

MASTER DEGREE DISSERTATION
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UNDERSTANDING BARRIERS TO SMOKING CESSATION ON COPD PATIENTS - A PREVALENCE STUDY

Author: Francisco Assunção

Mentor: Raquel Duarte

Co-mentors: Ivone Pascoal, Miguel Guimarães

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FACULDADE DE MEDICINA



ABSTRACT

Introduction - COPD is an emerging public health problem. Smoking cessation must be a priority in the management of COPD. The aim of the study was to investigate the reasons that make smoking cessation difficult in patients with COPD, in order to outline future public health strategies.

Methods - COPD patients, with a history of smoking, who underwent spirometry between Jan 2020 and Jun 2021 at CHVNG/E were included. A telephone questionnaire was carried out, including data collection of age, sex, BMI, occupational exposure, literacy, comorbidities, COPD and exacerbations characterization, and validated scales for dyspnea and tobacco dependence. The symptoms of anxiety and depression were recorded, as well as the usual intake of alcohol, coffee and anxiolytics/antidepressants. Smoking history and habits, smoking-packs year, age of smoking onset, intention to quit smoking, use of medication, medical monitoring and reasons to return smoking were surveyed. Finally, the biggest obstacle to smoking cessation was asked to all participants and the most relevant reason to quit, in ex-smokers. The variables were compared between different groups of smokers/ex-smokers and student's t-tests were used with a level of significance of 0.05.

Results - Data was collected from 168 participants. Stress was identified as the main reason to restart smoking for 43,0% of ex-smokers, and the biggest obstacle to quit smoking for 41.3% of the participants. The group of smokers who tried to quit smoking and smokers who never tried, showed more symptoms of anxiety ($p < 0.001$ and $p < 0.001$, respectively) and depression ($p = 0.002$ and $p = 0.007$, respectively) than the group of ex-smokers. There was an increasing incidence of ex-smokers, as the GOLD classification worsened ($p = 0.001$). A negative correlation was found between literacy and smoking load and the level of smoking dependence, and a positive correlation between anxiety symptoms and smoking-packs year ($p < 0.001$), and between depression and mMRC ($p = 0.003$).

Conclusions - Anxiety/stress and depression were the most referred relevant variables in the success of smoking cessation in COPD patients. Clinical intervention, information about the dangers of tobacco and choice of the ideal time to quit smoking will increase successful attempts.

Key Words: COPD, smoking cessation, clinical intervention, tobacco harms, public health information

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the most common chronic respiratory diseases. It is characterized by persistent airflow limitation, due to a dysfunctional airway, usually caused by significant exposure to particles, smoke or gases, influenced by host factors, which induces abnormal lung development.¹ Frequently, COPD prevalence is related to tobacco smoking prevalence. A person who smokes, has an estimated chance of getting COPD over 20% than non-smokers.²

COPD affects about 3% of the population worldwide and is the cause of over 3 million deaths annually.³ By now, it is one of the top three leading causes of mortality, with a particular incidence in Low and Middle-Income Countries, which corresponds to 90% of total deaths caused by COPD.⁴ As a consequence, COPD Prevalence, Mortality and Morbidity varies according to country and the socioeconomic strata living in each region. That shows COPD as an important public health challenge, particularly with many deaths and complications that can be avoided with proper diagnosis and prevention. Thus, the number of deaths and hospitalizations of COPD is growing. Moreover, will be growing for the following years, considering the increasing exposure to COPD risk factors and ageing of population.⁵

COPD induces economic and social burdens, which have been significant and increasingly high over the last years. The burden of disease is high, due to the increasing prevalence and progressive disease course, which is characterized by exacerbations.^{3, 6}

A variety of studies from all over the world report that COPD has a significant societal economic burden, associated with increased health care resource utilization and higher health care costs.⁷⁻¹⁰ Additionally, higher direct costs (including average fees per patient per year and average costs per exacerbation) seem to be associated with increasingly severe COPD and/or a history of more frequent or severe exacerbations.

