The Effect of Psychiatric Disorders and Stressful Environmental Factors in Correlation with Smoking and Coronary Heart Disease

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Abstract

Introduction: Smoking has been associated, among others, with morbidity and mortality from coronary heart disease. Moreover, it has been established by many studies that there are several mediating factors in the relationship between smoking and coronary heart disease. The purpose of this research is to examine the relationship between smoking and coronary heart disease, with particular emphasis on the factors that mediate this relationship. **Methods:** A demographic questionnaire, and the Smoking in psychiatric hospitals—a survey of patients' views, were used. The research was conducted on a sample of 152 patients at the Cardiology Clinic of the National University of Athens "Sotiria". **Results:** The vast majority of patients with coronary heart disease have smoked in the past and continue to smoke, despite their knowledge that smoking is very harmful to health and the physician's advice to stop smoking immediately. In addition, a partial correlation between smoking and gender as well as smoking and history of psychiatric disorders, and baseline anxiety was found. The latest research hypothesis about the role of stressors is partially confirmed. **Conclusions:** The effects of smoking cessation are important in terms of the risk and recurrence of coronary heart disease. Smoking cessation interventions have been found to be effective when psychosocial intervention strategies are used. However, the role of emotional intelligence in smoking cessation has also been established. Monitoring and using information about one's emotions is important in the context of health behavior, as it can be used to guide thoughts, attitudes, and perceptions.

Therefore, it is proposed to design and implement educational programs that aim to strengthen and utilize emotional intelligence, both at the level of prevention and in dealing with smoking.

Keywords

Stressful, Smoking, Coronary Heart Disease

1. Introduction

Cardiovascular diseases are a major cause of morbidity and mortality worldwide (Gautam et al., 2022; Gallucci et al., 2020) and are associated with a significant financial burden on healthcare systems worldwide (Gautam et al., 2022), with smoking (active and passive) to determine a significant percentage of all cardiovascular diseases (Gallucci et al., 2020; Leone et al., 2004). Cardiovascular disease refers to a set of disorders of the heart and blood vessels and includes, among others, coronary artery disease (Appleton & Kubzansky, 2014). Smoking has been associated with morbidity and mortality from coronary heart disease for several decades (Shang et al., 2022; Salehi et al., 2021; Banks et al., 2019; Stallones, 2015; Tolstrup et al., 2014; Baba et al., 2006; He & Lam, 1999; Rigotti & Pasternak, 1996).

Cigarette smoke contains more than 4000 chemicals, including polycyclic aromatic hydrocarbons and oxidizing gases, most of which are cardiotoxic (Pyrgakis, 2009). Early studies of the effects of smoking on cardiovascular health focused on nicotine, a known bioactive compound. Nicotine works primarily through stimulation of the sympathetic nervous system. This affects the cardiovascular system by increasing systolic and diastolic blood pressure, heart rate and cardiac output. Smoking is known to increase inflammation and thrombosis. Smoking also leads to oxidative stress manifested through vasomotor dysfunction, prothrombotic activity, platelet activation, leukocyte activation, lipid peroxidation, and smooth muscle proliferation (Filion & Luepker, 2013).

In their study, Lu et al. (2021) mention that coronary artery disease and atrial fibrillation have a mediating effect upon heart failure associated with smoking. In another study, Salehi et al. (2021) concluded that smoking may be associated with coronary artery disease through damaged arteries and location of arterial occlusion. Inoue (2004) mentions an association between smoking and coronary heart disease, since smoking is related to thrombogenesis and atherogenesis. In another recent study it was found that smoking is related with a >2-fold increased risk of coronary heart disease (Oshunbade et al., 2021).

