

## Women and smoking: Risks, impacts, and challenges\*

O tabagismo e a mulher: Riscos, impactos e desafios

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### Abstract

Smoking among women has drawn increasing attention because of the increase (or less pronounced decrease) in its prevalence when compared with that observed for men, as well as because of the specific effects that smoking has on women's health. For the 2010 "World No Tobacco Day", the World Health Organization chose the theme "Gender and tobacco with an emphasis on marketing to women", with the aim of encouraging policies to combat marketing strategies employed by the tobacco industry and to curb the epidemic of smoking among women. In this article, we discuss the characteristics of smoking among women, addressing factors such as smoking prevalence, nicotine dependence, the role of the tobacco industry, health risks, approaches to smoking cessation, treatment strategies, and prevention measures.

**Keywords:** Smoking; Women's health; Tobacco industry.

### Resumo

O tabagismo entre as mulheres tem cada vez mais merecido destaque devido ao aumento (ou da redução menos acentuada) de sua prevalência em comparação com aquela dos homens, bem como devido a especificidades dos efeitos do tabagismo na saúde da mulher. Em 2010, a Organização Mundial da Saúde elegeu para o "Dia Mundial sem Tabaco" o tema "Gênero e tabaco com ênfase na propaganda voltada para a mulher", com o objetivo de estimular políticas de combate às estratégias de marketing da indústria do tabaco e conter a epidemia de tabagismo entre as mulheres. O presente artigo discorre sobre as características do tabagismo na mulher, abordando fatores como prevalência, dependência, a atuação da indústria, riscos à saúde, abordagens à cessação do tabagismo e estratégias de tratamento e prevenção.

**Descritores:** Tabagismo; Saúde da mulher; Indústria do tabaco.

### Introduction

Smoking by women has been a growing concern, drawing the attention of health care institutions in an attempt to alert society and health care workers to the negative impact that smoking has on women's health.<sup>(1,2)</sup>

For the 2010 "World No Tobacco Day", which was created by the World Health Organization (WHO) in 1987, the WHO chose the theme "Gender and tobacco with an emphasis on marketing to women". The primary objective was to encourage policies to combat the marketing strategies employed by the tobacco industry and to curb the epidemic of smoking among women.

<sup>(1,3)</sup> The initiative was motivated by mounting evidence that smoking in this population group had increased in many countries.<sup>(1,2)</sup> Even in societies where smoking has decreased, the reduction is less pronounced among women.<sup>(1,4)</sup> It is known that the tobacco industry makes an effort to increase the numbers of women who are nicotine-dependent. Data regarding 151 countries revealed that, in general, the prevalence of smoking is higher in adolescent boys than in adolescent girls (12% vs. 7%); however, in various countries, the prevalence of smoking is similar for both genders.<sup>(1)</sup>

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## Number of women who smoke and who they are

On the basis of recent data from the WHO, it has been estimated that 250 million women worldwide smoke daily.<sup>(2)</sup> Between 1950 and 2000, approximately 10 million women died due to smoking,<sup>(5)</sup> and it has been estimated that, between 2002 and 2030, this figure will have increased to 40 million.<sup>(6)</sup>

Although the prevalence of smoking among adult women has been decreasing in countries such as Australia, the United States, England, New Zealand, and Canada, it remains high in other developed countries, the mean prevalence being 22%. In developing countries and certain regions of Europe (the east and southeast), the prevalence of smoking in adult women is approximately 9%, ranging from 3% (in China, India, Guatemala, and Honduras) to over 20% (in Venezuela, Chile, Argentina, and Peru), the number of female smokers in such countries having shown a trend toward stabilizing or even increasing.<sup>(2)</sup>

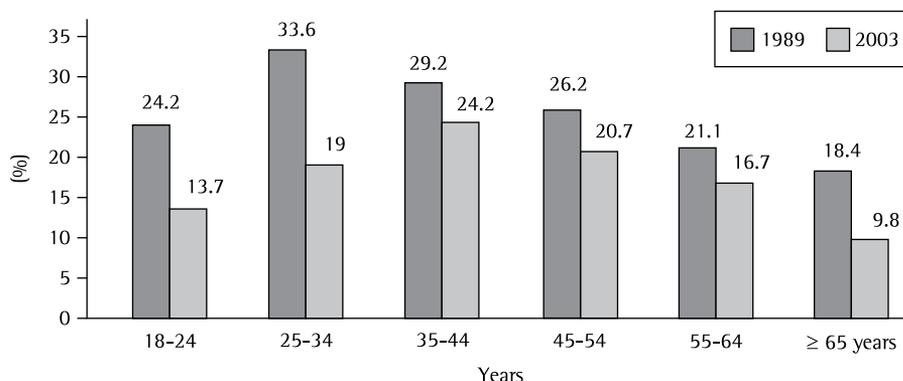
The prevalence of smoking among young women has been increasing worldwide, and in some countries (Uruguay, the United States, New Zealand, and Costa Rica), the number of girls who smoke is higher than is that of boys who smoke.<sup>(2)</sup>

