

# Cigarette Smoking Habits of Patients with Coronary Heart Disease\*

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We are conducting a retrospective survey of patients with coronary heart disease and our study already includes 800 adult subjects of all ages and both sexes. Our aim is to identify the presence of possible atherogenic factors in our patients, and for this purpose a large number of such factors are being studied.

This communication concerns the 326 male patients in this group who are under 60 years and who presented with classical ischaemic disease. It deals only with the cigarette smoking habits of the group and the possible aetiological role played by smoking.

In attempting to identify likely atherogenic factors there is much to be said for studying the younger age-groups. Coronary heart disease is easier to detect with certainty in younger people and one is left with fewer borderline diagnostic cases. Also, as might be expected, causative influences are likely to be more potent and therefore should be more obvious and easier to identify. Finally, the collection of data involving recall, such as, for example, smoking habits over a lifetime, is more likely to be accurate when dealing with younger people.

## SUBJECTS AND METHODS

Patients included in this study presented with typical cardiac pain and with the characteristic electrocardiogram of myocardial ischaemia. Patients without pain or those with atypical or negative resting and exercise cardiograms were excluded. Patients with bundle-branch block were also excluded except for those with right bundle-branch block, pathological Q waves, and cardiac pain.

Our interpretation of cardiac pain conforms to the recommendations of the World Health Organization  
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(Burgess, Fejfar, and Kagan, 1963). Our standards of electrocardiographic interpretation in cardiac infarction, acute coronary insufficiency, and angina pectoris are referred to in previous publications (Mulcahy, 1958; Babio, Goff, and Mulcahy, 1962; Mulcahy, Goff, and Hickey, 1963).

Figure 1 illustrates our method of recording the cigarette smoking experience of our patients as a "cigarette index". This is a quantitative measure of the patients' smoking and it is arrived at by multiplying the average daily consumption of cigarettes by the number of years of smoking. This method requires careful questioning of the subject, but, allowing for the shortcomings of any such method of recall, it has proved reasonably reliable and, because it measures the subject's lifetime smoking experience, it has advantages over the commoner method of recording the contemporary smoking habits only.

To check the validity of our cigarette consumption data, we have had an independent check made on our cigarette index figures by a trained social worker from the Department of Social Medicine at University College, Dublin. She questioned 100 randomly chosen subjects who had a cigarette index estimation done by us (R.M. or N.H.) previously. There was a fairly close correlation between the two inquiries (correlation coefficient=0.819; SD=0.03), though amongst the very heavy smokers we tended to be more conservative in our estimates (Fig. 2).

Information about the smoking habits of the Irish adult male population was available to us and supplied control material for this study. This information was derived from a sample study conducted in 1961 by Research Services Limited on behalf of the Imperial Tobacco Company (*Statistics of Smoking in the Irish Republic*, 1962).

As well as providing information on the distribution of smokers, ex-smokers, and non-smokers in the adult male and female population of all ages, the results of the 1961 survey enabled us to arrive at an estimate of the total average cigarette consumption or "cigarette index" of the adult population at different ages. This provided

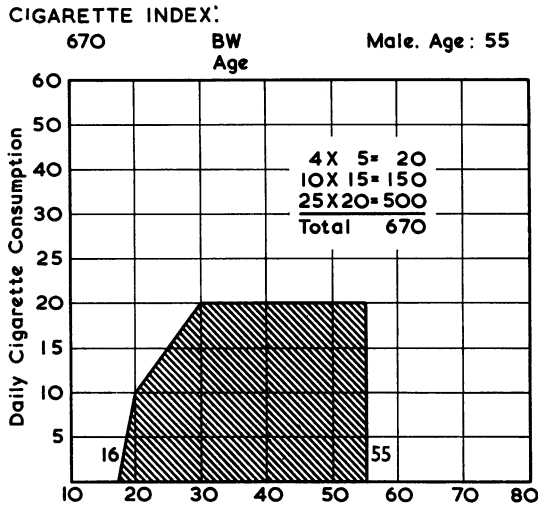


FIG. 1.—Method of recording patient's cigarette consumption.

a quantitative control for our own subjects' total cigarette smoking experience. These control figures were derived as follows.

Data are available for the total national consumption of cigarettes by weight for each year 1926 to 1961. On the basis of Table 9 of *Statistics of Smoking in the Irish Republic* (showing the male/female ratio of cigarette consumption in 1961 in the different age groups) and of the population figures, the total consumption of cigarettes for 1961 was allocated between males and females. No information was available to make a similar allocation for other years, and it was, therefore, assumed that the trend of cigarette consumption per head by women increased uniformly from zero in 1921 to the present level. This appears to have been approximately the case in the United Kingdom as can be judged from Fig. 1, page 3, of the Report of Royal College of Physicians, London (1962) on smoking and health (the smoking habits of the Irish population follow closely those of the British population).