A study from Germany¹¹ found COPD to be significantly associated with excess direct and indirect costs that both increased with disease severity. However, indirect costs are largely unevaluated in most studies. COPD patients often bring an increased prevalence of comorbidities, and it is important to understand the impact of their costs on the population. Prevention of severe comorbidities and managing them more effectively would benefit for the patients and could potentially also relieve much of the financial burden of disease.¹²

Cigarette smoking is the most important risk factor for COPD. Generally, smoking has negative health effects and is the single largest preventable cause of morbidity and

mortality worldwide.¹³ According to the Global Burden of Disease study, more than 8 million people died prematurely in 2017, due to smoking.¹⁴

The report «Portugal - Prevention and Control of Smoking 2019»¹⁵, presented by the Portuguese General Health Department (DGS), reveals that one person died every 50 minutes in Portugal last year, from illnesses attributable to tobacco. The same report, retrieving data from 2016, predicted that more than 11,800 people died in Portugal from illnesses attributable to tobacco. Furthermore, a Eurobarometer study, cited in the document, refers that in 2017, about a third of people who smoked said they had tried to quit at some point (35.7%), 6.3% in the last 12 months and 30.1 % for more than a year. According to the latest available data, 1.8 million residents in Portugal, aged 15 or over, were smokers (20%) and 1.5 million smoked daily (16.8%).¹⁵

Of the 11,843 deaths caused by tobacco in 2016 (10.6% of the total deaths in the country), 9,263 were men (16.4% of the total who died) and 2,581 were women (4.7%). The report's authors refer that "tobacco was responsible for about one in four deaths in the 50 to 59 age group". In men, the highest percentage of deaths attributable to tobacco was found in the age group from 50 to 59 years old (about 30% of deaths), while in women, the age group with the highest mortality was 45 to 49 years old (14,5% of the total deaths). In the same year, tobacco was responsible for 46.4% of deaths from chronic obstructive pulmonary disease, 19.5% of cancer deaths, 12% from respiratory tract infections, 5.7% of deaths from cerebrocardiovascular diseases and 2.4% of deaths from diabetes.¹⁵

The debut of smoking is a severe health problem for children and young people. More than a third of youngsters who start smoking, will continue to smoke throughout adulthood, thus compromising their health and longevity. In 2018, according to data collected on Portuguese National Defence Day, 60.1% of 18-year-old youngsters of both sexes said they had already smoked, and 38.3% said they had consumed tobacco in the last 30 days, representing a 10.9% reduction compared to 2015. In the same year, a collaboration protocol was signed between the General Health Department and the General Education Department to intensify smoking prevention in schools.¹⁵

Since 2016, it has been implemented an access to intensive support queries for smoking cessation in all Health Centre Groups. It should also be noted that one of the main support drugs for smoking cessation started to be reimbursed in January 2017.¹⁵

In 2018, about 13000 people were assisted under the intensive support program for smoking cessation. In the same year, pharmacies' sales for drugs used to aid smoking cessation registered an increase of about 9.1% compared with the previous year.¹⁵

There is a lot of debate in the tobacco control literature about the value of a medical support and the use of drugs in reducing smoking-related harm. For example, a 2011 UK report found that 54% of smokers who had made a quit attempt in the past year had used pharmacotherapy, but only 5.5% had attended cessation clinics.¹⁶ Based on this report, we can argue that smoking cessation drugs are often easier to put in practice than medical assistance support because it appears to be more appealing to convincing them to buy a nicotine replacement drug than to encourage them to look for behavioural support with a health professional. Regarding support in the context of smoking cessation, the authors of the report «Portugal - Prevention and Control of Smoking 2019»¹⁵ highlights the increase registered in 2016 in the dispensing of medicine packaging in pharmacies: another 56,330 dispensed packaging. The consumption of one of these drugs (varenicline) increased by 68.2% in the first quarter of 2017 (plus 6,196 packages). Last year, there was also “an increase in accessibility to smoking cessation consultations”, with around 31,800 consultations of intensive support for smoking cessation registered at the level of health centre groups and hospital units of the National Health Service (an increase of 3.5% compared to 2015).