In Brazil, since 2001, successive epidemiological surveys have been conducted, and the results have shown that the prevalence of smoking has decreased in relation to that found in 1989, when the first nationwide study was conducted. Prior to 2000, the study

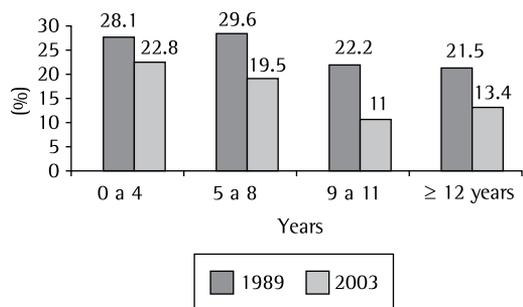
conducted in 1989 was the only nationwide study of the prevalence of smoking. In 1989, the prevalence of smoking among women was 27%, having decreased to 18% in 2003 and to 13% in 2008. In addition, the rates of smoking among men and women have shown a trend toward convergence. The prevalence of smoking has been reported to be highest among women who live in rural areas, those with a lower level of education, and those with a lower income (Figures 1 to 4).<sup>(7)</sup>

A survey conducted in 2006 revealed that the rates of cigarette experimentation among girls over 18 years of age were higher in southern Brazil than in other parts of the country, and that these data were strongly correlated with the prevalence of smoking among the parents of those young smokers.<sup>(8)</sup>

In 2009, a study<sup>(9)</sup> evaluating individuals aged 15 years or older in Brazil revealed that, of an estimated total of 24.6 million smokers (prevalence of 17.2%), 9.8 million (prevalence of 13.1%) were women and 14.8 million (prevalence of 21.6%) were men, data that were similar to those found in a survey conducted in large Brazilian cities in 2008.<sup>(9,10)</sup> According to the study conducted in 2009,<sup>(9)</sup> approximately 76% of Brazilian women start smoking before age 19 years, a proportion that is similar to that observed among men (79%) and is corroborated by the global data.<sup>(1)</sup> A recent study evaluating residents of Brazilian capitals showed that the prevalence of smoking among women was 12.4% and, in some capitals, the proportion of female smokers was remarkably close to that of male smokers.<sup>(10)</sup>



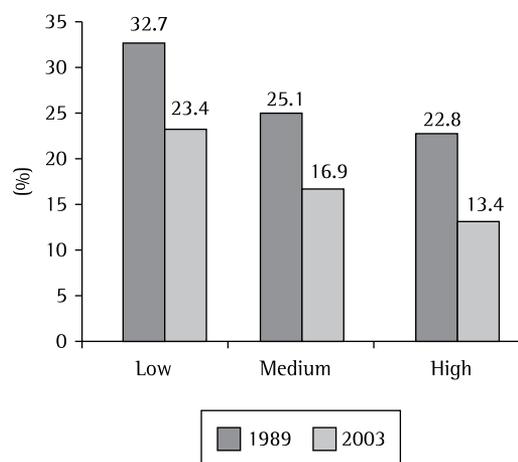
**Figure 1** – Prevalence of smoking among women in Brazil, by age bracket, in 1989 and 2003.