On the basis of these assumptions the total of cigarettes smoked by women in Ireland was calculated at five-yearly intervals 1926 to 1961, and the quantity smoked by men obtained as a difference from the known total consumption. This made it possible to estimate the total consumption per head by men in the years in question. It must be pointed out that, even if the assumption about the consumption by women is not accurate, owing to its relative magnitude any errors involved do not seriously affect the estimated male consumption over the period.

No data were available before 1926 for over-all cigarette consumption and the best that could be done in the light of data in Fig. 1, page 3, of Report of Royal College of Physicians, London, already referred to, was to assume that the male cigarette consumption per head rose uniformly from zero in 1891 to the 1926 average obtained as described above.

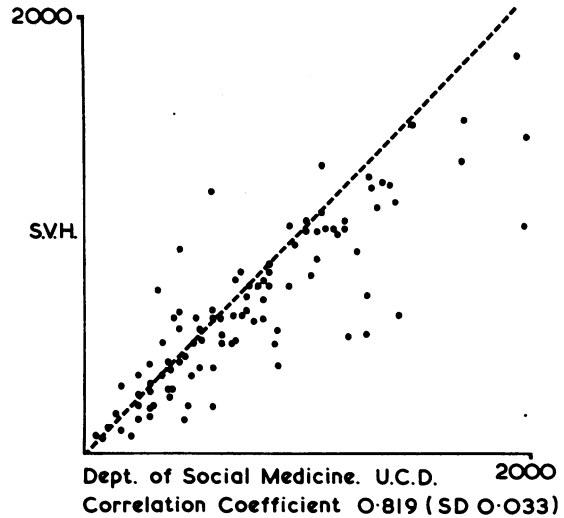


FIG. 2.—Independent assessment of patient's cigarette smoking experience by Department of Social Medicine, University College, Dublin.

Taking these estimates of the Irish male and female consumption of cigarettes it was assumed that, in addition, the relative consumption per head in the various age-groups in 1961 shown in Table IX of *Statistics of Smoking in the Irish Republic* apply to each five-year period. On these assumptions, and taking it that the average of the age specific consumption at the beginning and end of each five-year period operated throughout each five years, estimates were made of the average total number of cigarettes smoked throughout their lives by males and females of different ages in 1961. This total divided by the number of days in the year gave for the average male and female of various ages the "cigarette index" as defined for the purpose of the study. These results are presented in Table I and are graphically shown for males by the continuous line in Fig. 3.

Because the rural male population in Ireland appears to smoke less than four-fifths as heavily as the urban population, and because only 96 of our 326 patients

TABLE I  
ESTIMATED AVERAGE CIGARETTE INDEX FOR  
MEN AND WOMEN OF DIFFERENT AGES  
IN IRELAND, 1961

Age (yr.)	Men	Women
30	133	35
35	187	50
40	232	65
45	267	77
50	297	87
55	315	94
60	329	98
65	314	86
70	297	75
75	280	65
80	268	57

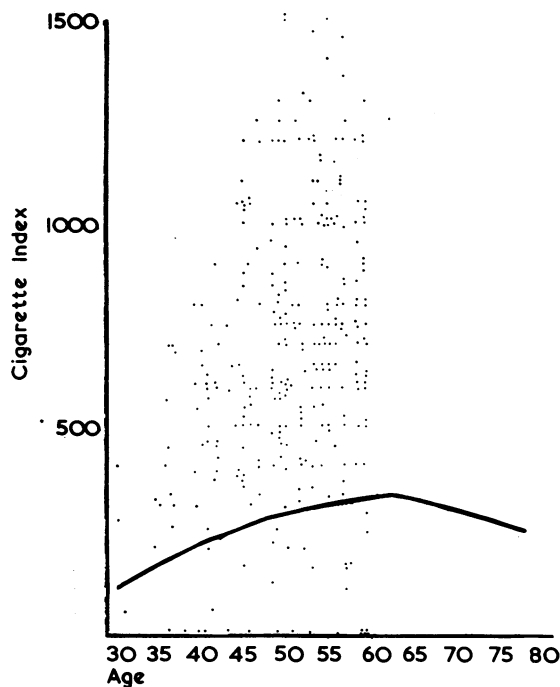


FIG. 3.—Cigarette index of each patient plotted against age and compared to estimated cigarette index of average Irish male population (continuous line).

were of rural origin, an allowance must be made in estimating a comparable national average cigarette consumption curve. To be strictly comparable the figures in Table I need to be slightly raised but this allowance does not exceed 10 per cent.

