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# Influence of psychosocial factors on smoking cessation: Longitudinal evidence from the Pro-Saude Study

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## ABSTRACT

**OBJECTIVE:** To evaluate the incidence of smoking cessation and its association with psychosocial factors.

**METHODS:** Data came from three consecutive waves of the Pro-Saude Study, a longitudinal study of non-faculty civil servants working at a university in Rio de Janeiro, Southeastern Brazil. Inclusion criteria were having participated in Phases 1 and 3 and being a smoker at baseline (Phase 1 – 1999). Those who had stopped smoking less than a year before the follow-up (Phase 3 – 2007) were excluded. The final study population consisted of 661 employees (78% of those eligible). Relative risks (RR) of smoking cessation were evaluated through Poisson regression with robust variance.

**RESULTS:** The cumulative incidence of smoking cessation in eight years of follow-up was 27.7%. Among the psychosocial factors evaluated in the multivariate analysis, only lack of experience of physical violence was associated with higher smoking cessation (RR = 1.67, 95%CI 1.09;2.55).

**CONCLUSIONS:** The incidence of smoking cessation was high, and the fact that associations were not found with most factors evaluated suggests that much of the effect found is due to the impact of public policies implemented in Brazil over the past decades. The association between no exposure to violence and higher incidence of smoking cessation draws attention to the importance of this factor in tobacco control policies.

**DESCRIPTORS:** Tobacco Use Cessation, psychology. Smoking, prevention & control. Tobacco Control Campaigns. Cohort Studies.

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## INTRODUCTION

The habit of smoking cigarettes, which began in the mid-19<sup>th</sup> century, grew to enormous proportions after the First World War, mainly due to massive propaganda by the tobacco industry, which linked smoking with images of glamour and social acceptance.<sup>28</sup> Smoking is known to be one of the main avoidable causes of morbidity and mortality.<sup>7</sup> As the deleterious effects of smoking become better known, the social pressure to stop smoking has increased, as have the number of treatment options to assist in this.<sup>28</sup> However, a considerable number of individuals start or continue to smoke. Smoking tends to be concentrated in populations which have particular difficulty in giving up and possess specific psychosocial factors, including mental disorders, low levels of social support and chronic exposure to violence.<sup>2,5</sup>

Although some studies suggest that a history of depression decreases the likelihood of smoking,<sup>11</sup> other evidence fails to confirm these findings. A meta-analysis based on 15 longitudinal studies of the subject<sup>14</sup> shows having a history of depression has no significant effect on stopping smoking. As 14 of the 15 studies evaluated involved people undergoing treatment to stop smoking, the lack of effect observed needs to be interpreted in this specific context. Moreover, the analyses in the small number of studies which did report a link between having a history of depression and stopping smoking had low statistical power.

Other psychosocial factors can influence stopping smoking. Longitudinal studies suggest that living with a smoker<sup>15</sup> and low levels of social support<sup>5</sup> make it more difficult to give up.

The relationship between physical violence and psychosocial and behavioral problems has been well established in the literature.<sup>16</sup> Studies show that exposure to physical violence/victimization is a risk factor for other health outcomes and habits, including smoking.<sup>2</sup> This link is believed to be mediated by psychological stress resulting from exposure to violence and, especially in the case of tobacco, is potentially being used as a relaxant. However, the role of psychological stress in lower levels of smoking cessation has not been fully established.<sup>26,27</sup>

Smoking cessation is an international public health goal.<sup>a</sup> Identifying the factors which make it difficult to stop smoking may give more support to public policies in this area. Brazil is one of the countries in which the responses to policies aimed at controlling smoking have been quite effective, with significant decreases.<sup>b</sup> However, few studies carried out in Brazil

have investigated socio-economic conditions, physical health problems, habits, smoking patterns or use of health care services connected to this decrease.<sup>1,22,23,c</sup> According to the literature examined, this is the first longitudinal study carried out in Latin America to investigate the incidence of smoking cessation and the role of psychosocial factors in this outcome.

The aim of this study was to analyze the incidence of smoking cessation and its link to psychosocial factors.

## METHODS

This was a longitudinal study using data from the Pro-Saude Study.<sup>9</sup> It was a cohort census-style study, the main aim of which was to investigate social determinants of health. The target population of the Pro-Saude Study were non-faculty civil servants working at a university in the state of Rio de Janeiro, excluding those working for other institutions or on leave for non-health reasons. The participation rate was 90.4%, meaning 4,030 employees participated in phase 1, the baseline of the study. Data were collected again in 200 (phase 2) and in 2006 to 2007 (phase 3).

