Established cardiovascular disease and CVD risk factors in a primary care population of middle−aged Irish men and women

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Abstract

Contemporary Irish data on the prevalence of major cardiovascular disease (CVD) risk factors are sparse. The primary aims of this study were (1) to estimate the prevalence of major cardiovascular disease risk factors, including Type 2 Diabetes Mellitus, in the general population of men and women between the ages of 50 and 69 years; and (2) to estimate the proportion of individuals in this age group at high absolute risk of cardiovascular disease events on the basis of pre−existing cardiovascular disease or as defined by the Framingham equation. Participants were drawn from the practice lists of 17 general practices in Cork and Kerry using stratified random sampling. A total of 1018 people attended for screening (490 men, 48%) from 1473 who were invited, a response rate of 69.1%. Cardiovascular disease risk factors and glucose intolerance are common in the population of men and women aged between 50 and 69 years. Almost half the participants were overweight and a further quarter met current international criteria for obesity, one of the highest recorded prevalence rates for obesity in a European population sample. Forty per cent of the population reported minimal levels of physical activity and 19% were current cigarette smokers. Approximately half the sample had blood pressure readings consistent with international criteria for the diagnosis of hypertension, but only 38% of these individuals were known to be hypertensive. Eighty per cent of the population sample had a cholesterol concentration in excess of 5 mmol/l. Almost 4% of the population had Type 2 Diabetes Mellitus, of whom 30% were previously undiagnosed. A total of 137 participants (13.5%) had a history or ECG findings consistent with established cardiovascular disease. Of the remaining 881 individuals in the primary prevention population, a total of 20 high−risk individuals (19 male) had a risk of a coronary heart disease event 30% over ten years according to the Framingham risk equation, giving an overall population prevalence of 2.0% (95% CI 1.3 − 3.0). At a risk level 20% over ten years, an additional 91 individuals (8.9%) were identified. Thus a total of 24.4% of the population were at risk either through pre−existing CVD (13.5%) or an estimated 10−year risk exceeding 20% according to the Framingham risk equation (10.9%). Thus a substantial proportion of middle−aged men are at high risk of CVD. The findings emphasise the scale of the CVD epidemic in Ireland and the need for ongoing monitoring of risk factors at the population level and the need to develop preventive strategies at both the clinical and societal level.

Introduction

Vascular deaths accounted for 43% of all deaths in Ireland in 1997[1] and in the 1999 WHO MONICA Project report[2], of 37 centres surveyed, Belfast recorded the 4th highest coronary−event rate in men and the 2nd highest coronary−event rate in women. Contemporary data are lacking on the distribution of cardiovascular disease risk factors in Ireland and in particular, the prevalence of Type 2 Diabetes Mellitus is not well documented[3,4]. Policy formulation and guidelines on the diagnosis and management of cardiovascular disease and its associated risk factors need to be informed by relevant local data.

Evidence is emerging of benefit from treating risk factors for cardiovascular disease (CVD) at levels which are common in the community[5−7]. There is considerable debate on how best to target those with high absolute risk of Coronary Heart Disease (CHD) for primary prevention. A number of composite risk scores designed to identify those at highest absolute risk have been proposed and all recent models have been based on the Framingham Risk Function[9−12]. The choice of a threshold for intervention based on absolute risk is a contentious issue, supported by scientific evidence but constrained by clinical and economic realities.

The primary aims of this study were to estimate the prevalence of major cardiovascular disease risk factors, including Type 2 Diabetes Mellitus, in the general population of men and women between the ages of 50 and 69 years and to estimate the proportion of individuals in this age group at high absolute risk of cardiovascular disease events on the basis of pre−existing cardiovascular disease or as defined by the Framingham equation. This survey employed composite risk scoring to provide an estimate of the absolute risk of major CHD events using the original Framingham Risk Equation[12].

Material and Methods

The Cork and Kerry Diabetes and Heart Disease Study is a cross−sectional study based in primary care. Participants were drawn from the practice lists of 17 general practices affiliated with the Cork Training Programme for General Practice. These practices are broadly representative of the socio−economic profile of the area, with six urban and 11 rural practices. Fifteen practices are in Co. Cork and two are in Co. Kerry. Stratified random sampling by age and sex was employed to recruit equal numbers of men and women in four quartiles between the ages of 50 to 69 years. The field survey work was conducted between March and August 1998. Subjects with cardiovascular disease, known diabetes mellitus or other disease, or those receiving medication, were not excluded.