Smoking causes acute hemodynamic alterations such as increased heart rate, systemic and coronary vascular resistance, myocardial contractility and myocardial oxygen demand. There is also evidence that smoking leads to endothelial dysfunction mainly through increased inactivation of nitric oxide. These short-term effects may reduce the ischemic threshold in smokers with coronary heart dis-

ease and contribute to the increased risk for acute cardiovascular events (Heitzer & Meinertz, 2005). Even for passive smokers it has been established by several studies (Heidrich et al., 2007; Whincup et al., 2004; Leone et al., 2004; de Groh & Morrison, 2002; Thun et al., 1999; Howard & Thun, 1999; Steenland et al., 1996) that there is a relationship between coronary heart disease and passive smoking either after acute or chronic exposure, even if this relationship is quite weak according to Enstrom & Kabat (2006). Inoue (2004) reports that there is a relationship between active and passive smoking and atherosclerosis, myocardial infarction, and death from coronary artery disease. In fact, Wang et al. (2021) found that passive smoking during childhood was associated with coronary heart disease in adulthood. Also, it has been established by several studies that there are several mediating factors in the relationship between smoking and coronary heart disease (Mokhayeri et al., 2022; Oshunbade et al., 2021; Hackshaw et al., 2018; Harper et al., 2012; Nakamura et al., 2012; Taylor & Rehm, 2006).

The relationship between smoking and coronary heart disease is influenced by several factors and gender is one of them, according to various researches (King, 2011; Huxley & Woodward, 2011; Aubin et al., 2012; Singhal et al., 2012; Harper et al., 2012; Hackshaw et al., 2018). Burkman (1988) previously reported that women with smoking patterns similar to those of men have similar rates of cardiovascular morbidity and mortality. However, it is unclear whether the mechanisms underlying the gender difference in CHD risk are biological or related to differences in smoking behavior between men and women. The meta-analysis by Huxley & Woodward (2011) found that smoking was associated with an increased risk of coronary heart disease for women compared to men, but found no gender difference in coronary disease among former smokers compared with those who had never smoked. The meta-analysis by Hackshaw et al. (2018) showed that even people who smoke a minimal number of cigarettes per day have an increased risk of coronary heart disease, especially women: Among men, the relative risk for coronary disease was 1.48 for smoking one cigarette per day and 2.04 for 20 cigarettes a day. Among women, the relative risks were 1.57 and 2.84 for one and 20 cigarettes per day, respectively.

Willett et al. (1987) examined the incidence of coronary heart disease in relation to smoking in women (N = 119,404) aged 30-55 years without a diagnosis of coronary heart disease. Even smoking a few cigarettes a day was associated with a two- to three-fold increase in the risk of death from coronary heart disease. The attributable (absolute excess) risk of coronary heart disease due to current smoking was higher among women who were already at increased risk due to older age, parental history of myocardial infarction, higher relative weight, hypertension, hypercholesterolemia, or diabetes. In contrast, ex-smokers had little, if any, increase in risk.

Apart from gender, however, there are other factors that have been recognized as mediating the relationship between smoking and coronary heart disease. The review by Freedland et al. (2005) found evidence, albeit limited, that smoking may partially mediate the effect of depression on coronary heart disease morbid-

ity and mortality.

Stress is another factor that has been found to mediate the relationship between smoking and coronary heart disease. For many smokers, environmental stressors, which have also been associated with coronary heart disease risk, appear to be strong determinants of smoking behavior and relapse after cessation. On this basis, an interaction between stressors and smoking and the possible impact of this interaction on coronary heart disease risk over and above that due to stressors or smoking alone has been established (Epstein, & Perkins, 1988). In a similar context, Pomerleau & Pomerleau (1989) report that smoking increases in stressful situations, while at the same time, the cardiovascular effects of smoking in combination with those of psychological stress can be greater than each parameter separately.

2. Aim and Research Hypotheses

The aim of the research was to examine the relationship between smoking and coronary heart disease, and examining the effect of gender, comorbidity with psychiatric disorders, and stressful environmental factors. Based on the preceding review, the research hypotheses formulated are the following:

H_1: There is a positive correlation between gender and smoking in patients with coronary artery disease. This hypothesis is based on the fact that several studies (King, 2011; Huxley & Woodward, 2011; Aubin et al., 2012; Singhal et al., 2012; Harper et al., 2012; Hackshawet al., 2018) have concluded that gender plays a significant role in the effect of smoking upon coronary artery disease, and especially the female gender.