Phase 1 was deemed to be the baseline and phase 3 the follow up. The data from phase 2 were taken into consideration in order to complement the exposure variables, as no information was collected on the point at which the participant stopped smoking.

Criteria for inclusion were: a) participating in phases 1 and 3 ( $n = 3,273$ ) and b) being a smoker in phase 1 ( $n = 892$ ). As the relapse rate in the first year was so high, those who reported having stopped smoking less than a year before ( $n = 42$ ) were excluded from the study at phase 3, following the example of the First National Health and Nutrition Examination Survey (NHANES I), carried out in the United States.<sup>20</sup>

The population eligible to participate in the study was 850 (892-42) individuals. There were 189 losses, resulting in a final population of 661 employees (78% of those who were eligible).

Self-administered questionnaires were used which included socio-economic and demographic variables, history of smoking and passive smoking, variables related to lifestyle, support and social network, stress inducing incidents and physical and mental morbidity among others. In order to guarantee the quality of the data, pre-tests and a pilot study were carried out, scales were validated and reliability tests conducted, the entire

<sup>a</sup> World Health Organization. WHO report on the global tobacco epidemic, 2011: warning about the dangers of tobacco. MPOWER package. Geneva; 2011.

<sup>b</sup> Figueiredo VC. Um panorama do tabagismo em 16 capitais e no Distrito Federal: tendências e heterogeneidades. Rio de Janeiro: UERJ; 2007.

<sup>c</sup> Sampaio MM. Fatores associados à cessação do tabagismo no Estudo Pró-Saúde [tese de mestrado]. Rio de Janeiro: Instituto de Medicina Social da UERJ; 2010.

data collection and processing process was monitored. Reliability test-retest of the data collected on smoking at the baseline showed Kappa of 0.97 (95%CI 0.92;1.00) for current smokers and an intra-class coefficient of correlation (ICC) of 0.92 (95%CI 0.88;0.95) for having ever smoked at least 100 cigarettes. The report of passive smoking was substantially reliable (Kappa = 0.73; 95%CI 0.65;0.95).<sup>6</sup> The psychometric properties of the scales which were translated and adapted in the Pro-Saude Study and used in this study were shown to be appropriate.<sup>13</sup>

The outcome variable of this study was stopping smoking, created from the following question “Do you currently smoke cigarettes?” included in the questionnaire in phase 3, with four response options: 1) Yes; 2) No, I have never smoked; 3) No, I stopped smoking over a year ago; and 4) No, I stopped smoking less than one year ago. Those who responded “yes” were deemed to be smokers and those who had given up smoking more than a year ago were deemed to be ex-smokers. Those who had stopped giving up smoking less than one year before were excluded from the analysis.

The exposure variables were common mental disorders (CMD), living with a smoker, social support, social network and exposure to physical violence.

The existence of CMD was evaluated using the GHQ-12 (General Health Questionnaire) screening instrument, validated in the original version<sup>12</sup> and the Brazilian version.<sup>17</sup> The cutoff point used in the questionnaire considered each item as present or absent (0 or 1). Those who were positive for three items (in 12), were classified as cases of CMD. The reference period for the GHQ-12 were the two weeks preceding filling in the questionnaire.

At phase 1, it was investigated whether the individual lived with a smoker, lived and worked with smokers, only worked with smokers or did not live or work with smokers. The frequency of individuals who live with smokers was similar to that observed among those who lived and worked with smokers. Thus, a new variable was created: “live with smokers”, with two response options: 1) Yes – Live with smokers, irrespective of working with smokers; 2) No – only work with smokers or do not live and work with smokers.

Social support was evaluated in phase 1 using the scale used in the Medical Outcomes Study (MOS).<sup>25</sup> This scale has 19 items, evaluating five aspects of support: material, affective, emotional, positive social interaction and information. The adaptation into Portuguese, carried out as part of the Pro-Saude Study, had good psychometric properties.<sup>13</sup>

Social network was evaluated using five questions in phase 1. In this study, only two question on the number of close friends and relatives with whom the

participants felt comfortable talking about anything were considered. These questions were combined and a score created (number of friends and/or relatives with whom the participant feels comfortable talking about anything) and a new variable, which divided the score based on terciles.