**Figure 2** - Prevalence of smoking among women in Brazil, by number of years of schooling, in 1989 and 2003.

### Women and the tobacco industry

The trend toward an increasing approximation between the rates of smoking among men and women is influenced by the aggressive marketing employed by the tobacco industry, which focuses on the female population. The strategy consists of disseminating ideas of emancipation, as well as false images of vitality, elegance, sophistication, and modernity. In addition, products and campaigns targeting women—such as the cigarette brand Virginia Slims (which alluded to weight loss) and its marketing campaign (“You’ve come a long way, baby”), launched by Phillip Morris in the early 1970s—have been developed. Over time, numerous new products, such as “light” cigarettes, “ultralight” cigarettes, new filter tips, and flavored cigarettes, were launched.<sup>(2,4,5)</sup>



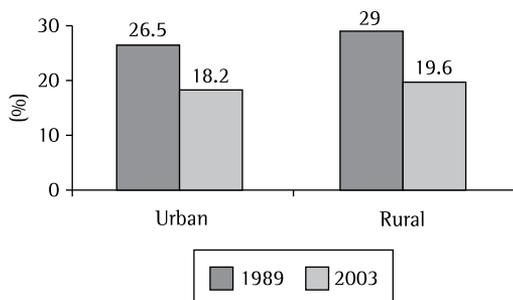
**Figure 3** - Prevalence of smoking among women in Brazil, by income bracket, in 1989 and 2003.

The investments in marketing targeting female consumers are part of an old but extremely focused strategy, which includes research into individual behavior and reactions to various stimuli, such as the colors of the packages. Cigarette packages are designed to capture the female imagination, with colors that evoke tranquility (blue), power (red), and femininity (pink). These symbolic attributes have been shown to be quite effective in selling these products.<sup>(4)</sup> One study revealed that pro-smoking advertising on cigarette packs is a quite advantageous marketing strategy and is effective at the point of purchase, since cigarette consumption and experimentation were shown to vary according to the package used.<sup>(11)</sup> In contrast, studies have demonstrated that the warning printed on cigarette packs plays an important role in disseminating information regarding the risks of smoking and the role it plays in cardiovascular diseases, lung cancer, and sexual impotence.<sup>(12)</sup>

Between the 1970s and the 1990s in the United States, the tobacco industry consolidated its position as a major sponsor of female athletes, especially tennis players, and tennis player Martina Navratilova represented the Virginia Slims brand (Phillip Morris) during the Wimbledon tournament. In the 1980s, political and ethnic minority organizations in the United States also received financial support from the tobacco industry. In 1987, Phillip Morris sponsored, in the city of New York, training programs for female leaders in African-American and Hispanic-American society, having contributed large sums of money.<sup>(4,5)</sup>

A prospective study conducted in the United States between 2003 and 2008 and involving over 1,000 adolescents in the 11-13 year age bracket evaluated the efficacy of an antismoking campaign launched in 1998, as well as the susceptibility of the individuals to pro-smoking advertisements. The study revealed that, after the advertisement for the Camel no. 9 brand, which began to run in 2007 and exclusively targeted female adolescents, there was a 10% increase, in that same year, in the preference for that cigarette brand.<sup>(13)</sup>

Another study evaluated the exposure of young individuals in the 12-17 year age bracket to cigarette advertisements by analyzing, between 1992 and 1998, the five most read



**Figure 4** - Prevalence of smoking among women in Brazil, by location of residence, in 1989 and 2003.

magazines by those individuals. The authors found that there were over 2,000 cigarette advertisements targeting principally the female population. In 1992, the number of cigarette-related images per issue of those magazines was 4, having increased to 16 in 1998.<sup>(14)</sup>

The tobacco industry attempts to adjust its strategies to the characteristics of each target population. These strategies have recently directed the market toward the production of smokeless tobacco products, such as snuff and chewing tobacco, as a means of diversification, allowing the use of tobacco in enclosed spaces and leading to an overall increase in the consumption of tobacco products. The analysis of approximately 60 internal documents issued by the tobacco industry between 1978 and 2006 revealed that, in the opinion of the producers, smokeless tobacco can be presented as more sophisticated, hygienic, discreet, and socially acceptable than smoked tobacco, characteristics that can stimulate women to consume smokeless tobacco products.<sup>(15)</sup>

Special discounts significantly contribute to cigarette consumption among women and young individuals, who are collectively more sensitive to cigarette pricing and advertisements.<sup>(16)</sup> Although tobacco companies deny that advertising specifically targets young individuals, it is evident that advertising campaigns focus on this population, as demonstrated by a recently published meta-analysis.<sup>(17)</sup> A cross-sectional study involving adolescents aged 15-16 years demonstrated that 95% of the adolescents had been exposed to cigarette advertisements; in addition, 30% of the adolescents who smoked and 11% of those who did not had received cigarettes as a free sample.<sup>(18)</sup>