But if smokers often try to quit it doesn't mean they are using the best available method. The best research evidence suggests that the most effective way to quit smoking is to use medical monitoring and replacement therapy.¹⁷

Smokers also often describe smoking as having a behavioural or psychological aspect that cessation therapy does not address.¹⁸ The key finding is that smokers believe that the physiological aspect of their addiction only partly explains why they continue to smoke. This finding is supported by survey research with smokers, which found low levels of agreement that an inability to quit was caused by biological factors (21%) or that smoking was a “disease” (10%).¹⁹ It suggests that biomedical conceptualizations of smoking do not strongly align with how smokers understand their smoking.

Anxiety-related to stress and depression are often described as obstacles in smoking cessation, and both are examples of these biomedical conceptualizations that disallow smokers to quit smoking.²⁰

Literature has been referring to and discussing the role of anxiety and depression in the success of a smoking cessation attempt. Taylor et al.²¹, in a meta-analysis, compiled

a series of 26 studies used to assess factors like anxiety, depression and quality of life in participants, six weeks from their smoking cessation. The overall picture showed a significantly better mood and quality of life from those who left smoking comparing with those who kept smoking.

Another study²², performed in a sample of patients enrolled in a smoking cessation clinic in the Czech Republic, showing that the rate of smoking abstinence was lower in participants/patients with moderate/severe depression, compared with those without depression. Also in this study, most participants showed fewer depression symptoms in the follow-up compared with the start of the data collection. These studies emphasise on the importance of an overall good mood, with controlled or preferably absent anxiety and depression, for a successful quit smoking attempt.

As smoking is widely known as the major risk factor for COPD, smoking cessation is the most effective way to control the spread of this disease. That lays on the prevalence of smokers, and the relevance of tobacco as a risk factor for many cardiovascular, pulmonary and carcinogenic pathologies. Smoking cessation should be the top priority in the treatment of COPD since it is the most effective intervention in stopping the progression of the disease and, as increasing survival, and reducing morbidity.¹³ Quit smoking is beneficial since it improves survival in patients with COPD and improves the quality of life by positive physiological and psychological effects.^{2,21,23,24}

Many governments and stakeholders have discussed smoking cessation best policies and strategies. Unfortunately, there are no findable magic bullets for this problem. First of all, as a clinical principle, each patient has to be intended as one of a kind. But, considering each public health policy as an instrument with limited resources and a limited range of action, we should be precise in deciding which policies should be considered and rejected. This work intends to understand the most significant barriers patients find during smoking cessation and, what could be the most effective strategies to help patients, clinicians and stakeholders involved. That could guide clinicians in improving their strategies on patients' rate of success of smoking abstinence and governments and stakeholders, as tobacco has a considerable impact in economy, health, and overall state of a country. Thus, our research intends to understand the most important factors that affect the rate of success of smoking cessation attempts and what could guide clinicians and stakeholders to find the best strategies and policies to mitigate tobacco damage, particularly in COPD patients.

MATERIALS AND METHODS

We conducted a prevalence study among COPD patients from Pulmonology Service at Centro Hospitalar de Vila Nova de Gaia / Espinho (CHVNG/E), in Vila Nova de Gaia, Portugal. The data collection was both prospective and retrospective and included COPD patients who attended the Lung Functional Test Laboratory from January 2020 to June 2021. The data collection was composed by a questionnaire and occurred by telephone.

According to spirometry parameters, the inclusion criteria was based on GOLD Guidelines²⁵: Participants included patients with Post-Bronchodilator FEV1/FVC <0.7, and with either positive or negative bronchodilation test. Post-bronchodilator spirometry was performed and interpreted per the American Thoracic Society standards²⁶. The participants without any history of smoking habits have been excluded from the study, along with those with a cognitive deficit or incapable of answering or completing the questionnaire.

