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Prevalence and correlates of light and non-daily smoking in Brazil: Results from a nationwide representative survey

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ABSTRACT

Background: The research of light (≤10 cigarettes per day) and non-daily smokers in developing countries including Brazil is scarce despite the high prevalence of these groups among smokers and health risks associated to low-level smoking.
Objective: To describe health and smoking characteristics of Brazilian adult light and non-daily smokers.
Methods: We analyzed data from the 2013 Brazilian National Health Research survey (n = 48,282).
Results: The prevalence of current manufactured cigarette smoking in the total sample was 12.4%. Among these smokers, 12.8% were non-daily smokers (NDS), 47.4% were light smokers (LS) and 39.8% were moderate/heavy smokers (MHS). Bivariate analysis showed that non-daily smoking was associated with higher odds of poor self-rated health, binge drinking and lung diseases compared to never smokers (ORs = 1.2; 5.9 and 1.9). Light smoking was associated with higher odds of poor self-rated health, binge drinking, depression, use of sleeping pills and lung diseases (ORs = 1.3; 4.3; 1.4; 1.2 and 2.0). After controlling for sex and age, non-daily smoking was associated with lung disease (OR = 2.2) and light smoking with depression and lung diseases (ORs = 1.3 and 1.8). Smoking levels were associated with living with same-level smokers in bivariate and multivariate analyses.
Conclusion: A large proportion of smokers in Brazil are light and non-daily smokers, carrying substantial health risks related to tobacco use. Longitudinal research is needed to provide further evidence of associations found in this study. Public health policies must take the different smoking patterns into consideration to effectively target all smokers and reduce the harmful consequences of tobacco worldwide.

1. Introduction

Tobacco control policies over the past two decades have contributed to a decrease in smoking prevalence around the world (Levy et al., 2012; Messer et al., 2008). Between 1980 and 2012, the prevalence of daily tobacco smoking for men declined from 41.2% to 31.1% globally (Ng et al., 2014). In Brazil, the prevalence decreased from 36.5% in 1989 to 15.0% in 2013 (IBGE, 2014; Monteiro et al., 2007). Tobacco control policies include tobacco tax increases, smoking restrictions and "denormalization" of smoking. As a result of these policies, the prevalence of low-level smoking has increased in many countries (Fagan and Rigotti, 2009).

Low-level smoking poses a serious public health problem. Light smokers (≤10 cigarettes per day [*cpd*]) and non-daily smokers often do not self-identify as smokers, experience difficulty quitting, underestimate the health risks of smoking and attempt cessation less than other smokers (Hayes and Borrelli, 2013; Schauer et al., 2014; Shiffman et al., 2012a; Tong et al., 2006). Light and non-daily smoking is associated with increased morbimortality including similar risk of cardiovascular disease as heavier smokers, different types of cancer, respiratory diseases and reproductive health problems (Schane et al., 2010).

Effective smoking cessation interventions for low-level smokers require solid knowledge about their characteristics and behaviors. To date, no evidence-based treatment guidelines exist for light and non-daily smokers, leaving a clear need for a significant group of smokers (Fagan and Rigotti, 2009). Developed countries have led the first attempts to gain understanding about light and non-daily smokers through population studies and a modest number of trials (Faseru et al., 2013; Hassmiller et al., 2003; Kotz et al., 2012; Trinidad et al., 2009;

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Wortley et al., 2003). However, light and non-daily smokers in developing countries, including Brazil, might not have the same characteristics as in developed countries where culture, the political, economic context, and genetics may be different (Reitzel et al., 2009; Swayampakala et al., 2013). Therefore, population studies are needed to gain knowledge on the characteristics of light and non-daily smokers.

In light of the above, the main objective of this manuscript is to describe health and smoking characteristics of light and non-daily smokers in Brazil. The research addresses the following points: 1) Prevalence of low-level smokers in Brazil 2) Association between light/non-daily smoking and health conditions 3) Association between light/non-daily smoking and smoking behaviors and 4) Differentiating characteristics of smoking patterns.

2. Methods

2.1. Design

Data for this study came from the 2013 National Health Research (*Pesquisa Nacional de Saúde − PNS*) conducted by the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2014). The PNS 2013 was a cross-sectional household survey representative of the general non-institutionalized adult population (≥18 years) of Brazil. Its purpose was to produce national data on self-reported health status, lifestyles, chronic diseases and use of health services.

2.2. Sample and procedures

The PNS included a short version of the Global Adult Tobacco Survey (GATS-Brazil), a household survey protocol part of the Global Tobacco Surveillance System (GTSS). Detailed PNS methods have been published elsewhere (IBGE, 2014; Souza-Júnior et al., 2015). A total of 60,202 adults answered the individual survey. There was no missing data in the variables used in this study. Former smokers (17.4%) and smokers of other tobacco products (2.4%) were excluded from this study's sample as their analysis was beyond the scope of this study. The final sample size for this study was 48,282 adults.