There is mounting evidence from observational, longitudinal, and experimental studies demonstrating that exposure to smoking in movies is associated with an increase in smoking initiation among young individuals. One group of authors<sup>(19)</sup> found that, among young individuals in England, there was a positive correlation between smoking initiation and exposure to smoking in movies.<sup>(20)</sup>

## Principal factors that induce women to smoke

The reasons why women start smoking and continue to do so vary according to age, psychological factors, socioeconomic factors, demographic factors, and cultural factors; in addition, tobacco industry advertising induces women to smoke.<sup>(2,5,21,22)</sup> Earlier smoking initiation and longer smoking history translate to greater difficulty in quitting smoking.<sup>(14,23)</sup>

Various studies have demonstrated that there is a strong association between the onset of smoking in young individuals and the presence of smokers among friends and family members.<sup>(18,23,24)</sup> Other studies have demonstrated a higher rate of smoking initiation among girls whose mothers smoke, due to the easier access to cigarettes; however, friends during adolescence have the greatest influence on smoking initiation and maintenance, an influence that is reinforced by the fact that the perception and knowledge that young individuals have of smoking-related health risks are lower.<sup>(4)</sup> A recently published study revealed that the principal determining factor for smoking initiation was directly associated with the number of friends who smoked, the risk of smoking initiation being 12 times higher when half or more of the friends were smokers. The study also revealed that divorced women were more likely to smoke than were those who had a steady partner.<sup>(25)</sup>

Young individuals from less privileged socioeconomic strata and with a lower level of education are also more vulnerable to smoking; tobacco industry advertising promises financial success and improved social status, which appeals to girls and boys alike.<sup>(14,19,23)</sup>

The fact that adolescents are going through a period in which their personality is being formed, often facing problems related to self-esteem, anxiety, depression, and loss of self-confidence, is also associated with a higher

risk of smoking initiation. In an attempt to improve their image and become more sociable, female adolescents experiment with cigarettes, believing that smoking will make them more feminine, mature, and sexually attractive.<sup>(4,5,25)</sup> Movies, which in the past clearly disseminated positive images of smoking, still play a role in smoking initiation among young individuals, regardless of the gender, as determined by a study conducted in Germany and involving over 4,000 young individuals aged 11-15 years.<sup>(26)</sup>

Among pregnant adolescents, the rates of smoking cessation during pregnancy have been reported to be higher for those of higher socioeconomic status, whereas those of lower socioeconomic status believe that smoking reduces the pain and duration of labor, which might promote the use of tobacco during pregnancy.<sup>(4)</sup> Other studies have shown that smoking during pregnancy is associated with a fear of gaining weight; however, this behavior has also been well-documented in non-pregnant women.<sup>(4,27)</sup>

Studies have shown that women smoke after negative life experiences. In recent years, with their increased participation in the workforce, women have, in addition to their roles as homemakers and mothers, taken on more responsibilities. In this sense, smoking, as well as being a mechanism of emotional escape, is associated with a stronger feeling of autonomy, of finding one's own place in society.<sup>(4,22,27)</sup>

Psychiatric comorbidities, such as depression, bipolar disorder, anxiety disorders, and schizophrenia, are also associated with a higher rate of smoking, as well as with greater difficulty in quitting smoking. This difficulty is related to an exacerbation of the psychiatric symptoms during the abstinence period, the risk of relapse during smoking cessation treatment being extremely high.<sup>(4,22)</sup>

## The characteristics of nicotine dependence in women

Cigarette smoke contains over 4,000 substances, among which is nicotine, the principal component related to dependence.<sup>(28)</sup> Seconds after having been inhaled or aspirated, nicotine reaches, through blood circulation, the mesolimbic dopaminergic and serotonergic pathways, where it binds to cholinergic nicotinic receptors in the brain, of which  $\alpha 4\beta 2$  is the

most abundant. The effect of nicotine on the cholinergic nicotinic receptors triggers the release of neurotransmitters, especially dopamine, which produce pleasurable or gratifying psychoactive effects.<sup>(29)</sup> With repeated exposure, individuals develop tolerance to many of the effects of nicotine. This reduces the primary reinforcement effect of nicotine and induces physical dependence, which manifests as withdrawal symptoms in the absence of nicotine. The act of smoking is influenced by the pharmacological effect of the lack of the drug and by the reward mechanism activated by contact with the drug. The act of smoking is also influenced by environmental factors, such as smoking by friends, stress, and tobacco advertising. Other factors that influence the behavior related to the act of smoking are age, gender, genetic characteristics, mental disease, and drug abuse.<sup>(4,22,28,29)</sup>