The patients of our sample were subjected to a questionnaire to collect information on demographics (age, sex, and race), Body Mass Index (BMI), Professional Exposure to harmful particles, COPD Diagnostic Date and COPD Recognition Date, Self-reported comorbidities, symptoms (regarding dyspnea and exacerbations), tobacco history, level of dependence and intention to quit smoking, literacy/education level, and assessment of symptoms of depression and anxiety. In addition, patients completed Portuguese-population validated scales to evaluate dyspnea and functional status on COPD and tobacco dependence.

GOLD Spirometry Stages of each individual, according to Post-Bronchodilator FEV1 value and Guideline reference values²⁵ were registered. GOLD Stage 1 was attributed to a FEV1 $\geq$ 80% of predicted value, following GOLD Stage 2 to a FEV1 $\geq$ 50% and <80%, GOLD Stage 3 to a FEV1 $\geq$ 30% and <50% and finally GOLD Stage 4 to FEV1 <30% of the predicted value.

The following related comorbidities were considered, according to ICD11 Classification²⁷: Neoplasms, Mental Behavioural and neurodevelopmental disorders, Diseases of the nervous system, Diseases of the circulatory system and Diseases of the respiratory system (excluding COPD).

Tobacco history was evaluated on the basis of smoking-packs year accountability. Smokers were asked if they ever managed to quit smoking for at least 24 hours since smoking onset. We considered ex-smokers the individuals who were without smoking for

at least 6 months from data collection. The level of dependence was evaluated according to Fagerström Test²⁸ simplified version. The average number of cigarettes consumed per day, and average time from waking up to smoke first cigarette was classified using a scale from 0-3 for each item. Dependence levels were attributed by following by summing up both items: Low dependence (0-1) Medium Dependence (2-3), and High Dependence (4-6).

Age of smoking onset and smoking habits (smoking at home or with colleagues at work or leisure) were registered. Participants were asked about their intention to quit smoking in the next 30 days from data collection. A past of any unsuccessful smoking cessation attempt was registered. Smoking cessation attempts (minimum 24h without smoking) were described by their date, duration, use of medication, medical monitoring and reason for failure (if applied). We considered medical monitoring the occurrence of any guidance performed by a clinician, regardless of their speciality. The most relevant reasons to quit smoking and years of abstinence were registered for ex-smokers. Participants were also asked about consuming regularly highly addictive substances, such as alcohol, coffee, and drugs. Finally, participants were asked about their biggest obstacle to quit smoking overall.

The number of exacerbations per year and last year, and those that needed hospital admission were also registered.

Dyspnea was assessed according to mMRC questionnaire²⁵, and based upon spirometry and exacerbations data, participants were integrated into ABCD classification.²⁵

Level of literacy was classified according to the 10 levels of Portuguese education system²⁹: Null; Basic School (includes 3 levels: 1st - Primary School – CITE 0, 2nd - CITE 1 and 3rd - CITE 2); High School (CITE 3); Post High School course without College Degree (CITE 4), College Degree with short duration (CITE 5), College Degree with full duration (CITE 6), Master Degree (CITE 7) and Doctorate (PhD - CITE 8).

The symptoms of depression were assessed by asking two questions: “Last month, have you been worried about feeling down, depressed or helpless?” and “Last month have you been concerned about your lack of interest or pleasure regarding your daily routine?” - A positive answer in any of these two questions was considered strongly suggestive of depression.³⁰

The symptoms of anxiety were assessed by a 0-6 score regarding 2 items (0-3 points each): “I feel impatient, and I can’t handle it” and “I have my mind full of concerns”.³¹

The results were presented as means and standard deviations or as absolute and relative frequencies. Values rounded to the first decimal place. The variables were analysed with Student’s t-tests. Independent samples t-test were used to assess for unadjusted associations. In order to compare means among two or more groups, we used one-way ANOVA. Correlation coefficient (R) and linear regression ($y = \beta_0 + \beta_1 x$) was used to analyse descriptive data or determine whether the various domains or motivational factors for smoking (dependent variable) correlated with the descriptors of interest (independent variables). For all analyses, values of $p < 0.05$ were considered significant. Statistical analysis was performed with SPSS.