1018 of the 1473 who were invited to participate attended for the assessment, a response rate of 69.1%. Allowing for those who could not attend by reason of being: hospitalised (N=5); out of the country (N=5); no longer alive (N=2); outside the target age group (N=2); too confused (N=1) and untraceable (N=2), the effective response rate was 1018/1456 = 69.9%.

Candidates were invited by letter, co−signed by their participating GP, explaining the aims of the study and accompanied by a reply slip and detailed questionnaire. Non−responders were followed up with a phone call where possible and otherwise with a single postal reminder.

Participants attended the surgery twice, initially between 8am and 10am for fasting bloods (minimum fast of 8−hours) and then later that day for a series of physical measurements and to ensure that the study questionnaire had been completed. Informed consent was obtained from each participant before commencing the assessment. Blood samples were taken for fasting glucose and lipoprotein profile and for glycosylated haemoglobin (HBA1c), full blood count (FBC) and biochemical profile. Analyses were performed in the Haematology and Biochemistry laboratories at the Cork University Hospital. Full blood counts (FBC) were analysed using the Sysmex XE 2100 analyser. Lipoprotein profile and blood glucose were analysed using the Roche Hitachi 747 Multichemistry analyser and the Olympus 640 Discrete analyser. Glycosylated haemoglobin was measured using the KDK Coorporation Hi−Auto Alc HA−814 system. Physical measurements included height; weight; blood pressure and pulse rate (3 readings); waist−hip ratio (2 readings) and 12 lead ECG. To ensure standardisation, all procedures were carried out with reference to the detailed guidelines contained in the studys "Standard Operating Procedures Manual" and all results were recorded on a standard "Clinical Report Form".

The prevalence of Type 2 DM and Impaired Fasting Glucose (IFG) was estimated by measurement of fasting plasma glucose, using the revised diagnostic criteria of the American Diabetes Association, 1997. These have been defined on the basis of fasting plasma glucose 7mmol/l and fasting plasma glucose 6.1mmol/l and <7mmol/l respectively. These criteria are in accordance with current recommendations from both the American Diabetes Association (ADA)[13] and the World Health Organisation (WHO)[14] for use in epidemiological studies of diabetes prevalence.

Subjects were overweight with a Body Mass Index (BMI =weight in kg/height in m2) between 25 kg/m2 and 29.9 kg/m2 inclusive and obese with a BMI 30kg/m2. Current cigarette smoking and rates of physical activity were based on responses to a standard questionnaire[15]. Current smokers were those who responded yes to the question "Do you regularly smoke cigarettes at present?" or "Do you currently smoke tobacco in any other form (e.g. pipe, cigar)?". The physical activity questionnaire addressed exercise associated with travel to work, weekend activities and the frequency of active physical exercise such as running, swimming, golf, tennis, squash, jogging, bowls, cycling, hill−walking or dancing. The diagnosis of hypertension was based on either a self−reported history of hypertension and on anti−hypertensive medication or on the basis of the mean of the latter two of three readings 140/90, as recommended in current international guidelines[16,17].

Pre−existing cardiovascular disease was determined by a self−reported history of myocardial infarction or angina (and/or a history of a Coronary Artery Bypass Graft or Coronary Artery Angioplasty) or a positive 'Rose Questionnaire'18 or a history of either a stroke, peripheral vascular disease or abdominal aortic aneurysm or where there was evidence of a definite previous Myocardial Infarction (MI) on an analysis of the electrocardiographs (ECG) by an experienced cardiologist i.e. a pathological 'Q wave' >1mm wide and > 3mm deep. We used Minnesota Codes 3−1 or 3−3 plus (4−1−1, 4−1−2 or 4−2) plus (5−1 or 5−2), using the anterolateral leads, to define definite left ventricular hypertrophy (LVH).

The proportion of the population at high risk of a first coronary heart disease event was estimated using the Framingham risk equations12 which incorporate and allow for the relative impact of the common variables which contribute to this risk: age; sex; smoking; systolic blood pressure; diabetes mellitus; total cholesterol/high density lipoprotein (HDL) cholesterol ratio and Left Ventricular Hypertrophy (LVH) by electrocardiographic (ECG) criteria. The CHD outcome we have used consists of MI, CHD death, angina pectoris and coronary insufficiency. 'High−risk' is defined as an absolute risk of a CHD event 30% over 10 years. The effect of lowering this 'high−risk' threshold to 20% and to 15% over 10 years respectively, on the proportion of the population deemed to be at risk, was also estimated. The primary prevention population included all those without pre−existing CVD.

The Ethics Committee of the Cork Teaching Hospitals approved the study protocol.