The levels of nicotine in the body are modulated by the rate of nicotine metabolism. Nicotine is metabolized in the liver, principally by means of the CYP2A6 enzyme. Nicotine induces a reduction in stress and anxiety, as well as allowing smokers to regulate excitement and mood. The cornerstone of nicotine dependence is the combination of positive reinforcements, including mood reinforcement, and the avoidance of withdrawal symptoms.<sup>(4,22)</sup>

Most of the studies of nicotine dependence conducted in the 20th century focused on the male population, the rationale being that the inclusion of women in those studies would represent a bias due to hormonal conditions (menstrual cycle and pregnancy) and might therefore interfere with the results. However, in recent years, these differences have been more carefully observed by researchers, and new studies are being published in the area.<sup>(4)</sup>

There are subtle but significant differences between men and women in terms of the characteristics of nicotine dependence. Although various studies have suggested that women have more difficulty in quitting smoking than do men, this remains controversial. The behavior of female smokers is more influenced by conditioning related to mood and negative affect, whereas male smokers are more conditioned by the pharmacological response, which is regulated by nicotine consumption.<sup>(4,30)</sup> In addition, women metabolize nicotine more

rapidly than do men,<sup>(31)</sup> and depression is more prevalent in women than in men, factors that support the assumption that women have more difficulty in quitting smoking than do men.<sup>(29,30)</sup>

The characteristics of cigarette consumption vary between men and women. In addition to inhaling less deeply and putting out their cigarettes before having smoked them completely, women prefer light cigarettes and rarely use hand-rolled cigarettes.<sup>(4)</sup>

Some of the reasons that lead women to quit smoking are different from those that lead men to quit, and there are indications that the interaction between nicotine and the body is different during the menstrual cycle (luteal phase), causing reactions during the withdrawal syndrome that make smoking cessation more difficult.<sup>(4,31)</sup>

Due to the peculiarities of nicotine dependence among female smokers, treatment should be focused and adjusted to the situation of women in order to be effective. In addition, external social factors that might become obstacles to therapy, such as responsibilities toward children and family, inflexibility at work, and low income, should always be taken into consideration. Another factor to be considered is that women have been shown to have less confidence in the efficacy of the treatment than do men.<sup>(4,25,31)</sup> The withdrawal syndrome is also different in women than in men. The principal manifestations of the withdrawal syndrome in women are irritability, increased appetite, depression, anxiety, sleep disorders, and difficulty concentrating. Studies have demonstrated that the rate of relapse due to withdrawal symptoms is higher among women than among men. Concomitant alcohol dependence, if left untreated, reduces the probability of success of smoking cessation treatment and therefore should not be overlooked when treating female smokers.<sup>(4,30,31)</sup>

## Health risks—the particularities of women

The health problems that tobacco causes in men and women are similar, including emphysema, chronic bronchitis, cardiovascular diseases, infertility, and cancer; in women, tobacco causes pregnancy complications and postpartum complications that also affect the

health of the fetus and of children living in the same household.<sup>(4,5,32)</sup>

The relationship between smoking and lung cancer was identified in the mid-20th century, and lung cancer is the leading cause of cancer death in women worldwide. Tobacco smoke is also a risk factor for cancer of the bladder, kidney, nasal cavity, paranasal sinuses, lips, tongue, larynx, pharynx, esophagus (adenocarcinoma), stomach, uterine cervix, liver, and pancreas, as well as for acute myeloid leukemia.<sup>(32)</sup> Recent studies have associated tobacco with an increased risk of developing colorectal cancer,<sup>(33)</sup> vulvar cancer,<sup>(34)</sup> and ovarian cancer.<sup>(35)</sup>

Some authors have suggested that genetic and biochemical factors might explain why women are more likely to develop lung cancer: women present greater expression of the gastrin-releasing peptide receptor, which is located on the long arm of chromosome X and whose expression is induced by the use of nicotine; women present greater genetic variation in the *CYP2A6* gene; women metabolize nicotine rapidly; and women produce more tobacco-specific nitrosamines than do men.<sup>(30)</sup>