RESULTS

Our sample was composed by 168 participants, being 138 (82,1%) male and 30 (17,9%) female. The average age was 65,3 $\pm$ 8,9 years (minimum 44 - maximum 89). The average BMI was 25,9 $\pm$ 4,6 (17-44). Literacy distribution was the following: Null: 1 (0,6%), CITE 0: 83 (49,4%), CITE 1: 15 (8,9%), CITE 2: 35 (20,8%), CITE 3: 29 (17,3%), CITE 6: 4 (2,4%), CITE 7: 1 (0,6%).

Exposure to harmful particles during work was reported by 86 participants (51,1%). Related comorbidities were registered in 87 participants (51,8%).

COPD diagnosis date and recognition varied from 1980 to 2021 (by average, participants have been diagnosed for 6 years). There wasn't a significant difference between both described dates. 23 participants (13,7%) did not recognised they had been diagnosed with COPD. GOLD distribution was the following: GOLD1: 35 (20,8%); GOLD2: 87 (51,8%); GOLD3: 33 (19,6%); GOLD4: 12 (7,1%). mMRC distribution was: mMRC0: 15 (8,9%), mMRC1: 78 (46,4%), mMRC2: 59 (35,1%), mMRC3: 14 (8,3%) mMRC4: 2 (1,2%). ABCD Classification followed: A: 77 (45,8%), B: 39 (23,2%), C: 17 (10,1%), D: 34 (20,2%). COPD information was not possible to collect in 1 participant (0,6%). Incidence of exacerbations was reported in 21 participants (12,5%).

In what relates to alcohol consumption, at least 1 glass per day was reported by 67 participants (39,9%). Coffee consumption (at least a cup per day) was reported by 135 participants (80,4%), and daily intake of anxiolytic or antidepressants was present in 50 participants (29,8%).

We registered an incidence of depression symptoms in 83 participants (49,4%). anxiety symptoms distribution followed: Never: 67 (39,9%), Sometimes: 28 (16,7%), Often: 52 (30,9%), Always: 21 (12,5%).

In terms of tobacco history, our sample was composed by 94 ex-smokers (56,0%) and 74 smokers (44,0%). From the last, 54 (32,1% of total, 73% of smokers) have been abstinent at least once for a day, while 20 (11,9% of total, 27% of smokers) haven't.

Tobacco load, measured in smoking-packs year, followed an average of 47,5 $\pm$ 22,7 (4-105). The average age of tobacco onset was 16 $\pm$ 9 years (7-30). The average period of smoking abstinence in ex-smokers was 11 years (0-40).

Nicotine dependence assessed by simplified Fagerström test distribution followed: 0-1 Low dependence (20,3%), 2-3 Medium dependence (34,5%), 4-6 High dependence (44,6%). As detailed: Time from wake up to 1st cigarette- 0-5 minutes

(37,5%), 6-30 (29,2%), 31-60 (12,5%), >60 (20,2%); and Cigarettes/day: 0-10 (22,0%), 11-20 (42,5%), 21-30 (22,0%), >30 (13,1%).

From our sample, 113 participants (67,7%) reported they usually smoke/smoked (ex-smokers) at home, 101 (60,5%) at work, and 129 (77,2%) with friends (1 participant missing data).

113 participants (67,7%) reported at least 1 unsuccessful attempt (more than 24 hours) to quit smoking (1 - 0,6% missing data) ; 84,1% of attempters tried to quit smoking for more than once; 43,7% of attempts took a month or less; 34 ex-smokers only attempted to quit smoking once and succeeded, meaning they hadn't any unsuccessful attempts. From smokers group, 29 were intending to quit smoking in 30 days, while 41 were not; 4 smokers were abstinent for at least 24 hours and less than 6 months, and had clear to quit definitely.

