








Association between demographic factors, anxiety and depression in smokers

Associação entre fatores demográficos, ansiedade e depressão entre tabagistas

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Resumo

Introdução: O tabagismo é uma das principais causas de morte, e embora existam várias estratégias para parar de fumar, a ansiedade e a depressão podem prejudicar este processo. **Objetivo:** Avaliar os níveis de ansiedade e depressão em tabagistas, ajustando os valores para possíveis variáveis de confusão, como sexo, idade, escolaridade e nível socioeconômico. **Método:** Estudo transversal, amostra de 444 indivíduos avaliados em relação ao histórico de tabagismo, níveis de ansiedade e depressão pela Escala Hospitalar de Ansiedade e Depressão e caracterizados conforme o perfil socioeconômico. **Resultados:** Encontrou-se uma associação entre tabagismo e ansiedade ($p = 0,003$) e entre tabagismo e depressão ($p < 0,001$) mesmo após ajustes para fatores de confusão (tabagismo e ansiedade: OR sexo: 2,01; OR idade: 2,56; OR escolaridade: 2,25; OR nível socioeconômico: 2,26; tabagismo e depressão: OR sexo: 4,80; OR idade: 3,13; OR escolaridade: 1,82; OR nível socioeconômico: 1,81). **Conclusão:** O estudo mostrou que tabagistas apresentam altos níveis de ansiedade e depressão.

Palavras-chave: tabagismo; ansiedade; saúde mental; psicológico; depressão.

Abstract

Background: Smoking is one of the leading causes of death, although there are several strategies for quitting smoking. Anxiety and depression can hinder this process. **Objective:** To assess levels of anxiety and depression in smokers, adjusting the values for possible confounding variables such as sex, age, schooling, and socioeconomic status. **Method:** Cross-sectional study, the sample included 444 subjects were assessed for smoking history, anxiety levels and depression by the Hospital Anxiety and Depression Scale and characterized according to the socioeconomic profile. **Results:** An association was found between smoking and anxiety ($p=0.003$) and between smoking and depression ($p \leq 0.001$) even after adjustments for confounding factors (Smoking and anxiety: OR Sex: 2.01; OR Age: 2.56; OR Schooling: 2.25; OR Socioeconomic level: 2.26; Smoking and Depression: OR Sex: 4.80; OR Age: 3.13; OR Schooling: 1.82; OR Socioeconomic level: 1.81). **Conclusion:** The study showed that smokers present high anxiety and depression.

Keywords: tobacco; anxiety; mental health; psychological; depression.



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INTRODUCTION

Smoking is a chronic disease and one of the leading causes of preventable death in the world. Also, smoking is a serious public health problem¹, once it represents a risk factor for cancer, cardiovascular, respiratory diseases, and a variety of other health problems^{2,3}.

However, even with so many of strategies to treat smoking, cessation rates and maintenance of abstinence are still very low^{4,5}. Among the several factors that can interfere in this process, psychological dependence may be the main one in the influence of lapses and relapses^{6,7}. A study report an association between smoking and mental illness, showing that smoking rates increase the severity of the disease⁸, being responsible for reduced life expectancy associated with mental illness⁹. Although, cigarette consumption in the general population has declined over the past 20 years, smoking rates in individuals with established mental illness have remained relatively unchanged, as they smoke to decrease the symptoms of anxiety and depression^{10,11}.

There is a hypothesis that smoking may be directly related to depressive symptoms and anxiety. According to Cooper et al.¹², smoking can cause individuals to experience depressive symptoms and depressive symptoms can lead them to smoke. Smokers report that they smoke for pleasure and to relieve negative feelings¹³, while health professionals believe that quitting smoking can accelerate or worsen depression in susceptible individuals⁹.

Symptoms of anxiety and/or depression may interfere in the attempts to quit, thus creating a vicious cycle in which the smoker develops an exacerbated symptom of depression, making it more difficult to abandon this addiction¹². Individuals with generalized anxiety disorder are approximately twice as likely to become smokers compared to individuals without this disorder¹⁴, also they report greater nicotine dependence¹⁵ and present lower success in abstinence rates¹⁶. The identification of possible correlations between the symptoms of anxiety and depression and nicotine dependence levels associated with smoking burden is of great importance for health professionals involved in smoking treatment. Verification of a possible direct relation between smoking and these mental symptoms could lead to a more targeted approach in smoking cessation and maintenance of abstinence, perfecting the pre-existing methods.