Although the principal risk factor for cervical cancer is HPV infection, smoking is a contributing factor, since the risk of developing this type of cancer is nearly 3 times higher in women who smoke (OR = 2.6; 95% CI: 1.7-4.0), the effect of smoking being dose-dependent.<sup>(36)</sup>

The association between breast cancer and smoking remains controversial in the literature, and there have been studies comparing evidence for and against this association. Experimental studies have demonstrated, through findings of DNA adducts and mutations in the *p53* gene, that compounds found in cigarette smoke (polycyclic hydrocarbons, aromatic amines, and nitrosamines) induce mammary carcinogenesis.<sup>(37)</sup> A recent meta-analysis suggested that passive and active smoking correlated positively with the development of breast cancer in premenopausal women, although the biological mechanisms involved remain unclear.<sup>(38)</sup> A systematic review conducted in Japan demonstrated that the risk of developing breast cancer ranged from 0.71 to 6.26 in the three cohorts and eight case-controlled studies evaluated, the risk being 70% higher among smokers.<sup>(39)</sup>

A retrospective study evaluating over 78,000 female smokers and nonsmokers between 1982

and 1996 reported that the risk of developing breast cancer was 40% higher in current smokers, the risk of developing breast cancer being 9% in former smokers.<sup>(37)</sup> Another study found that the risk of developing breast cancer was significantly higher among active smokers who started smoking at an earlier age, among those who smoked more cigarettes per day, and among those who started smoking 5 years before the first pregnancy.<sup>(40)</sup>

One group of authors compared a study conducted by the California Environmental Protection Agency in 2005 (which investigated evidence that breast cancer was associated with exposure to environmental tobacco smoke) with a study conducted by the US Surgeon General in 1988 (which investigated evidence that lung cancer was associated with exposure to environmental tobacco smoke) and suggested that the 2005 evidence for the role of environmental tobacco smoke in breast cancer was stronger than was the 1988 evidence for the role of environmental tobacco smoke in lung cancer.<sup>(41)</sup> Although the association between tobacco and breast cancer remains controversial, as once were the association between tobacco and lung cancer and that between nicotine and dependence, the questioning of the findings of breast cancer (the most common type of cancer in women) among smokers suggests that, as occurred before, there is pressure from the tobacco industry.

The principal cardiovascular manifestations related to smoking are myocardial infarction, cerebral ischemia, hypercholesterolemia, atherosclerosis, peripheral arterial disease, and aortic aneurysm.<sup>(42,43)</sup> There is a higher risk of stroke, principally when there is concomitant use of contraceptives.<sup>(43,44)</sup> In premenopausal women, these risks decrease, which suggests that estrogen has a protective effect. A case-controlled study involving nearly 30,000 participants in 52 countries demonstrated that the risk for nonfatal acute myocardial infarction was 2.95 times higher in smokers than in former smokers who had quit smoking 3 years prior<sup>(43)</sup>; in addition, the risk for nonfatal acute myocardial infarction has been shown to be 1.9 times higher in former smokers than in never smokers.<sup>(42,44)</sup>

A prospective study involving over 40,000 participants and evaluating the risk of smoking-

related diseases revealed that women who smoked 1-4 cigarettes/day were 3 times more likely to die from coronary disease and 5 times more likely to die from lung cancer than were those who did not smoke, suggesting that even the so-called light smokers were at a high risk for disease.<sup>(45)</sup>

Another effect of smoking is the development of osteoporosis and bone fractures regardless of bone mineral density. In women, smoking has been associated with lower estrogen concentration, lower body mass index, increased bone turnover, decreased calcium absorption, and decreased bone mineral density, the risk of fractures being 80% higher in women who smoke.<sup>(21)</sup>

Smoking has been shown to be an independent risk factor for the development of ectopic pregnancy because it interferes with fallopian tube function and ovulation, leading to a two-fold higher risk of ectopic implantation of a fertilized egg in women who smoke when compared with those who do not.<sup>(21)</sup> The products of tobacco smoke interact with oral contraceptives, increasing their metabolization and decreasing their serum levels, which increases the risk of thrombotic events.<sup>(46)</sup> Endocrine disorders also include premature menopause, which can occur 8 months to 3 years earlier than expected.<sup>(47)</sup> Women who smoke are 3 times more likely to experience delayed conception (conception delayed by more than 1 year) than are those who do not, due to an early decrease in gonadotropin levels and follicular atresia.<sup>(48)</sup> A case-controlled study has shown that women who start smoking during adolescence and those with greater tobacco intake are at a higher risk for premenstrual syndrome and irregular, shorter menstrual cycles than are those who do not smoke.<sup>(49)</sup>