The most prevalent reason for smoking cessation attempt failure (unsuccessful attempts) was stress - 49 (43,0%), followed by "lack of motivation" – 37 (32,5%), and friends influence – 28 (24,6%).

A total 69 participants (41,3%) named stress as their biggest obstacle to quit smoking, followed by tobacco addiction – 54 (32,1%), "never felt the need" – 35 (20,8%), and friends influence – 9 (5,4%), 1 - 0,6% missing data.

From ex-smokers, 52 (53,1%) reported health problems, or a declining health condition as the most relevant reason to quit smoking; while 14 (14,3%) ex-smokers referred they quit smoking due to a medical advice; 6 (6,1%) due to medication (nicotine replacement therapy); 4 (4,1%) due to a friends' or familiar advice, and 4 (4,1%) due to economic reasons; 18 ex-smokers did not state any specific reason to quit smoking, as they found their motivation alone. 4 smokers that were abstinent for at least 24 hours and less than 6 months, with clear intention to definitely quit were considered eligible for this item.

Regarding statistical analysis, and using independent samples t-Test, we compared ex-smokers group (μ_1) with both smoker's groups (μ_2 and μ_3) in terms of symptoms of anxiety and depression. Considering $H_0: \mu_1 = \mu_2$ and $H_1: \mu_1 \neq \mu_2$, we rejected H_0 , as we could conclude that the ex-smokers group showed significantly fewer symptoms of anxiety and depression than the group of smokers that have already tried to quit smoking ($p < 0,001$ and $p = 0,002$, respectively). Considering $H_0: \mu_1 = \mu_3$ and $H_1: \mu_1 \neq \mu_3$ we rejected H_0 , as we were able conclude that the ex-smokers group showed

significantly fewer symptoms of anxiety and depression than the group of smokers that have never tried to quit smoking ($p < 0,001$ and $p = 0,007$, respectively).

We have also used one-way ANOVA to check for a possible linear regression ($y = \beta_0 + \beta_1 x$), between incidence of smokers (y) and bronchial obstruction (GOLD - x). Considering $H_0: \beta_1 = 0$, we rejected β_1 , as we could conclude that the incidence of smokers reduces as GOLD worsens ($p = 0,001$; $R = 0,245$; $y = 0,759 - 0,148x$).

We have also used one-way ANOVA to compare every variable and check for possible correlations. In the case of literacy, we rejected H_0 , as it has been found to be negatively correlated with smoking-packs year ($p = 0,001$; $R = 0,246$; $y = 52,1 - 3,8x$) and the result of the Fagerström Test ($p = 0,010$; $R = 0,200$; $y = 3,4 - 0,248x$). Based on this sample of COPD patients, we could argue that higher literacy is associated with lower smoking habits and lower tobacco dependence.

Regarding depression symptoms, we rejected H_0 , as they have been found to be positively correlated with worse levels of dyspnea (mMRC Classification) ($p = 0,003$; $R = 0,226$; $y = 0,291 + 0,138x$) and with worse anxiety symptoms ($p < 0,001$; $R = 0,511$; $y = 0,221 + 0,235x$). In the case of anxiety symptoms, we were able to reject H_0 , as they showed correlation with a higher number of exacerbations per year ($p < 0,001$; $R = 0,270$; $y = 1,060 + 0,573x$), with a higher number of smoking-packs years ($p = 0,002$; $R = 0,236$; $y = 0,628 + 0,011x$) and with shorter duration in quit smoking attempts ($p < 0,001$; $R = 0,478$; $y = 1,390 - 0,201x$). Finally, regarding simplified Fagerström test, we were able to reject H_0 , as they have been found to be correlated with a higher number of exacerbations per year ($p = 0,005$; $R = 0,218$; $y = -0,012 + 0,061x$) and incidence of alcohol consumption ($p = 0,005$; $R = 0,218$; $y = 0,221 + 0,058x$).