Exposure to physical violence was evaluated at phase 1 (1999) and 2 (2001) using two questions: “In the last 12 months have you been attacked or robbed, i.e., has money or property been stolen with violence or with the threat of violence?” and “In the last 12 months, have you been the victim of a physical attack?”. Based on the responses to these questions, a new variable was created, with the categories: never been a victim; victim in at least one of the phases.

Distribution of the situation in relation to smoking and the incidence of stopping smoking (outcome variable) were estimated. The distribution of smokers and ex-smokers for each explanatory variable, as well as the relative risk (RR) of stopping smoking linked to the exposures in the study and their respective 95% confidence intervals were evaluated using Poisson regression with robust variance. The variables which had a significant correlation ( $p < 0.25$ ) in the uni-variate model and variables deemed to be relevant according to the literature on the subject (sex and age) were included in the multivariate model.

The study was approved by the Research Ethics Committee of the *Hospital Universitário Pedro Ernesto/Universidade do Estado do Rio de Janeiro* (Protocol No 224/99).

## RESULTS

At phase 1 of the Pro-Saude Study, 3,841 participants presented valid data on the subjects related to smoking; of these, 23.2% fulfilled the criteria to be classes as “smokers” at the baseline, 18.6% were “ex-smokers” and 58.2% had never smoked. The situation with regards to smoking at the baseline showed that there were more smokers among: men ( $p = 0.025$ ), people in the intermediary age groups (between 35 and 45 years old) ( $p < 0.001$ ), those with black and dark skin ( $p = 0.001$ ), individuals with lower household per capita income ( $p < 0.001$ ) and schooling ( $p < 0.001$ ) and those who were not married/in a civil partnership ( $p < 0.001$ ) (Table 1).

The incidence of stopping smoking in the study population was 27.7% between 1997 and 2006. Of the psychosocial factors evaluated, not having experienced physical violence proved to have the strongest link with stopping smoking, after being adjusted for sex, age and number of cigarettes smoked/day.

Despite the associations with the smoking situation at the baseline, the other socio-economic variables did

**Table 1.** Situation with regards smoking according to socio-economic characteristics in the base line population (phase 1) of the Pro-Saude Study. Rio de Janeiro, RJ, Southeastern Brazil, 1999.

Variable	Smoker	%	Ex-smoker	%	Never smoked	%	Total	p
Sex								0.0025
Male	426	24.8	334	19.4	959	55.8	1,719	
Female	466	22.0	381	18.0	1,275	60.1	2,122	
Age								< 0.001
Up to 34 years	108	9.8	93	8.4	903	81.8	1,104	
35-44 years	475	28.6	340	20.5	846	50.9	1,661	
45-54 years	255	31.5	217	26.8	338	41.7	810	
55 and over	54	20.3	65	24.4	147	55.3	266	
Color or Race								0.001
Black/dark skinned	434	25.9	303	18.1	939	56.0	1,676	
White	419	20.7	387	19.1	1,216	60.1	2,022	
Income								< 0.001
< 3 MW	304	35.3	200	23.2	357	41.5	861	
3-6 MW	296	21.8	228	16.8	835	61.4	1,359	
> 6 MW	284	17.9	281	17.7	1,024	64.4	1,589	
Schooling								< 0.001
Did not finish high school	269	27.2	195	19.7	524	53.0	988	
Finished high school	299	22.9	228	17.5	778	59.6	1,305	
Further education	255	19.3	244	18.5	823	62.3	1,322	
Marital status								< 0.001
Other	349	24.1	218	15.0	882	60.9	1,449	
Married/living together	511	22.5	470	20.7	1,290	56.8	2,271	

MW: minimum wage

not prove to be significantly associated with stopping smoking in the follow up. The presence of CMD, living with smokers, having social support and social networks were not significantly associated with incidence of stopping smoking (Table 2).

## DISCUSSION

In this study, after eight years of follow up, the incidence of stopping smoking (27.7%) was similar to that found in a cohort population-based study carried out in Spain between 1994 and 2002<sup>10</sup> (28.3% in eight years) and higher than that in the National Health and Nutrition Examination Survey (NHANES I),<sup>20</sup> carried out in the USA between 1971 to 1975 and 1982 to 1984 (21.0% in nine years), and that of the British Household Panel Survey (BHPS),<sup>5</sup> a representative cohort of British adults which had results evaluated between 1991 and 2000 (21.0% in ten years). However, comparing the findings of this study with international studies should be done with caution, as public policies aimed at reducing smoking were established at different periods and their coverage and restrictions imposed were different in the different countries. Such policies played an important, if not crucial, role in the incidence of stopping smoking in Brazil and in other countries.

