Original Research

Factors Affecting Smoking Resumption After Acute Coronary Syndromes

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Introduction: Many patients who are hospitalised for acute ischaemic episodes stop smoking; however, many of them relapse and resume smoking again within three months from their hospitalisation. The aim of this study was to study the factors that might affect smoking resumption in patients who have suffered an acute coronary syndrome.

Methods: We studied 420 patients, active smokers at the time of admission, who were hospitalised for an acute coronary episode. The patients' data (history, risk factors, smoking habits) were retrieved from their medical files. During their hospitalisation they were asked to stop smoking and to attend the smoking cessation clinic to be advised about this. The patients were followed for one year and logistic regression analysis was used to evaluate the independent predictors of smoking resumption and continuation.

Results: Of the total patient population, 280 (66.67%) visited the smoking cessation clinic and followed a special programme. Most relapses were recorded during the first 3 months of follow up, after which time 223 (53.1%) were still smoking, compared with 256 (61.43%) at 1 year. Independent predictors of smoking resumption were: non-participation in the smoking cessation programme (odds ratio, OR: 4.32, p=0.0007); the use of antidepressants (OR: 2.28, p=0.01); a history of vascular disease (OR: 2.32, p=0.03); a history of chronic obstructive pulmonary disease (OR: 1.35, p=0.001; and a decree of nicotine dependency >8 on the Fagerström scale, as recorded in questionnaires (OR: 1.42, p=0.04).

Conclusions: Smokers with acute coronary syndromes should be encouraged to participate in special secondary prevention programmes. Smoking cessation clinics contribute significantly to a reduction in smoking in this group of patients.

The adverse effects of smoking on coronary artery disease (CAD) and on atheromatosis in general are widely known. Smoking is strongly associated with the development and progression of cardiovascular diseases, and indirectly with the prevalence of adverse events (acute ischaemic episodes), morbidity and mortality in the general population.[1,2] In western societies the percentage of smoking-related deaths reaches 25% in those aged 35-69 years.[3]

Also well known are the beneficial effects of smoking cessation in patients who have suffered an acute coronary episode;[4] studies have shown that mortality is significantly greater in smokers who have undergone such an episode and continue to smoke than in those who give up smoking.[5] In addition, the risk of a new episode decreases rapidly after smoking cessation, and 2-3 years after stopping smoking the probability of a new episode is the same as in individuals who have never smoked.[6,7] Furthermore, patients who continue to smoke after a reperfusion procedure have a higher risk of recurrence of an ischaemic episode compared with those who stop smoking.[8]

Most people stop smoking during their

hospitalisation for the ischaemic episode; however, many of them relapse within a short time. Others continue to smoke even after their discharge from hospital and despite strong recommendations from physicians.[9,10]

It appears that there are many factors that influence patients' attempts to stop smoking: personal, epidemiological, psychosocial, and clinical. The aim of this study was to determine the factors that affect patients' efforts and will to give up smoking after an acute coronary syndrome.

Methods

We studied 426 patients (322 men, 104 women, mean age 59.53 ± 7.6 years) who were hospitalised in the hospital's Coronary Care Unit with an acute coronary syndrome between December 2003 and November 2006. These patients were all active smokers –that is, they smoked at least one cigarette, cigar or pipe per day– at the time of admission, or one month prior to admission. Patients aged over 75 years were excluded.

This paper is part of a more general prospective study analysing the risk factors in patients with acute coronary syndromes who were treated in our clinic. The purpose of the larger study is to record the clinical and biochemical indexes of long-term prognosis in this group of patients. For the present study, we selected from the total population of patients who were treated in the Coronary Care Unit those 426 who were active smokers and they were enrolled in this research protocol.

The data were retrieved from the patients' histories and hospital records during their hospitalisation. Specifically, we analysed their clinical, demographic and epidemiological data (previous medical history, risk factors, smoking). In particular, we assessed their degree of nicotine dependence (using the Fagerström questionnaire),[11] their level of motivation or desire to give up smoking,[12] and any use of tranquilliser or antidepressant medication.

During hospitalisation smoking was strictly prohibited in all cases and patients were advised to visit the smoking cessation clinic immediately after their discharge from hospital, for further assistance in the attempt to break their nicotine dependency.

All patients were followed for 12 months after their discharge, by telephone and with scheduled visits to the outpatients' department at 1, 3, 6 and 12 months. Patients who were lost to follow up for any reason or did not come for a scheduled visit were deemed to have continued smoking. One year after hospital discharge the patients were classified into two groups, according to whether they had given up smoking or not: group A (stopped smoking) and group B (resumed smoking).

Statistical analysis

Categorical variables were compared between the two groups using the χ^2 or Fisher's exact test, while for qualitative variables the t-test or Mann-Whitney test was used, depending on the regularity of the variables. Quantitative variables are given as mean values ± standard deviation.