DISCUSSION

Stress was described as the major reason for restart smoking for 43,0% of ex-smokers, and the biggest obstacle to quit smoking for 41.3% of the participants. The groups of smokers showed more symptoms of anxiety than the group of ex-smokers. There was an increasing incidence of ex-smokers, as the GOLD classification worsened. A negative correlation was found between literacy and smoking load and the level of smoking dependence, and a positive correlation between anxiety symptoms and smoking-packs year, and between depression and mMRC.

The literature has been linking the consumption of tobacco with depression and anxiety. Accordingly, smoking cessation could lead to a long-term reducing anxiety and depression, and improved positive mood and quality of life, compared with continuing to smoke.²¹

Comparing with Taylor et al.²¹, our research agrees, as smoker groups presented significantly higher symptoms of anxiety and depression than ex-smoker group. Furthermore, stress was chosen in our research as the biggest obstacle to quit smoking and a major reason to restart after unsuccessful attempts. A study from South Korea³² found evidence of an association between unsuccessful attempts and increasing stress levels. Another study from US³³, performed with young adults described “loss of a way to handle stress” as the biggest barrier to quit smoking. Emre et al.³⁴ showed an increased risk of mental illness in smokers compared with non-smokers, with higher nicotine addiction in the participants with higher anxiety and depression scores. These researches turn evident tobacco consumption is often associated with worse mental health. Still, among smokers it is not unanimous, as most of them continue to smoke, thinking on relieve their anxiety or depression.

In Zarghami et al³⁵, authors showed that, guided self-change (medical monitoring) and it combined with nicotine replacement therapy, appeared to be more effective in smoking cessation than the nicotine replacement therapy alone. Also, levels of anxiety and depression were higher in nicotine replacement group. It is important to clarify that, even with low percentage in the most relevant reason to quit smoking in ex-smokers, we consider medical support has a very important role in smoking cessation success. As Zarghami et al. conclude, for example, medical monitoring have a positive impact in reducing anxiety and depression, thus finding the optimal moment to quit smoking in COPD patients.

In 2014, a systematic review from Twyman et al.³⁶, identified 3 main barriers to quit smoking: smoking for stress management, lack of support from health and other service providers, and the high prevalence and acceptability of smoking in vulnerable communities. That comes into our results: our evidence shows higher prevalence of symptoms of anxiety and depression in smokers' groups, stress pointed out as the biggest obstacle to quit smoking and the major reason to restart after unsuccessful attempts. We can also consider an association between anxiety symptoms and a higher tobacco consumption, which could be a cause for higher number of exacerbations, and shorter-term unsuccessful attempts to quit smoking.

A study from Turkey³⁷, showed a negative correlation between current smoking and GOLD Stage. Such conclusion becomes suggestive in our study as the prevalence of ex-smokers increase as the GOLD stage is higher. That also is supported for the significant percentage (53,1%) of ex-smokers that manage to quit smoking due to their declining health condition. This evidence suggests that smokers can often understand their health status, and smoking harms, as their condition worsens, and take action.

When comparing with other studies using a sample from the Portuguese population, Farinha et al.³⁸ concluded that there was a relationship between nicotine dependence and increasing symptoms of anxiety and depression, particularly in women. Our research, did not find any significant relationship between Fagerström Test result and anxiety or depression symptoms, but an unfair distribution in terms of gender, could have affected further results.

As for the role of literacy, we highlight the study by Stewart et al.³⁹ This study considered that low health literacy can become critical when it comes to smoking cessation failure, particularly among low socioeconomic strata. Finally, it adds that less knowledge of the risks of tobacco leads to a lower perception of its dangers and higher nicotine dependence. These results come in accordance with ours, as lower literacy showed relationship with higher tobacco consumption and nicotine dependence.