Active and passive smoking have been associated with increased perinatal morbidity and mortality, including low birth weight, miscarriage, preterm delivery, placenta previa, preterm premature rupture of membranes, intrauterine growth restriction, and sudden infant death.<sup>(48)</sup> Intrauterine growth restriction is due to fetal hypoxia, which in turn is probably due to high blood carbon monoxide levels and reduced blood flow to the placenta.<sup>(50)</sup> Nicotine has been found in the breast milk of women who smoke during breastfeeding, and children

of mothers who smoke during breastfeeding seem to be at a higher risk of becoming smokers in the future.<sup>(21)</sup> However, there have been no studies evaluating the effects of intrauterine exposure with regard to differences between the genders in terms of nicotine dependence or the risk of nicotine dependence among adolescents and adults.<sup>(21)</sup>

Intrauterine exposure to tobacco, regardless of exposure after birth, has been shown to be an independent risk factor for the development of wheezing and asthma in children, impaired lung development having been demonstrated by pulmonary function testing, bronchial hyperreactivity, exacerbations of previous lung diseases, respiratory infections, and ear infections.<sup>(21)</sup>

A large proportion of women stop smoking during pregnancy, more than in any other period of life. In the United States, over 40% of the pregnant women stop smoking before the first prenatal care visit. This is probably due to a heightened perception of the risks involved and to a sense of responsibility for the fetus during pregnancy. However, only one third of those women remain abstinent for at least 12 months.<sup>(27)</sup>

### **Smoking cessation in women: Does it require a different approach?**

Surveys show that, in Brazil, most of the individuals currently being treated at centers for the treatment of nicotine dependence are women.<sup>(51,52)</sup> All of the treatments for which there are levels of evidence—nicotine replacement therapy, bupropion, varenicline, nortriptyline, and clonidine—increase the chances of success in quitting smoking. Nicotine replacement therapy increases the chances of smoking cessation by 50–70%, as assessed in individuals smoking  $\geq 15$  cigarettes per day. When two forms of nicotine replacement therapy—slow release (nicotine patches) and rapid release (gum or tablets/lozenges)—are combined, the chances of quitting smoking are even greater.

The efficacy of the antidepressants bupropion and nortriptyline is similar to that of nicotine replacement therapy, and the use of these drugs is not restricted to patients with depression. Some studies have suggested that, in women, these antidepressants are more effective than is nicotine replacement therapy, although

the differences do not seem to be significant. There have been no studies confirming that combining bupropion/nortriptyline with nicotine replacement therapy provides an additive benefit. Although selective serotonin reuptake inhibitors have also been evaluated as treatments for smoking, they have not proven effective.<sup>(53,54)</sup>

Although bupropion and nortriptyline are similarly effective, the guidelines developed in the United States list bupropion as a first-line treatment and nortriptyline as a second-line treatment, because of the side effects of the latter, which are more common than are those of the former. The principal side effects of bupropion are insomnia, dry mouth, nausea, and, rarely (in 0.1% of cases), convulsions. Nortriptyline can cause constipation, dry mouth, nausea, sedation, intoxication, and cardiovascular side effects, principally arrhythmias.<sup>(54)</sup>

There is preliminary evidence that there are genotypic differences among individuals in terms of the dopaminergic receptors, meaning that normal receptors determine a good response to bupropion, whereas altered receptors determine a poor response.<sup>(54,55)</sup> It has also been reported that women with a given genotype respond better to bupropion than do men with the same genotype.<sup>(54,55)</sup> It is speculated that the rate of nicotine metabolism also varies from individual to individual, those who metabolize nicotine rapidly gaining more benefit from the treatment with bupropion.<sup>(54,55)</sup>

Varenicline is a nicotinic receptor partial agonist and, when used as monotherapy, is more effective than bupropion and nicotine replacement therapy.<sup>(54)</sup> Cytisine is a drug from the same class, the efficacy of which has yet to be confirmed. The principal reported side effects of varenicline are nausea, depressive mood, and suicidal ideation, which restrict the use of the drug in individuals with psychiatric comorbidities.<sup>(54)</sup>

One study<sup>(17)</sup> has suggested that, for adolescents and pregnant women, the recommended treatment is counseling and cognitive-behavioral therapy (CBT). Although quitting smoking at any point during pregnancy is beneficial, physicians should prescribe smoking cessation treatment in the very first prenatal care visit. Although 23–29% of pregnant women quit smoking when CBT is used in combination with

**Table 1** – Relative risk of abstinence, compared with the use of placebo, for the forms of smoking cessation treatment.