Results

Men accounted for 48.2% of participants in the study. Overall, 42% of the female population and 52% of the male population were overweight while 26% of the female population and 25% of the male population were obese. The proportion overweight and obese were broadly similar across the four age strata between 50 and 69 years (Figure 1). The mean BMI was 27.9 (s.d. 4.06) for men and 27.4 (s.d. 4.70) for women. The waist−to−hip ratio exceeded 0.9 in 88.8% of men aged 50−54, rising to 92.4 % of men aged 65−69; waist−to−hip ratio exceeded 0.85 in 54.8% of women aged 50−54, rising to 60.5% of women aged 65−69.

Participation in physical exercise was generally not high. A total of 40% of the study population reported being inactive or only occasionally active (Figure 2). In addition, a total of 192 individuals, 18.9% (95% CI 16.5 − 21.4) reported that they currently smoked cigarettes or tobacco, 20.6% of males and 16.5% of females.
The mean total cholesterol among men was 5.61 mmol/l (s.d. 0.88) and the mean total cholesterol among women was 6.06 mmol/l (s.d. 1.01). The total cholesterol concentration exceeded 5mmol/l in a total of 836 individuals (82.2%). In excess of 70% of men and in excess of 80% of women in all four age strata had total cholesterol concentrations 5.0 mmol/l. In addition, 759 (74.6%) had a Low−Density Lipoprotein (LDL) cholesterol concentration greater than 3.0 mmol/l, 44 (4.3%) had High Density Lipoprotein (HDL) cholesterol concentrations below 0.9 mmol/l (men) or 1.0 mmol/l (women). A total of 301 (29.6%) had triglyceride concentrations exceeding 1.7 mmol/l. The principal risk factors employed by the Framingham risk score, including cholesterol levels, are documented by age group and sex in Table 1.

Table 1 The percentage prevalence of each risk factor contained in the Framingham composite risk score, by age group and sex

		50−54	55−59	60−64	65−69	All
Waist:Hip ratio > 0.9 (men) or 0.85 (women)	m	88.8	89.3	92.7	92.4	90.8
	f	54.8	55.5	54.1	60.5	56.2
Smoker	m	24.1	31.4	9.8	18.3	20.9
	f	20.6	15.3	17.8	14.7	17.1
LDL Cholesterol	m	69.8	67.8	69.1	75.6	70.6
	f	71.4	76.6	83.0	81.4	78.1
HDL Cholesterol	m	6	3.3	8.1	5.3	5.7
	f	1.6	2.9	3.0	4.7	3.1
Hypertension	m	39.7	52.9	55.3	55	50.7
	f	25.4	44.5	46.7	57.4	43.5
History of CVD	m	13.8	18.2	15.4	23.7	17.8
	f	4.8	5.8	8.1	19.4	9.5

The prevalence rate for Type 2 Diabetes Mellitus was 3.9% (95% CI 2.9 − 5.4) and the prevalence rate was higher in males and in the older age groups. One individual had Type 1 Diabetes Mellitus. Seventy percent of all diabetics (28/40) had already been diagnosed. The prevalence rate for Impaired Fasting Glucose (IFG) was 2.5% (95% CI 1.6 − 3.6). The prevalence rate was higher in males and in the older age groups. In males 65 years or older, over 13% had either Type 2 DM or IFG. The corresponding prevalence rate for women in this age group was 7%.

The prevalence rate for hypertension was 47% (480/1018). A total of 182 (38%) of these individuals had a documented history of hypertension and were on anti−hypertensive medication. Only 74 (41%) of individuals in this latter group had blood pressure readings below 140/90, the current target level recommended in international guidelines[16,17]. A total of 9 (0.8%) individuals had left ventricular hypertrophy by ECG criteria.

The overall prevalence of pre−existing cardiovascular disease was 13.5% (137/1018). The prevalence was higher in males and with increasing age. A total of 114 of these individuals reported a history of CVD, a further 11 were detected using the Rose questionnaire only and 12 had evidence of a previous Myocardial Infarction using ECG criteria only. Of the 114 with self−reported CVD, 68% were taking aspirin, 6.1% were taking Warfarin and 23.7% were taking a statin (lipid lowering drug).

Of the 881 individuals in the primary prevention population, the Framingham risk equation identified 20 with a risk of a CHD event 30% over ten years, 19 of whom were men, giving an overall population prevalence of 2.0% (95% CI 1.3 3.0). Considering a lower risk threshold of 20% over 10 years, 10.9% of the population would be considered to be at high absolute risk of a CHD event, in addition to the 13.5% with pre−existing CVD. Lowering the risk threshold further, to 15% over 10 years, would include an additional 10% of the population (Figure 3).