As observed in the study by Jamal et al.¹⁷, there is a higher prevalence of cigarette use in men compared to women, in adults aged 25-44 years old, in less educated individuals with higher levels of poverty. It is unclear if social and demographic differences interfere with the symptoms of anxiety and depression in smokers, or if these symptoms are more likely to appear in smokers than non-smokers. Thus, it is necessary to evaluate anxiety and depression levels in smokers, in order to perfect the therapy offered to this population type. But also, there is a need to evaluate whether other factors (confounding variables) interfere with the expression of these symptoms.

Therefore, the aim of the present study was to evaluate the levels of anxiety and depression in smokers according to the Hospital Anxiety and Depression Scale (HADS), adjusting the values for possible confounding variables such as sex, age, schooling, and socioeconomic status.

METHOD

In this cross-sectional study, smokers (Smoking Group - SG) and non-smokers (Control Group - CG) were evaluated. Participants were previously informed of research purposes and procedures and, after agreeing to participate, signed the free and informed consent form, according to the Helsinki Declaration of the World Medical Association. The present study was approved by the Research Ethics Committee of the Faculty of Sciences and Technology of UNESP, campus of Presidente Prudente, SP – Brazil, under protocol 245/2008.

Sample selection and inclusion and exclusion criteria

The sample consisted of smokers and non-smokers, men and women, invited to participate through local media, who met the following inclusion criteria: (1) smoking at least 10 cigarettes/

day – due to nicotine dependence levels; (2) aged between 18 and 60 years; (3) individuals with no changes in drug use for at least 30 days; (4) no use of antidepressant medication in order to avoid interference of its effects in the HADS questionnaire response; (5) no abusive use of alcohol; and (3) not being pregnant. The exclusion criteria were: (1) non-comprehension of the questionnaires.

Assessments

The questionnaires were applied by one of the researchers and some of the individuals answered online. The evaluations consisted of: personal identification data (name, age, sex, medications, weight, height, schooling), smoking history (cigarettes/day), evaluation of the level of nicotine dependence through the Fagerström test^{18,19}, assessment of anxiety and depression levels through the Hospital Anxiety and Depression Scale (HADS)²⁰, and characterization of the socioeconomic profile through the Brazilian economic classification criterion²¹.

The Fagerström test determines the nicotine dependence into five levels: very low (0 to 2 points); low (3 to 4 points); moderate (5 points); high (6 to 7 points); and very high (8 to 10 points)¹⁸.

The HADS consists of a scale of 14 items, seven exclusively for anxiety and seven exclusively for depression; a score above 8 points classifies the individual as presenting anxiety/depression²⁰.

The Brazilian economic classification consists of closed questions that categorize individuals into eight classes (A1, A2, B1, C1, C2, D, and E), with class A1 representing the highest purchasing power (\$32216, 23) and class E the lowest (\$916, 87)²¹.

Sample size

In order to calculate the sample size, the average prevalence of smoking considered was 17.8%, taking into account information from a recently published meta-analysis by Casetta et al.²² based on a tolerable error of 5% and 20% possible sample losses, the minimum number required for this study was 390 subjects, 195 smokers and 195 non-smokers. At the end, the sample consisted of 444 individuals, fulfilling the required sample number.

Statistical analysis

In order to verify possible differences in the continuous score of the anxiety and depression scale between the smoking and non-smoking groups, a Covariance (ANCOVA) analysis was performed, adjusted for gender, age, schooling, and socioeconomic level before adding these variables to the binary logistic regression. The association between smoking and anxiety and depression was assessed using the Chi-square test. The magnitude of these associations was verified using Binary Logistic Regression in which several models were created and the adjustment variables inserted one by one into the model. The statistical package used was SPSS version 15.0. The statistical significance adopted was 5% and 95% confidence interval.

RESULTS

The sample consisted of 444 adults, 36.3% male and 63.7% female. Total of 221 subjects (49.8%) comprised the SG and 223 subjects (50.6%) comprised the GC. 161 individuals were men, 98 were smokers (60.9%). While in women, of the 283 that made up the sample, 123 (43.5%) smoked, differing significantly from the men. Table 1 represents the characterization of the sample.

In relation to Fagerström, 12.6% had very low nicotine dependence, 12.2% low, 35.3% moderate, 31.2% high, 2.2% very high, 6.3% did not respond to the questionnaire.