Variables found to differentiate the groups on single factor analysis were introduced into a multi-factorial analysis (logistic regression) in order to determine the factors that were independent predictors of continuing or resuming smoking.[12] The results of the multi-factorial analysis are given as odds ratios and 96% confidence intervals (CI).

A p-value <0.05 was the criterion of statistical significance throughout. Statistical tests were performed using SPSS 9.0 for Windows.

Results

Of the 426 patients originally participating in the study, 5 died during the follow-up period, while 1 patient refused to participate further and was excluded. Finally, 420 patients made up the study population. Group A contained 162 patients (non-smokers: 124 men, 38 women, mean age 59 years), while group B contained 258 patients (relapsed smokers: 196 men, 62 women, mean age 58 years).

Table 1 shows the baseline characteristics of the patients studied. Their mean age was 58 years (range 33-74) and they smoked an average of 16.5 cigarettes per day. The exit diagnosis was acute myocardial infarction (AMI) with ST-segment elevation (STEMI) in 41% of patients, AMI without ST-segment elevation (NSTEMI) in 50.7%, and unstable angina in 8.3% of patients.

According to the patients' history, 34% were hypertensive, 17.4% diabetic, and 30.2% had dyslipidaemia. Also, 12.6% had suffered a prior infarction, 46.4% had experienced episodes of angina, and 11.4% had undergone reperfusion (angioplasty or coronary bypass). Other findings included intermittent claudication (8.3%), cerebrovascular stroke (19.8%) and chronic obstructive pulmonary disease

Table 1. Baseline characteristics of the study population.

Age (years)	58.2 ± 8.6
Male sex, n (%)	320 (76.2)
Fagerström test >8, n (%)	263 (62.6)
Reason for admission:	
STEMI, n (%)	172 (41.0)
NSTEMI, n (%)	213 (50.7)
Unstable angina, n (%)	35 (8.3)
Medical history:	
Hypertension, n (%)	143 (34.0)
Dyslipidaemia, n (%)	127 (30.2)
Diabetes mellitus, n (%)	73 (17.4)
Body mass index (kg/m^2)	26.3 ± 4.1
History of vascular disease, n (%):	208 (49.5)
Myocardial infarction, n (%)	53 (12.6)
Angina, n (%)	195 (46.4)
PCI or CABG, n (%)	48 (11.4)
Cerebrovascular disease, n (%)	39 (9.3)
Intermittent claudication, n (%)	35 (8.3)
COPD, n (%)	83 (19.8)
Antidepressants, n (%)	38 (9.0)
Anti-smoking programme, n (%)	280 (66.7)

STEMI – ST-elevation myocardial infarction; NSTEMI – non ST-elevation myocardial infarction; PCI – percutaneous coronary intervention; CABG – coronary artery bypass grafting; COPD – chronic obstructive pulmonary disease.

(COPD) related to smoking. Finally, 9% were taking antidepressants or sedatives.

After their discharge from hospital, 280 patients (66.67%) visited the smoking cessation clinic and received instructions concerning participation in a special programme for nicotine withdrawal (medication, counselling, and in some cases psychotherapy).

The patients in group B (n=258, 61.4%) were still smoking one year after their discharge from hospital. Most of them (223 patients, 53.1%) stopped smoking initially but relapsed during the first three months post discharge. The patients in group A successfully gave up smoking altogether.

The patients in group B were more likely to have been admitted for NSTEMI (56.8% vs. 47%). In addition, their history showed a higher incidence of cardiac disease, stroke, or COPD. These patients were more dependent on nicotine, as indicated by a Fagerström score >8 (72.9% vs. 46.3%), but only half of them finally participated in the special nicotine desensitisation programme recommended by the smoking cessation clinic. The data from the two groups of patients are given in detail in Table 2.

According to the logistic regression analysis, five factors were independently related with the continuation or resumption of smoking: a history of stroke or COPD, medication with antidepressants or sedatives at the time of admission, and a high Fagerström dependency score (>8). In contrast, participation in the desensitisation programme supervised by the smoking cessation clinic helped patients avoid relapse. Details of the regression analysis are given in Table 3. The

Table 2. Comparison of patients who successfully gave up smoking (group A) and those who resumed smoking (group B).