CONCLUSIONS

In view of the evidence that stress is presented as the biggest barrier to smoking cessation, as well as the main cause for smoking restart after an unsuccessful quitting attempt, it is imperative to emphasise its importance for the success of any smoking cessation attempt. Besides that, the control of depression, strongly associated and even confused with stress, will play a fundamental role in COPD patients trying to quit smoking, according to our research.

Our evidence demonstrates that a large percentage (73%) of smokers have already been without smoking for at least 24 hours. 84.1% of those who tried did it for more than once, but 43.7% of the attempts lasted only a month or less. These results demonstrate that smoking cessation attempts are frequent in COPD patients, although short on duration. Reasons for failure should be taken into account by clinicians and worked by patients in order to increase chances of success. As stress is pointed as a major reason for failure, reducing it could increase the chances of success. Motivation from friends, family, health professionals about the benefits of smoking cessation will also play a significant role.

We were able to find an increasing incidence of ex-smokers as COPD worsens (as measured by the GOLD classification). Furthermore, we could verify that the increasing COPD severity could be associated with an emotional and general well-being deterioration of patients. These data allow us to conclude that the window of opportunity to quit smoking does not depend on the severity of the disease, and so any patient can and should have guidance to quit smoking, regardless of their COPD stage. Therefore, there is an important window of opportunity for everyone to act to increase the success of these attempts. We consider important to take advantage of the COPD diagnosis moment, exacerbations, anxiety and depression low levels and abstinence periods to motivate the smoker to proceed with the attempt and ensure they have adequate treatment and follow-up.

It was possible to find a negative correlation between literacy and smoking-packs year, and the level of tobacco dependence, assessed by the simplified Fagerström Test. Likewise, the age of smoking onset in our sample was 16+-9 years. Although it is not possible to establish a cause-effect relationship for these variables, given that we know from the literature that there are other factors that affect the burden and level of tobacco dependence, these results allow us to conclude that an adequate education about the dangers of tobacco may have an important role in reducing tobacco consumption. This

measure may have even more relevance if we take into account the age at which smoking starts is normally in the adolescence. In conclusion, we believe that correct and complete information about the dangers and harms caused by tobacco, transmitted by health professionals, teachers, parents or other means of dissemination, can reduce its consumption, thus reducing the burden of diseases like COPD.

As the recruitment has been made in a central hospital, with some of the participants in smoking cessation queries (we were not able to find how many), we should discuss a possible selection bias. As stated in the results, 90 out of 167 participants already had some kind of medical support to quit smoking, and according to our research we were not able to check which kind of support (general practice, pulmonologist, smoking cessation query...) they had in each smoking cessation attempt. Further investigation is needed in order to find the relative success of smoking cessation attempts according to the kind of support (medical support, smoking cessation queries and medication) COPD patients have. We believe that making more accessible and easy the referral of patients to follow-up appointments for smoking cessation will have a significant effect on reducing tobacco consumption and consequent harm.

In the same way, as evidenced in the study by Kim et al³², the accumulation of unsuccessful attempts to quit smoking may lead to an increase in stress levels. Based on the results of our study, we can conclude that to increase the chances of a successful attempt occurring, we must optimize the patient's condition in terms of anxiety, depression and general well-being. Thus, the guidance of a health professional, using appropriate anxiety and depression scales, can help to choose the appropriate time for smoking cessation, with collaboration of patients.

In short, according to our research, anxiety/stress and depression are the variables that most interfere in the success of smoking cessation in patients with COPD. Proper and specialized clinical intervention, information about the dangers of tobacco and the choice of the ideal time to quit smoking will increase the chances of successful attempts, and consequently a lower impact of the disease.

As a challenge for further studies, and to complement what we believe were the weaknesses of our study, we suggest the inclusion of a broader and more equitable sample in terms of gender to assess anxiety and depression and other variables of interest. In addition, the possible inclusion of patients with pathologies of interest besides COPD, may allow us to understand the capacity or tendency to success or failure of smoking cessation as the health condition deteriorates.

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