Table 2 presents the information regarding the anxiety and depression values of the SG in comparison with the CG. Regarding the comparison performed in the ANCOVA, adjusted for sex, age, schooling, and socioeconomic status, it was observed that mean anxiety and

Table 1. Characterization of the sample

| | SG (n=221)% (mean ± SD) | CG (n=223)% (mean ± SD) |
|--------------------------------------|-------------------------|-------------------------|
| Age (years) | 47.96 ± 11.8 | 30.21 ± 10.61 |
| Weight (kg) | 72.2 ± 16.9 | 71.48 ± 17.52 |
| Height (m) | 1.89 ± 3.65 | 1.68 ± 0.09 |
| Body mass index (kg/m ²) | 26.5 ± 5.19 | 25.12 ± 5.40 |
| Anxiety score | 8.3 ± 4.15 | 7.38 ± 4.19 |
| Depression score | 7.28 ± 3.98 | 5.1 ± 3.22 |
| Cigarettes/day | 21.8 ± 11.08 | -- |
| Nicotine dependence (FTND) | 6.16 ± 2.09 | -- |
| | SG (n=221)% | CG (n=223)% |
| Schooling | | |
| Illiterate to Fundamental | 73.3 (162) | 3.6 (8) |
| High school to Higher | 18.5 (41) | 93.7 (209) |
| Not answer | 8.1 (18) | 2.7 (6) |
| Socioeconomic level | | |
| Class A | 19 (42) | 44.3(99) |
| Class B | 63.8 (141) | 47 (105) |
| Class C | 16.3 (36) | 5.4 (12) |
| Not answer | 0.9 (2) | 3.1 (7) |

SG: Smoking Group; CG: Control group; BMI: body mass index; kg: kilograms; m: meters; kg / m²: kilogram per square meter; SD: standard deviation; FTND = Fagerström test for nicotine dependence

Table 2. Covariance analysis comparing anxiety and depression among smokers and non-smokers

| | Mean | SD | F | p value |
|-------------------|------|------|------|---------|
| Anxiety | | | | |
| SG | 8.30 | 4.14 | 6.84 | 0.009* |
| CG | 6.65 | 4.31 | | |
| Depression | | | | |
| SG | 7.28 | 3.97 | 5.10 | 0.024* |
| CG | 4.65 | 3.31 | | |

SD: Standard deviation; SG: Smoking Group; CG: Control group. F: Values adjusted by sex, age, schooling and socioeconomic level; *The comparison of the results respected the statistically significant difference with P <0.05

depression scores were higher in smokers than in non-smokers even after adjustment for possible confounding factors.

An association was observed between smoking and anxiety, present in 44.3% of the SG versus 30.2% of the CG (p = 0.003). Similar findings were observed in the association between smoking and depression, in which the prevalence of depression was verified in 37.3% of the SG and only 13.5% of the CG (p ≤ 0.001). The size of these associations is represented in Tables 3 and 4, after the creation of several statistical models considering the input variables

Table 3. Association between smoking and anxiety in adults

| | OR | CI (95%) | p value |
|---|-----------|-----------------|----------------|
| Unadjusted model | 1.84 | 1.24-2.72 | 0.002* |
| Model 1 adjusted by sex | 2.01 | 1.34-3.00 | 0.001* |
| Model 2 adjusted by age | 2.56 | 1.52-4.29 | ≤0.001* |
| Model 3 adjusted by schooling | 2.25 | 1.19-4.25 | 0.013* |
| Model 4 adjusted by socioeconomic level | 2.26 | 1.19-4.29 | 0.012* |

OR: Odds Ratio; CI: Confidence Interval;

*The comparison of the results respected the statistically significant difference with P <0.05

Table 4. Association between smoking and depression in adults

| | OR | CI (95%) | p value |
|---|-----------|-----------------|----------------|
| Unadjusted model | 3.84 | 2.40-6.16 | ≤0.001* |
| Model 1 adjusted by sex | 4.80 | 2.93-7.86 | ≤0.001* |
| Model 2 adjusted by age | 3.13 | 1.72-5.68 | ≤0.001* |
| Model 3 adjusted by schooling | 1.82 | 0.87-3.83 | 0.110 |
| Model 4 adjusted by socioeconomic level | 1.81 | 0.86-3.80 | 0.117 |

OR: Odds Ratio; CI: Confidence Interval;

*The comparison of the results respected the statistically significant difference with P <0.05

one by one. Even after adjustments, the individuals in the SG were about twice as likely to present anxiety according to the HADS scale. In relation to depression there was a decrease in the association after the entry of the variables education and socioeconomic level; although a tendency between being a smoker and presenting depression was observed (p for trend ≤0.001).

DISCUSSION

The main results observed to suggest that even after controlling for confounding factors, smokers are about twice as likely to present anxiety compared to non-smokers, regardless of age, gender, schooling, and socioeconomic status. The same occurred with depression: a greater tendency was observed among smokers, however this relation was reduced after insertion of the variables education and socioeconomic level.