#### RESULTS

The results of this inquiry are recorded in Tables II to IV, and in Fig. 3. Table II shows the distribution of cases according to diagnosis and includes their mean age and the mean age of each diagnostic group. A relatively small number of cases of angina pectoris is included. This deficiency is largely explained by the age selection of our patients. It is also explained by the fact that patients with angina pectoris and a negative exercise electrocardiogram were rejected for the purpose of this study.

Table III compares the number of cigarette smokers, ex-smokers, and non-smokers amongst our 326 patients, with the experience of the general Irish male population of the same age-group. It is clear from this Table that there is a deficiency of non-smokers and ex-smokers amongst our patients and there is an excess of cigarette smokers. The

TABLE II

DISTRIBUTION OF CASES ACCORDING TO DIAGNOSIS (WITH MEAN AGE OF EACH GROUP)

Diagnosis	No. of cases	Average age (yr.)
Cardiac infarction	179	49.8
Acute coronary insufficiency	88	50.2
Angina pectoris	59	51.9
Total	326	50.3

TABLE III

RATIO OF SMOKERS TO NON-SMOKERS IN 326 MALE PATIENTS UNDER 60 YEARS WITH CORONARY HEART DISEASE COMPARED TO ESTIMATED RATIO IN GENERAL POPULATION FOR AGE-GROUP 35-59 IN 1961

Category	Present inquiry (mean age 50.3)		Male population* (age-group 35-59)	
	No. of cases	%	No. of cases	%
Smokers	293	90	427	70.6
Ex-smokers	18	5.5	68	11.2
Non-smokers	15	4.5	110	18.2
Total	326	100	605	100

Value of  $\chi^2$  calculated from above = 61 (0.1% significance level = 13.8).

\*Source: *Statistics of Smoking in the Irish Republic, 1962.*

difference between the two groups is highly significant.

Table IV illustrates the average cigarette index of the whole group and the figures of the three subgroups of cardiac infarction, acute coronary insufficiency, and angina pectoris. This average figure at 713 contrasts sharply with the figure of 297 which is the estimated cigarette index of the Irish male population of the same average age (50 years).

It is apparent therefore that our patients are heavier smokers than the average male population, and this conclusion is emphasized by Fig. 3 which shows the cigarette index of each patient plotted against his age. The continuous line is drawn to illustrate the smoking experience of the average male population at different ages.

TABLE IV

AVERAGE CIGARETTE INDEX AND AGE OF PATIENTS WITH CARDIAC INFARCTION, ACUTE CORONARY INSUFFICIENCY, AND ANGINA PECTORIS

Diagnosis	No. of cases	Cigarette index	Average age (yr.)
Cardiac infarction	179	719	49.8
Acute coronary insufficiency	88	645	50.2
Angina pectoris	59	787	51.9
Total	326	713	50.3

Note: The estimated average cigarette index of the male population at the age of 50 years is 297 see Table I).

## DISCUSSION

We have shown that our patients with coronary heart disease under 60 years of age are heavy smokers and that relatively few of them are non-smokers. Data about our patients over 60 years show that this strong association with cigarette smoking is less obvious amongst them. Our findings, therefore, are in close accord with those of Hammond and Horn (1958), Doll and Hill (1964), and the Framingham and Albany workers (Doyle *et al.*, 1964), who show that there is emerging from their prospective surveys a strong positive association between cigarette smoking and the presence of overt coronary disease amongst their younger subjects.

Our findings of a heavy cigarette smoking experience amongst patients with angina pectoris differs from the Framingham and Albany results however, which show that, while there is emerging a strong association between cigarette smoking and acute coronary heart disease (cardiac infarction and sudden death), there appears to be no such association with angina pectoris. Our results conform more closely to those of Shapiro *et al.* (1965) who found cigarette smoking positively associated with angina. The Framingham and Albany results were based on small numbers of cases and there was a disparity between the Albany and Framingham experience. Nevertheless, further information is required on the smoking habits of younger patients with angina pectoris.