Baseline characteristics	Group A (n=162)	Group B (n=258)	p
Age (years)	58.8 ± 8.2	57.6 ± 8.1	NS
Male sex, n (%)	124 (76.5)	196 (76.0)	NS
Fagerström test >8, n (%)	75 (46.3)	188 (72.9)	0.0001
Reason for admission:			
STEMI, n (%)	67 (41.4)	105 (40.7)	NS
NSTEMI, n (%)	92 (56.8)	121 (47.0)	0.04
Unstable angina, n (%)	14 (8.6)	21 (8.1)	NS
Medical history:			
Hypertension, n (%)	56 (34.7)	87 (33.7)	NS
Dyslipidaemia, n (%)	53 (32.7)	74 (28.7)	NS
Diabetes mellitus, n (%)	30 (18.5)	44 (17.1)	NS
Body mass index (kg/m^2)	25.9 ± 4.2	26.4 ± 4.0	NS
History of vascular disease, n (%):	57 (35.2)	151 (58.2)	0.002
Myocardial infarction, n (%)	15 (9.3)	38 (14.7)	0.04
Angina, n (%)	35 (21.6)	85 (32.9)	0.02
PCI or CABG, n (%)	13 (8.0)	35 (13.6)	0.04
Cerebrovascular disease, n (%)	10 (6.2)	29 (11.2)	0.04
Intermittent claudication, n (%)	13 (8.0)	22 (8.5)	NS
COPD, n (%)	15 (9.3)	68 (26.4)	0.006
Antidepressants, n (%)	6 (3.7)	32 (12.4)	0.005
Anti-smoking programme, n (%)	134 (82.7)	146 (56.6)	0.0001

NS – non-significant (p<0.05). Other abbreviations as in Table 1.

Table 3. Independent predictors of smoking resumption from multiple regression analysis.

Factors for smoking resumption	Odds ratio (95% CI)	p
Non-participation in desensitisation programme	4.32 (4.06-4.59)	0.0007
Antidepressants	2.28 (1.56-3.24)	0.01
Cerebrovascular disease	2.32 (1.37-3.86)	0.03
COPD	1.32 (1.04-1.89)	0.001
Fagerström test > 8	1.42 (1.05-2.01)	0.04

CI – confidence interval; COPD – chronic obstructive pulmonary disease.

existence of multiple factors was significantly correlated with the probability of continuing or resuming smoking, despite having been hospitalised for an acute ischaemic episode.

Discussion

This study analysed the factors that impeded smoking cessation in a large number of patients who were hospitalised in our Cardiology Department for an acute ischaemic syndrome. These patients were a representative sample of smokers with coronary artery disease. The follow up was carried out through personal contact and was persistent, which explains the high participation.

According to our findings, neither age, sex, familial status nor education were correlated with the cessation of smoking. Other investigators[13] found similar results, although Hasdai et al[14] reported a correlation between young age and resumption of smoking in patients who underwent coronary bypass surgery. Similar conflicting results have been found by other researchers,[15-17] even in random samples of the population.[18]

Patients with a previous cardiac ischaemic episode continued smoking during the follow-up period. According to the literature,[13] this finding, strange as it may seem, has also been noted by other investigators.[16] One would expect the first episode to provide motivation for giving up smoking: however, it appears that these patients make up a special group of smokers who are highly dependent on nicotine. The same applies to those who suffer from COPD or have suffered a stroke.

Patients with mental health problems, who were taking sedatives or antidepressants at the time of their admission, did not succeed in giving up smoking. It is known that coronary artery disease often leads to psychological disturbances that are significantly associated with a strong nicotine dependency and the continuation of smoking.[19,20] Patients with psychological disturbances (neuroses, depression) more often find it difficult to give up smoking. Mayou et al[21] reported that 41% of smokers with psychological disturbances who suffered an infarction and stopped smoking relapsed during the first three months following their discharge from hospital, compared with 10% of those who had no mood disorder. These findings suggest that, in order to give up smoking, these patients need more support than is provided by a usual hospitalisation and follow up in the outpatients' department.

Patients who, for various reasons, did not visit the smoking cessation clinic or did not participate in the desensitisation programme had a higher rate of smoking resumption. The programme appeared to have helped the participants significantly. It is difficult, however, to evaluate this factor, since our study was a simple registry analysis. All patients were given the information and the opportunity to participate and those who did so made up a selected group.

A high dependency on nicotine, as expressed by Fagerström score, was a significant predictive factor for smoking resumption, a finding that agrees with other studies. Hasdai et al[14] reported that in patients who underwent angioplasty, the more cigarettes they smoked before admission to hospital, the greater the probability of smoking relapse after the procedure. In another study,[22] a low nicotine dependency was a significant predictor of giving up smoking in coronary patients.

In these patients, as previous studies have noted, a withdrawal programme offers significant help.[22-24] Carlson et al[25] reported a 53% smoking cessation rate in cardiac patients who participated in such programmes, compared with 29% in those who were given standard treatment.