H_2: There is a positive correlation between psychiatric disorders and smoking in patients with coronary artery disease. There is scarce evidence that there is a relationship between these variables (Freedland et al., 2005) and for this reason more research is necessary.

H_3: There is a positive correlation between stressful environmental factors and smoking in patients with coronary artery disease. Earlier studies (Epstein & Perkins, 1988; Pomerleau & Pomerleau, 1989) have found a relation between these variables, so there is a need for more up-to-date evidence.

3. Material and Methods

3.1. Research Method

Quantitative research using a structured questionnaire was conducted. It allows the collection of data from a large number of respondents, without space-time limitations, as well as the examination of any correlations and interactions between the variables (Franses & Paap, 2004; Vanderstoep & Johnston, 2009).

3.2. Sample

Convenience sampling was used as the sampling method. More specifically, the researcher addressed to the Cardiology Clinic of the public hospital "Sotiria" in

Athens, Greece. A total of 155 questionnaires were distributed to patients, of which 152 were completed. All questionnaires were valid. The questionnaire was accompanied by a participant information and consent form. Approval permission was received from the Board of Directors of the hospital, under application protocol no. 16773/24-6-21 and a hospital license no. 17810/6-7-21 was also obtained.

3.3. Smoking Questionnaire

The Smoking in psychiatric hospitals-a survey of patients' views questionnaire was used (Kourakos et al, 2016).This questionnaire includes the following sections:

- Demographic and smoking information: Name, age, gender, place of birth, residence, marital status, number of children, educational level, occupational status, number of cigarettes per day, age of initiation, years of smoking, duration of smoking cessation, family history of psychiatric disorders.
- Smoking history: Information about individuals' smoking history and whether there have been periods when they had stopped smoking, reasons that encourage or discourage smoking cessation, as well as existing conditions related to smoking.
- Smoking and health: The following factors were examined: Age of smoking initiation, reasons for initiation, number of cigarettes per day, type of cigarette, knowledge of the harmful effects of smoking, and comorbidity.

4. Results

4.1. Demographic Data

The majority of the participants are men (67.8%), with an average age of approximately 62 years ($M = 61.9$), graduates of higher education (42.1%), married (70.4%), with two children (44.7%), who are currently working (61.8%) (Table 1).

4.2. Smoking Habits and Smoking History

Based on the results, 98.7% (N = 150) of the survey participants stated that they have smoked in their lifetime, while 97.4% (N = 148) were smoking during the survey period. 72.4% (N = 110) stated that they have never tried to quit smoking, while of those who answered positively, they stopped smoking for an average of 4.6 years ($M = 55.4$ months). Of those who answered positively that they smoke during this period, the average age of starting smoking was 18 years ($M = 17.7$) and therefore the average number of years of smoking is 43 ($M = 43$), while the average number of cigarettes per day is 20 ($M = 20$) (Table 2). Regarding the reasons for starting smoking, social influence (43.4%), curiosity (24.3%), "fashion" (19.7%), as well as stress and personal problems (10.5%) (Table 3). Finally, the cigarettes that are preferred are filter (88.2%) versus unfiltered (1.3%) and twisters (7.2%).

Table 1. Respondents' demographic data.

		N (Mean)	% (Std. Dev.)
	Man	103	67.8
Gender	Woman	42	27.6
	NA	7	4.6
Age		(61.9)	(7.7)
	Basic education	48	31.6
	High school	18	11.8
Education	University degree	64	42.1
	Master/PhD	20	13.2
	NA	2	1.3
	Single	20	13.2
	Married	107	70.4
Marital status	Divorced	12	7.9
	Widow	7	4.6
	NA	6	3.9
	0/NA	24	15.7
	1	16	10.5
Number of children	2	68	44.7
	3	39	25.7
	4	5	3.3
	Unemployed	3	2.0
	Household	9	5.9
Occupation	Retired	46	30.3
	Currently employed	94	61.8
	Yes	18	11.8
Family history of psychiatric disorders	No	95	62.5
	NA	39	25.7

Table 2. Smoking habits and smoking history.