2.3. Measures

Selected sociodemographic characteristics were sex, age and educational level. Age was categorized into 18–24; 25–39; 40–59; ≥60. Categories for highest level of education completed were "0-7 years and ≥8". This cut-point reflects educational program's efforts made by the government to increase the proportion of individuals with at least 8 years of education (Szklo et al., 2015).

Chronic medical conditions were assessed by asking whether the individuals had been diagnosed with various chronic diseases by a physician. Diseases selected to be variables of this study were part of the four noncommunicable diseases groups selected by WHO as highly associated with tobacco (hypertension, stroke and heart diseases, chronic respiratory diseases, diabetes and cancer) (WHO, 2014). Self-rated health status was assessed by asking "In general, how do you evaluate your own health status?" and categorized as "very good or good" and "fair, poor and very poor" (Szwarcwald et al., 2005). Participants were also asked about depression and use of sleeping pills. Binge alcohol consumption was assessed by the question "over the past 30 days, have you used 4/5 or more alcoholic beverages on any occasion? (4 for women/5 for men)". Physical activity was measured by asking "In the last three months, have you participated in some form of physical exercise or sport?".

Tobacco consumption was assessed using five questions. Item 1 from the Fagerstrom test was used to measure level of dependence "How soon after wake up do you usually have your first cigarette?" (Heatherton et al., 1991). Smoking age of onset was assessed by asking "How old were you when you started to smoke cigarettes daily?". Categories were grouped into " < 18", "18-24" and "≥ 25", to reflect teenage, young adult or adult life stages. The presence of another smoker in the household was categorized into "daily", "non-daily" and "never".

Cessation information was evaluated through 1) "During the past 12 months, have you tried to quit smoking?" and 2) "When you tried to quit, did you seek treatment with a health professional?". To evaluate the impact of warning labels on the cigarette packs the question, "Over the past 30 days, did the warning labels on cigarette packages lead you to thinking about quitting?" was used.

To categorize never, non-daily, light and moderate/heavy smokers according to previous research, we defined non-daily smokers (NDS) as the respondents that were current smokers who did not smoke every day (Wortley et al., 2003), light smokers (LS) as current daily smokers who smoked ≤10 *cpd* (Choi et al., 2004; Okuyemi et al., 2002) and moderate/heavy smokers (MHS) as current daily who smoked > 10 *cpd*. Never smokers (NS) were defined as those who never smoked any tobacco products. Since the definition used for LS and MHS refers to the number of cigarettes, we excluded all the respondents that smoked any other tobacco product other than manufactured cigarettes.

2.4. Data analysis

The data analysis was conducted using *R* (R Core Team, 2014). For the estimates of prevalence, including sample weights and design, the *survey* package was used (Lumley, 2014). In order to estimate prevalence, the sample weight for individuals, given by the inverse of individual sample probability, were used in the Horvitz-Thompson weighted estimator. Standard errors and 95% confidence interval were estimated using Taylors' series linearization having census sector as the primary sampling unit and federal states as strata. For modeling purposes, only the sample design was considered in pseudo-likelihood estimators without sample weights because the response variable is not a function of the sample design variables (Hosmer et al., 2013).

To examine the associations between the tobacco patterns and sociodemographic, psychosocial factors, health variables and tobacco use, prevalence data and multinomial logistic regressions were used. Bivariate models estimated raw associations [odds ratio (OR), 95%CI] for each factor. Multivariate models were adjusted to identify factors that might differentiate profiles of NDS, LS and MHS, using NS as reference. Only variables that presented at least two different *OR's* among the three comparisons to NS (NDS, LS and MHS) were used in this model. A significance of $p < 0.05$ was used for all analyses.

3. Results

3.1. Prevalence of smoking

The prevalence of current tobacco use in the total sample was 15.0% (CI = 14.4%; 15.5%) and the prevalence of use of manufactured cigarettes was 12.4% (CI = 12.0%; 12.9%). Among these, 12.8% (CI = 11.6%; 14.0%) were NDS, 47.4% (CI = 45.3%; 49.2%) were LS and 39.8% (CI = 37.8%; 41.8%) were MHS.

3.2. Description of the sample and bivariate multinomial associations between smoking patterns and correlates

The distribution of smoking patterns by socio-demographic and health variables are shown in Table 1. Smokers independent of their pattern were more likely to be men. There were more women among LS than among NDS and MHS (44.7% vs 32.9% and 35.0%). NDS were more likely than NS to be in their middle ages and more likely to be young (18–24 years) compared to MHS. All patterns of smoking had a lower education compared to NS (65.4% to 68.7% studied < 8 years compared to 47.9% of NS).

Smokers in general evaluated their health more poorly than NS and

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