of any population of pregnant patients.

The FSPTCA has given the FDA the authority to reduce the nicotine content of cigarettes, presenting the tobacco research community an opportunity to directly inform policy by rigorously examining RNC cigarettes. There is presently a lack of research examining the efficacy and safety of RNC use among pregnant smokers, and interventions that benefit the overall population are not necessarily of benefit for pregnant women. Thus, this population should be considered when recruiting for future studies examining RNC cigarettes. Such research could inform public health

policy and would be particularly informative for areas of the country with high smoking prevalence.² Only by including pregnant participants in these research studies will there be sufficient evidence to inform the FDA of the public health impact of a large-scale reduction in the nicotine content of cigarettes.

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