	N	Minimum	Maximun	Mean	Std. Dev.
Number of cigarettes per day	152	10	40	20	6.2
Age of smoking initiation	152	15	24	17.7	1.5
Years of smoking	151	26	60	43	8.2
Duration of smoking cessation (in months)	17	5	192	55.4	44.1

4.3. Opinions/Attitudes about Smoking Cessation

Based on the results, 94.7% of respondents stated that their doctor advised them to stop smoking immediately. Also, 75% believe that smoking harms their health

Table 3. Reasons for smoking initiation.

		Frequency	%
Curiosity	Yes	37	24.3
	No	114	75.0
Most of my friends were smoking	Yes	66	43.4
	No	85	55.9
Stress and personal problems	Yes	16	10.5
	No	135	88.8
It was fashion	Yes	30	19.7
	No	121	79.6

a lot, compared to 21.1% who said that smoking harms their health to a small extent. 53.3% of respondents stated that it is very/very difficult to quit smoking. Regarding the reasons, smoky atmosphere (65.2%), seeing other patients (52%) and staff (52.6%) smoking were mentioned to a very, very large extent. It should be noted that 9.2% stated as an additional reason stress, habit or both. In addition, 62.8% (N = 94) of the respondents stated that they would need help to stop smoking and mainly nicotine substitutes—mastics and stickers (47.4%). It is noteworthy that 34.2% (N = 52) admitted that they do not want help, but that quitting smoking depends only on their own will.

4.4. Test of Hypotheses

The Mann-Whitney test was used to examine the association of gender, psychiatric disorders and stressors with patients' smoking habits. This particular test was chosen as the data do not follow a normal distribution, as it resulted from the normality test with the Kolmogorov-Smirnov test ($p < .05$). From Table 4 it can be seen that men report more compared to women that they started smoking due to stress and personal problems ($p < .05$). On the contrary, women report more that they have tried to quit smoking in the past, but also that it is difficult for them to stop this habit ($p < .05$). Those without a family history of psychiatric disorders stated to a greater extent that they started smoking due to stress and personal problems, while those with a family history of psychiatric disorders stated that smoking harms their health to a small extent ($p < .05$). From Table 5 it can be seen that those who started smoking due to intense stress and personal problems did not try to quit smoking in the past, but they believe that smoking have a great negative impact upon their health ($p < .05$).

5. Discussion

From the results of the statistical analysis, it is observed that the vast majority of patients with coronary heart disease have smoked in the past and continue to smoke, despite knowing that smoking is very harmful to health and the doctor's advice to stop smoking immediately. This is in favor of the relationship between

Table 4. Correlation between smoking, gender and history of psychiatric disorders.

	Gender	History of psychiatric disorders
Have you ever smoked?	1.000	1.000
Do you currently smoke?	.520	.662
Have you ever tried to quit smoking?	**.000**	.964
Did you start smoking because of severe stress and personal problems?	**.002**	**.005**
Do you think smoking is bad for your health?	.105	**.024**
Is it hard to quit smoking?	**.105**	.879
Is stress preventing you from quitting smoking?	.872	.361

Table 5. Association between smoking and stress.

	You started smoking because of severe stress and personal problems	stress prevents you from quitting smoking
Have you ever smoked?	1.000	1.000
Do you currently smoke?	.738	.720
Have you ever tried to quit smoking?	**.010**	.807
Do you think smoking is bad for your health?	**.015**	.102
Is it hard to quit smoking?	.129	.857

smoking and coronary heart disease that has been reported in previous studies (Shang et al., 2022; Salehi et al., 2021; Banks et al., 2019; Stallones, 2015; Tolstrup et al., 2014; Baba et al., 2006; He & Lam, 1999; Rigotti & Pasternak, 1996). Smoking-related CVD risks are higher in current and recent smokers, compared with never-smokers and those who have quit smoking in the more distant past. The risk also increases with increasing duration of use and with greater intensity of smoking, as measured by the number of cigarettes smoked per day (Banks et al., 2019).