A large part of the high incidence of smoking cessation found is probably due to the public policies aimed at controlling smoking which took place in Brazil throughout the period of the study, reducing the influence of other factors traditionally associated with cessation. The fact that the study population had a higher average level of education than the general population, a considerable part of it being made up of health care professionals and university hospital employees, where health care campaigns are more intense, may have contributed to the greater incidence of stopping smoking.

No other study was identified which had evaluated the incidence of smoking cessation in Brazil. However, it is possible to compare changes in the prevalence of smoking found in the Pro-Saude Study, the data of which were used in this study, with the rates of prevalence found in population-based surveys conducted in Brazil. Care should be taken when making this comparison due to the different age groups which made up the populations. In the population of this study, the prevalence of smoking went from 23.2% in 1999 to 21.8% in 2001 and 21.4% in 2007. The comparison between the phases of the Pro-Saude Study shows there is a tendency for the prevalence of smoking to decline,

**Table 2.** Cumulative incidence of smoking cessation according to exposure to psychosocial factors, crude and adjusted relative risks (RR) and their ranges of 95% confidence intervals (95%). Pro-Saude Study. Rio de Janeiro, RJ, Southeastern Brazil, 1999/2007.

Variable	Smoker		Ex-smoker		p	RR crude	95%CI	RR adjusted <sup>a</sup>	95%CI
	n	%	n	%					
CMD in 1999					0.515				
No	289	73.3	105	26.7		1.00		–	–
Yes	161	70.9	66	29.1		1.09	0.80-1.48	–	–
Social support (terciles)					0.822				
< 69	153	72.5	58	27.5		1.00		–	–
69-87	160	73.1	59	26.9		0.98	0.68-1.41	–	–
88+	148	70.5	62	29.5		1.07	0.75-1.54	–	–
Social network (terciles)					0.247				
< 3	104	70.3	44	29.7		1.00		–	–
3-5	143	69.1	64	30.9		1.04	0.71-1.53	–	–
6+	190	75.7	61	24.3		0.82	0.55-1.20	–	–
Living with smoker					0.614				
Yes	219	73.2	80	26.8		1.00		–	–
No	253	71.5	101	28.5		1.07	0.80-1.43	–	–
Victim of assault					0.007				
At least once	113	81.9	25	18.1		1.00		–	–
Never	320	70.2	136	29.8		1.65	1.07-2.52	1.67	1.09-2.55

CMD: Common Mental Disorder

<sup>a</sup> adjusted for sex, age and number of cigarettes/day

which can be seen between 1989 and 2003 when comparing two population studies carried out in Brazil (Brazilian National Survey on Health and Nutrition – PNSN and World Health Survey – PMS),<sup>22</sup> their rates of prevalence being 34.8% and 22.4% in samples of the adult population. A more recent study with data from the National System for Chronic Disease Monitoring Telephone Survey (VIGITEL), between 2006 and 2009, showed a slight decline in smoking among men and no change among women, with the exception of those living in the North and Northeast.<sup>1</sup>

The first government movements to control smoking in Brazil began at the end of the 1970s.<sup>24</sup> The National Cancer Institute launched a National Anti-Smoking Program in 1988,<sup>4</sup> but it was only after Federal Law 9,294, came into force in 1996,<sup>6</sup> that continuous educational activities started to take place. This law covers restrictions on the advertising and use of tobacco products, banning their use in enclosed public or private spaces, except in specially designated areas with appropriate insulation and ventilation. It was followed by other laws which included banning these products in airplanes and public transport; banning advertising in any type of media except point of sale; banning sponsorship of cultural and national sporting events; banning descriptions which gave a misleading picture of

the products' harmfulness, such as 'light', 'low levels', on packets and in advertising, among other measures. A qualitative study, carried out in Porto Alegre, RS, Southeastern Brazil, between 2004 and 2006, showed that laws restricting smoking encouraged quitting. The stricter the laws, the greater the tendency to quit.<sup>8</sup>