Similar results were observed in the study by Tedeschi et al.²³, which pointed out that 52.2% of smokers reported at least one mental health condition, depression being the most frequent, followed by anxiety, but this study only used smokers' reports to identify these conditions. Saravanan et al.²⁴ observed the symptoms of anxiety and depression through the Depression, Stress and Anxiety Scale (DASS-21) in college students and the results were relatively higher in smokers.

In the cohort study by Lin et al.²⁵, conducted in low- and middle-income countries, there was also an increase in the risk of depression in smokers even after adjustment of multivariate models such as body mass index, age, sex, life habits and socioeconomic profile; however this study did not observe anxiety.

In contrast, Taylor et al.²⁶, stated that through the type of study available, it is not possible to define the causality of the association between smoking and anxiety and depression, suggesting that the causality may be at the genetic level, further studies being necessary in

this area. The study of Sheikh et al.²⁷ showed a relationship between childhood adversities and an increased risk of smoking in adulthood, as the individuals are more likely to exhibit symptoms of anxiety and depression in adulthood.

According to the results of the present study, there was a decrease in the association between smoking and depression when the variables of schooling and socioeconomic status were inserted, probably because individuals with better educational, social and economic conditions present a better knowledge about the risks of smoking¹⁷.

A systematic review, Fluharty et al.⁶ showed that the association of anxiety and depression differed between men and women. Of eight studies that evaluated the relationship between gender and smoking, five studies found that woman smokers are more likely to experience symptoms of anxiety and depression¹⁰. In the present study, the relationship between mental health and smoking was observed regardless of gender.

Symptoms of anxiety and depression are directly related to smoking and are considered a barrier to cessation of cigarette use¹⁰. This occurs because the symptoms may contribute to the abstinent smoker experiencing lapses, relapses, and increased symptoms of withdrawal symptoms¹⁰. Smokers with higher levels of anxiety sensitivity report that quitting is actually much more difficult²⁸.

The association between smoking and depression can also be two-way, in other words, smoking can be used to alleviate the symptoms but may aggravate the problem over time¹⁰. On the other hand, studies report that depressive symptoms are related to the likelihood of a person starting to smoke. Individuals who present depressive symptoms are more likely to fail to remain abstinent; in fact, smoking reduces the symptoms of depression and improves mood²⁹.

In animal models, there is evidence that prolonged exposure to nicotine produces deregulation in the hypothalamic-pituitary-adrenal system, leading to cortisol hypersecretion and alterations in neurotransmitter activity^{8,30}. These systems have the function of regulating the biological and psychological reactions to stressors, an effect that seems to normalize after withdrawal from nicotine^{8,30}.

Similarly, human studies have shown higher levels of cortisol in smokers compared to nonsmokers²⁶. Cigarette components inhibit the activity of monoamine oxidase, i.e., enzymes involved in the decomposition of monoamines (dopamine, serotonin, and norepinephrine); this effect normalizes after cessation of smoking²⁶. Another study in animals demonstrated that nicotine can alter the dopaminergic function of the brain, meaning long-term smokers may be more susceptible to emotional distress in response to emotional stressors²⁶.

Such findings are of great importance in order to alert health professionals who assist patients during the smoking cessation process, so that this process becomes easier and abstinence rates are higher, thus reflecting a decrease in people with chronic and mental illness, and a reduction in health spending on adapted programs³¹. Schmidt et al.³² demonstrated that it is possible to reduce anxiety sensitivity in smokers through brief theoretical interventions and that the possible adaptation of these treatments could offer a new and personalized approach to improving mental health and promoting smoking cessation. Krebs et al.³³, shows that cessation of smoking may be beneficial for the population that already has some mental health problem, because when quitting individuals showed improvements in their behavior and their mental illness, this information can be used as a way to encourage smokers in cessation, since in the long run they may have benefits in relation to symptoms of anxiety and depression, but the intervention should be directed towards this type of population since they have more difficulty in staying abstinent²⁹.

The present study has some limitations. Physical activity was not considered as a confounding variable; another factor that may have limited research in relation to the high socioeconomic and educational level in the control group is the fact that these individuals were mostly recruited online, that is, they had a higher purchasing power, this may also have interfered with the existence of different responses between individuals, since one party answered the questionnaires with the help of an evaluator and another part of the sample responded online without any assistance. The fact that it was a cross-sectional study prevented causal relations. However, in relation to the scientific evidence present in the literature, the

study proposes a statistical model of adjustment of the data, resulting in a differential increase in the veracity of the presented data.

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