Form of treatment	RR (95% CI)	Trials, n
Gum	1.43 (1.33-1.53)	53
Patch	1.66 (1.53-1.81)	41
Inhaled nicotine	1.90 (1.36-2.67)	4
Tablets/lozenges	2.00 (1.63-2.45)	6
Nasal spray	2.02 (1.49-3.73)	4
Bupropion	1.69 (1.53-1.85)	36
Nortriptyline	2.03 (1.48-2.78)	6
Bupropion + patch	1.23 (0.67-2.26)	6
Nortriptyline + patch	1.29 (0.97-1.72)	3
Varenicline	2.33 (1.95-2.80)	7
Cytisine	1.61 (1.24-2.08)	1
Fluoxetine	0.92 (0.68-1.24)	4
Paroxetine	1.08 (0.64-1.82)	1

RR: relative risk.

nicotine replacement therapy and 7–13% quit smoking when CBT is used in isolation, special attention should be given to pregnant smokers during and after delivery, since the postpartum recurrence rates are high.<sup>(27)</sup> The literature suggests that the health conditions of neonates, for instance in cases of infants who present with respiratory problems, such as infections and asthma, contribute to the maintenance of maternal abstinence from smoking.<sup>(53)</sup>

To date, there have been no studies of smoking cessation during breastfeeding, counseling and CBT being indicated.<sup>(53,54)</sup>

Since weight gain and the difficulty in managing the stressful pressures of everyday life are among the principal concerns of women, as well as being recognized reasons for relapse, an interesting option to be considered in this context is the prescription of bupropion or nicotine replacement therapies, especially gum, since these have been shown to play a role in delaying, although not always in preventing, weight gain.<sup>(53-55)</sup> Table 1 shows the forms of smoking treatment that have previously been studied, as well as the relative risk of abstinence compared with placebo.<sup>(54)</sup>

## Prevention and final considerations

The peculiarities of smoking in women, the vulnerabilities of women to the marketing strategies employed by the tobacco industry, and the risks that exposure to smoking pose

to women—principally during pregnancy and breastfeeding—as well as the specificities of the smoking cessation treatment, should all be taken into consideration and should be given greater attention.<sup>(3)</sup>

The implementation of policies for smoking prevention and cessation among women should encompass measures for the training of health care workers and the education of the population; in addition, measures that are more relevant to this segment of the population should be discussed and implemented.<sup>(4)</sup> The Brazilian anti-smoking law (no. 9.294, issued in 1996) is inadequate, and efforts to adjust the law to current scientific knowledge have been thwarted by a strong opposition from the tobacco industry and its allies in the associations of bars, restaurants, hotels, and similar establishments, as well as from parliamentarians. The potential reduction in the consumption of cigarettes and loss of profits by manufacturers, as well as the consequent social changes, have been reported to be the causes of such a delay.<sup>(56)</sup>

Not only pulmonologists but all physicians and health care workers should encourage women to undergo smoking cessation treatment. Pediatricians, gynecologists, and obstetricians have greater contact with female patients and therefore play a prominent role in promoting smoking cessation among women.<sup>(3)</sup>

Strategies to combat smoking should include prohibiting the tobacco industry from sponsoring events of any nature, such as sporting events, corporate events, and even those involving the judiciary; prohibiting advertising in places where tobacco products are sold; awareness-raising campaigns aiming to avoid household smoking, which is one of the principal causes of exposure of women and children to environmental tobacco smoke; compulsory dissemination of informative and preventive measures against smoking by all vehicles of communication operating under public concession; increasing the scope of the policy for raising cigarette taxes, submitting the tobacco industry to strict inspection; promoting a discussion of the theme of smoking prevention in schools, which can be achieved by implementing training programs for teachers; and training all health care workers in the public health care network, especially those who work in family health programs, which are aimed at rural populations, low-income

populations, and populations with a low level of education, populations that, in Brazil, have been associated with a higher prevalence of smoking and earlier smoking initiation.<sup>(3,4,53)</sup>

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