In other countries, as in Brazil, over the last two decades policies to control smoking have made great steps forward and a lot of studies were carried out during this period. In Spain, the law banning smoking in workplaces and in some establishments such as bars and restaurants, was established in 2006.<sup>18</sup> In England, there were many restrictions placed on smoking between 1996 and 2003, and a total ban came into force in 2007.<sup>19</sup> In the United States, due to the sovereignty of each state, there laws banning smoking are not uniform, neither in their coverage nor in the dates on which they came into force. Bans started in 1975 in the state of Minnesota, but the largest increase in tobacco control laws, in the majority of states, took place between 1993 and 1996.<sup>4</sup>

Not having experienced physical violence was the only factor which was linked to stopping smoking: the risk of stopping smoking was 67% greater in individuals who had not experienced physical violence. There is little

<sup>d</sup> Ministério da Saúde, Instituto Nacional de Câncer. Bases para implantação de um programa de controle do tabagismo. Rio de Janeiro; 1996.  
<sup>e</sup> Brasil. Lei 9.294, de 15 de julho de 1996. Dispõe sobre as restrições ao uso e à propaganda de produtos fumígenos, bebidas alcoólicas, medicamentos, terapias e defensivos agrícolas, nos termos do § 4º do art. 220 da Constituição Federal. *Diário Oficial Uniao*. 16 jul 1996:13074.

literature on this subject and no study with a similar result was found. A study carried out with young female adults in the USA did not find a link between stopping smoking and domestic violence, although a link with smoking was shown.<sup>26</sup> A study carried out with young adolescents, also in the USA, showed that victimization, together with other factors, was associated with smoking, but this association was less significant for stopping smoking.<sup>27</sup>

The lack of a significant association between the other psychosocial factors in question and stopping smoking was unexpected. Part of their effect may have been more significant in stopping smoking in the period before the public policies to control smoking in general.

Another possible explanation refers to the limited information available. Some of the variables in question may not have remained constant. The presence of CMD, for example, may have fluctuated over the eight years. However, there was only information available for two points in time before the outcome (1999 and 2001). The variable of living with a smoker may also have undergone a change in this period, due to the significant decrease in the number of smokers in the country. Therefore, someone who lived with a smoker in 1999 may no longer live with one. Studies evaluating causal factors in giving up smoking<sup>5,15,20</sup> have the same methodological difficulty and use information from the baseline to evaluate the variables in question. The same occurred with this outcome, i.e., data was not available on the exact moment at which the individual gave up smoking. Therefore, all were dealt with as if they had stopped smoking at the same time.

The limitations highlighted above may have contributed to the lack of association. However, the link between mental disorders and stopping smoking is inconsistent in the literature. Although some studies show that depression negatively influences stopping smoking,<sup>11</sup> other authors have not observed this association.<sup>3</sup> These studies, however, made use of psychiatric diagnoses, mainly of depression, and other studies were not found which assessed the link between common mental

disorders and stopping smoking. Using the GHQ, a screening tool which is self-administered and therefore more sensitive to changes in individuals' psychological state, may have weakened the link between CMD and stopping smoking.

The importance of social support is suggested in the literature although there is no consensus. Two longitudinal studies carried out in the USA with individuals undergoing treatment in order to stop smoking showed that perceived social support was important in increasing smoking cessation in the initial phases, as well as over the short term, although not in the long term.<sup>21</sup> A study in England<sup>5</sup> found a positive association between medium or high social support and greater levels of smoking cessation around ten years afterwards. No population-based studies assessing the relationship between social network and stopping smoking were found.

The losses (22%) were similar<sup>20</sup> or lower<sup>10</sup> than those of other studies on this subject. Comparing participants at the baseline with losses with regards sex, age and explanatory variables shows that there was no statistically significant difference, suggesting there was no bias due to losses.

The incidence of smoking cessation found in this study was high, a result which is in agreement with the public policies established with this aim and confirms the trend towards decreasing prevalence of smoking in Brazil.<sup>1,22</sup> New studies are needed to enable constant monitoring of this trend and the impact of control policies over time. The continuity and frequency of population-based health surveys, evaluating smoking, are essential to achieving this goal.

The results of this study show that there is a significant link between not being exposed to violence and higher levels of smoking cessation. Violence is a significant factor for various health outcomes and a determinant in unhealthy lifestyles.<sup>15</sup> Public policies aimed at controlling smoking should include focusing on areas of chronic violence.

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