In addition, a partial association of smoking and gender as well as smoking and history of psychiatric disorders, and baseline anxiety was found. Therefore, the first and second research hypotheses are partially confirmed, in line with the results of previous studies concerning gender (Hackshaw et al., 2018; Aubin et al., 2012; Singhal et al., 2012; Harper et al., 2012; King, 2011; Huxley & Woodward, 2011; Burkman, 1988; Willett et al., 1987) and psychiatric disorders (Freedland et al., 2005). Also, the latest research hypothesis about the role of stressors is also partially confirmed, as it has been found in previous research (Pomerleau & Pomerleau, 1989; Epstein, & Perkins, 1988).

6. Conclusion and Suggestions

The benefits of smoking cessation are significant in terms of the risk of develop-

ing and recurring coronary heart disease (Critchley & Capewell, 2012; Baba et al., 2006; Iso et al., 2005; Kawachi et al., 1994). Several studies have found that smoking cessation interventions are effective when they involve psychosocial intervention strategies or the combination of a psychosocial intervention strategy with nicotine replacement therapy or bupropion (Barth et al., 2006, 2015). According to Patnode et al. (2015) behavioral interventions and pharmacotherapy, alone or in combination, are effective in reducing smoking rates in the general adult population. Behavioral interventions, in particular, have been found to help pregnant women and people with mental health conditions quit smoking. Also, the study by Goettler et al. (2020) found that attending a cardiac rehabilitation program after a cardiovascular event was associated with smoking cessation supporting its use as a platform for smoking cessation counseling and relapse prevention.

Dale et al. (2015) and Bae et al. (2021) focus upon the exploitation of mHealth interventions to influence smokers' behaviour and lifestyle and to help self-management of smokers with coronary heath disease. This intervention may include messages concerning health diet, support for smoking cessation, and encouragement for engagement in physical activity, as well as monitoring of physical indexes (e.g. blood pressure).

Finally, a group of studies has focused on the importance of enhancing emotional intelligence as a parameter that can help reduce and stop smoking. Emotional intelligence is related to one's ability to accurately perceive, evaluate, manage, and express one's emotions (Trinidad et al., 2004; Mayer & Salovey, 1997; Salovey & Mayer, 1990). Emotional intelligence mainly includes a person's achievement, adaptability, emotional self-awareness, empathy, mood regulation/self-control, self-evaluation, cognitive ability, conceptual thinking, problem solving, and stress management (Goleman, 2002; Bar-On, 2001). The ability to monitor and use information about one's emotions is important in the context of health behavior, since it can be used to guide thoughts, attitudes, and perceptions (Yadegar Tirandaz et al., 2020; González-Yubero et al., 2020). In the international literature it has been found that high levels of emotional intelligence are a protective factor for smoking (Megías-Robles et al., 2020; Limonero et al., 2006; Trinidad et al., 2004), lower frequency of smoking (Kun & Demetrovics, 2010; Trinidad & Johnson, 2002), lower intention to smoke (Perea-Baena et al., 2011; Trinidad et al., 2004), as well as an inverse relationship with age of smoking initiation (González-Yubero et al., 2020; Limonero et al., 2006).

Consequently, emotional intelligence training can effectively facilitate individuals' adequate adaptation to health conditions (Karimzadeh et al., 2012), while individuals with higher levels of emotional intelligence can better benefit from prevention programs (Trinidad et al., 2004). In previous research, an educational intervention based on emotional intelligence was used to reduce smoking, the results of which showed that it was effective in smoking cessation (Lawrence & Egbule, 2021). Overall, it has been reported by various scholars (Yadegar Tirandaz et al., 2020; Bhochhibhoya & Branscum, 2015; Trinidad et al., 2004;

Trinidad & Johnson, 2002) that educational programs based on emotional intelligence can be beneficial in reducing of smoking addiction and overall the adoption of behaviors that reduce the intention to smoke. Additionally, stress management training and training aimed at enhancing emotional intelligence have been suggested to lead to a reduction in psychopathology in patients with coronary artery disease (Shal & Sharbaf, 2013). Therefore, it is proposed to design and implement educational programs that aim to strengthen and exploit emotional intelligence, both at the level of prevention and treatment of smoking.

Conflicts of Interest

The authors declare no conflicts of interest.

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