Hayek et al[22] found that a simple, short interview, advising patients to give up smoking, was not effective; the authors concluded that such counselling practices could not be successful in strongly dependent smokers, when applied as part of the regular therapeutic regimen. Similarly, Bolman et al[23] report-

ed only short-term success in smoking cessation during a follow up of coronary patients by cardiologists or specialised nurses. The recent guidelines of the European Society of Cardiology for the prevention of cardiovascular disease[26] note that encouragement by physicians, no matter how firm or for how long, is not sufficient to make the coronary patient give up smoking; stronger interventions are required. The findings of our study appear to support this guideline, since all patients were given, at least verbally, the advice to stop smoking, whereas only half of them finally complied.

In contrast, there are reports in the literature that participation in special programmes can be successful. Johnson et al[27] reported that smoking patients with cardiovascular problems who did not participate in smoking cessation programmes had a threefold greater risk of relapse, compared with those who had enrolled in special withdrawal and monitoring programmes. Other researchers[28] found an increase in smoking cessation 12 months after discharge from hospital in post-infarction patients who had visited the smoking cessation clinic and participated in special withdrawal programmes and follow up through telephone counselling.

In 1997, Carlsson et al[25] established an extensive programme for desensitisation and secondary prevention in post-infarction patients, in which nurses played a central role. After 12 months follow up, 53% of the participants had stopped smoking, compared to 29% of those who had received usual treatment. Therefore, as also shown by other studies,[29,30] coronary patients who give up smoking need to make significant alterations in their activities and way of life (psychological, social, cultural, etc.). Participation in organised programmes, such as a smoking cessation clinic with coordinated activities (drug therapy, psychological support, motivation, group therapy) is a good solution,[31,32] as the findings of this study show.

In our study, the patients who did not participate in the desensitisation programme did not have good results. However, health care professionals need to invest greater efforts in helping post-infarction patients not only to give up smoking, but also to avoid relapse. Therefore, continuing efforts are required to persuade patients to change their behaviour and way of thinking and to participate in such programmes.[33]

We found no significant difference in motivation questionnaire scores between those who gave up smoking and those who resumed. It seems that post-infarction patients, because of the good clinical and haemodynamic condition they enjoy at the end of their hospitalisation, underestimate the risk of smoking as a factor in secondary prevention. The same finding has been reported by other investigators,[34] while Rigotti et al[35] observed that patients who were candidates for coronary bypass surgery stopped smoking, but without there being any definite change in their behaviour or goals.

Inducement and motivation for giving up smoking have been evaluated in cardiac patients and are measured using special motivation questionnaires, as a function of the intention to quit and the number of previous attempts. Patients who express little optimism about their ability to stop smoking are unlikely to manage it, compared to those who are more positive. Rosal et al[36] reported that those who were determined to give up and ready to take action in that direction had better results compared to those who showed no special interest. Other investigators[37] found that multiple attempts were not especially effective, probably because they reflect a higher degree of dependence on nicotine. Similar results have been reported for the general population.[18]

Limitations

The most important limitation of our study is that we did not measure the levels of carbon monoxide associated with nicotine dependency. However, in an older study[38] it was found that patients are quite honest regarding their smoking habits during follow up, so this limitation is a minor one. Also, patients aged over 75 were not included. Our experience from our smoking cessation clinic shows that it is more difficult to enrol these patients in a programme, while because of their age they often suffer from conditions (liver or kidney failure, diseases of the central nervous system) that do not allow them to take the appropriate medication that could help them give up smoking. Some of them manage to give up through their own efforts, usually temporarily. However, we considered that their inclusion in this study could have skewed the results, as was the case in other similar studies.[39] Finally, we did not examine psychosocial or socio-economic factors that in other studies have been found to influence the result.[40]

Clinical applications

This study shows that there are five independent factors that predict patients' resumption of smoking after

acute coronary syndromes (Table 3) and these should be taken under serious consideration when evaluating the smoking status of these patients. Cardiac patients with these characteristics should be viewed as having a high risk of smoking resumption and extra assistance should be provided to them.

After giving up smoking, patients had a tendency to underestimate the difficulties of freeing themselves from nicotine dependency and thus overestimated their own ability. Health care professionals need to be aware of these difficulties and to be more active in helping these patients.[10] The challenge is to recognise the high risk and to focus support in the direction of withdrawal. The findings of this study could provide a basis for creating a means of stratification of coronary patients according to their risk of smoking resumption and offering these patients better access to smoking cessation clinics.

Future studies should focus on the reason why this group of patients has a high smoking relapse rate and how they differ from those who stop smoking completely, especially with regard to the motivation for giving up smoking and the kind of support they receive from smoking cessation clinics and from health care professionals in general.

Conclusions

Smokers with acute coronary syndromes should be encouraged to participate in special secondary prevention programmes. Smoking cessation clinics contribute significantly to a reduction in smoking in this particular group of patients.

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