Discussion

The burden of cardiovascular disease in Irish society is reflected in the high prevalence rates of common CVD risk factors observed in this study. Almost half of the participants were overweight and one in four was obese. Forty percent of the population reported having no physical exercise or only occasional physical exercise on a weekly basis.

The prevalence of obesity in this study is higher than that reported in the 1985 Kilkenny Health Project population survey[3,4] and is one of the highest reported in a European population sample. The Kilkenny Heart Project has reported findings from a random population sample of 784 men and women aged 35 to 64 years. The mean BMI in the Kilkenny study (in those aged 55−64 years) was 26.7 kg/m2 in men and 25.9 kg/m2 in women, as compared with 28.4 kg/m2 in men and 27.3 kg/m2 in women in the same age group in the present study. The overall prevalence of obesity in the Kilkenny study was 13.7% in men and 19.0% in women, a lower prevalence than in the current study, even allowing for the different age profile o the two samples.

The 1998 National Health and Lifestyle Surveys (SLAN) carried out in the Republic of Ireland[19] estimated that, in the 50−69 year age−group, 41% of this population were overweight and 15% were obese, compared with 47% and 26% respectively in the Cork and Kerry study. The SLAN study figures quoted here are based on a national postal survey with self−reported height and weight. The high proportion of overweight and obese individuals in the Irish population is similar to findings in other countries[20].

Lack of physical exercise is a significant factor in the increasing prevalence of both obesity and Type 2 DM[21,22]. The prevalence of smoking in this study (18.9%) is lower than that reported from the SLAN survey (25%), a difference which may reflect the different sampling strategies in the two surveys[19]. In the Kilkenny Health Project, the smoking prevalence was 27.7% in men and 27.1% in women.

The high proportion of this population with hypertension and the estimated numbers with undiagnosed and inadequately treated hypertension is in keeping with previously reported surveys on the detection and management of hypertension[23,24].

About 82% of the study population had a high total cholesterol concentration (5 mmol/l) and 75% a high Low−Density Lipoprotein (LDL) cholesterol concentration. It is interesting to note that while mean total cholesterol concentration is lower in both the men and women when compared to findings from the 55−65 year age group in the Kilkenny Health Project[3,4] this has occurred against a background of increasing obesity.

A total of 3.9% of the population sample had Type 2 Diabetes Mellitus. The prevalence rate for Type 2 DM in this study is in keeping with rates from cross−sectional surveys and national health data interviews from the UK[25] and the US[26, 27]. In the US there has been a 33% increase in diagnosed diabetes from 1991 to 1998 and this increase is highly correlated with the increasing prevalence of obesity[27,28].

Consistent with the high prevalence of CVD risk factors in this sample, over 13% of the middle−aged population of males and females had evidence of established cardiovascular disease. While there is widespread consensus on optimal management of those with pre−existing CVD1, it has been documented repeatedly that management of such individuals is generally sub−optimal[29]. This has been reflected in the findings of this study on the use of Aspirin and Statins and on the management of hypertension. There is potential for significant improvements in this area.

In estimating an individual's risk of CHD, it is necessary to consider all the factors that might contribute to this risk rather than looking at a single risk factor in isolation. The use of composite risk scores ensures that those at high absolute risk are targeted for intervention, thus maximising the benefit of relative risk reduction[30,31].

In addition to those with pre-existing CVD, a further 2% of the population was deemed to have an absolute risk of having a first Coronary Heart Disease event 30% over 10 years using the Framingham risk equation. The absolute numbers in the "high risk" category depend on the threshold chosen to define 'high absolute risk'. If we were to adopt a a risk threshold of 20% over 10 years, 10.9% of the population would be considered to be at high absolute risk of a CHD event, in addition to the 13.5% with pre-existing CVD. The question of the optimal risk score for use in the Irish population merits careful consideration. Regardless of which risk score is chosen, it is crucial that we put in place mechanisms to detect and manage those with pre-existing CVD and those with an absolute risk of a first CHD event 30% over 10 years.

The fact that one-quarter of the middle-aged population might be considered to be at high risk for cardiovascular disease emphasises the need for broad population-based strategies in parallel with the 'high-risk' case-finding approach. Ultimately, control of the CVD epidemic in Ireland will depend on the successful implementation of strategies to promote smoking cessation, increased levels of physical activity and a healthier diet with fewer calories, less saturated fat and salt intake and increased intake of fruit and vegetables. We now know what is required to tackle the cardiovascular disease epidemic. The challenge that we face is to translate this knowledge into effective policies, acting at both the individual and societal level.

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