There is insufficient evidence to show that the association between cigarette smoking and ischaemic heart disease is a causative one. However, there is as yet no reasonable alternative theory to account for this association and there is some circumstantial evidence to implicate cigarettes as a direct cause of atheroma. The acknowledged deleterious effect of smoking on the leg vessels (Juergens, Barker, and Hines, 1960; Eastcott, 1962), the much improved prognosis in patients with peripheral vascular disease who stop smoking (Juergens *et al.*, 1960), the findings through basic research of the complex effects of nicotine on the heart, circulatory dynamics, arteries, and blood elements, including coagulation factors (Horwitz and Waldorf, 1960), platelet survival (Mustard and Murphy, 1963), and fatty acids (Kershbaum *et al.*, 1961), are all consistent with a causative association.

If the association is a causative one, cigarette smoking could be a most important factor in the high morbidity and mortality from coronary heart disease in Ireland, at least in the younger age-groups. This conclusion may be tested by changes in smoking habits which are taking place in these

islands, and indeed in many other western countries. In the past ten years doctors, unlike the general population, have substantially reduced their cigarette smoking (Doll and Hill, 1964). If cigarette smoking is an important primary atherogenic factor the incidence of coronary heart disease should fall in the medical profession. Indeed, Morris (1963) shows that, unlike the rising mortality in the general population, the increase in mortality from this cause in doctors has come to a stop over the past ten years.

## SUMMARY

The cigarette smoking habits of 326 male patients under 60 years with coronary heart disease have been studied and compared to the smoking habits of the general Irish male population. There was a deficiency of non-smokers and ex-smokers amongst the patients, and they were found to smoke more than twice as heavily as the general population. These results correspond closely to the findings in some reported prospective surveys.

The significance of the association between cigarette smoking and coronary heart disease is discussed. If the association is a causative one, cigarette smoking must be heavily implicated as a cause of this disease in the younger age-groups.

Predictions are made about future changes in morbidity and mortality from coronary disease in these islands.

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## REFERENCES

- Babio, J., Goff, A., and Mulcahy, R. (1962). The topography of cardiac infarction: a study of 150 cases in Ireland. *Irish J. med. Sci.*, p. 193.
- Burgess, A. M., Fejfar, Z., and Kagan, A. R. (1963). Arterial hypertension and ischaemic heart disease: comparison in epidemiological studies. 4. Methods recommended for present use. *Chron. Wld Hlth Org.*, 17, 55.

- Doll, R., and Hill, A. B. (1964). Mortality in relation to smoking: Ten years observations of British doctors. *Brit. med. J.*, **1**, 1399.
- Doyle, J. T., Dawber, T. R., Kannel, W. B., Kinch, S. H., and Kahn, H. A. (1964). The relationship of cigarette smoking to coronary heart disease. *J. Amer. med. Ass.*, **190**, 886.
- Eastcott, H. H. G. (1962). Rarity of lower-limb ischæmia in non-smokers. *Lancet*, **2**, 1117.
- Hammond, E. C., and Horn, D. (1958). Smoking and death rates—Report on forty-four months of follow-up of 187,783 men. *J. Amer. med. Ass.*, **166**, 1159 and 1294.
- Horwitz, O., and Waldorf, D. S. (1960). Effect of tobacco smoking on the clotting process in man as measured by thrombelastography. *Circulation*, **22**, 765.
- Juergens, J. L., Barker, N. W., and Hines, E. A., Jr. (1960). Arteriosclerosis obliterans: Review of 520 cases with special reference to pathogenic and prognostic factors. *Circulation*, **21**, 188.
- Kershbaum, A., Bellet, S., Caplan, R. F., and Feinberg, L. J. (1961). Effect of cigarette smoking on free fatty acids in patients with myocardial infarction. *Circulation*, **24**, 970.
- Morris, J. N. (1963). Some current trends in public health. *Proc. roy. Soc. B*, **159**, 65.
- Mulcahy, R. (1958). The importance of the electrocardiogram after exercise in the detection of ischæmic heart disease. *J. Irish med. Ass.*, **42**, 143.
- , Goff, A., and Hickey, N. (1963). A study of the cigarette smoking habits of patients with coronary heart disease. *J. Irish med. Ass.*, **53**, 141.
- Mustard, J. F., and Murphy, E. A. (1963). Effect of smoking on blood coagulation and platelet survival in man. *Brit. med. J.*, **1**, 846.
- Report of Royal College of Physicians, London (1962). *Smoking and Health*. Pitman Medical Publishing Co., London.
- Shapiro, S., Weinblatt, E., Frank, C. W., and Sager, R. V. (1965). The H.I.P. study of incidence and prognosis of coronary heart disease. *J. chron. Dis.*, **18**, 527.
- Statistics of Smoking in the Irish Republic* (1962). Research Services, Ltd., Dublin.