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CARDIOVASCULAR MEDICINE

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Objective: To examine the epidemiology, primary care burden and treatment of angina in Scotland.
Design: Cross-sectional data from primary care practices participating in the Scottish continuous morbidity recording scheme between 1 April 2001 and 31 March 2002.
Setting: 55 primary care practices (362 155 patients).
Participants: 9508 patients with angina.
Results: The prevalence of angina in Scotland was 28/1000 in men and 25/1000 in women ($p < 0.05$) and increased with age. The prevalence of angina also increased with increasing socioeconomic deprivation from 18/1000 in the least deprived category to 31/1000 in the most deprived group ($p < 0.001$ for trend). The incidence of angina was higher in men (1.8/1000) than in women (1.4/1000) ($p = 0.004$) and increased with increasing age and socioeconomic deprivation. Socioeconomically deprived patients (0.48 contacts/patient among the most deprived) were less likely than affluent patients (0.58 contacts/patient among the least deprived) to see their general practitioner on an ongoing basis $p = 0.006$ for trend). Among men, 52% were prescribed β blockers, 44% calcium channel blockers, 72% aspirin, 54% statins and 36% angiotensin converting enzyme inhibitors or angiotensin receptor blockers. The corresponding prescription rates for women were 46% ($p < 0.001$), 41% ($p = 0.02$), 69% ($p < 0.001$), 45% ($p < 0.001$) and 30% ($p < 0.001$). Among patients < 75 years old 52% were prescribed a β blocker and 58% a statin. The corresponding figures for patients ⩾ 75 years were 42% ($p < 0.001$) and 31% ($p < 0.001$).
Conclusions: Angina is a common condition, more so in men than in women. Socioeconomically deprived patients are more likely to have angina but are less likely to consult their general practitioner. Guideline-recommended treatments for angina are underused in women and older patients. These suboptimal practice patterns, which are worst in older women, are of particular concern, as in Scotland more women (and particularly older women) than men have angina.

Angina is an important clinical manifestation of coronary heart disease. In addition, in patients with angina the risk of future cardiovascular events can be prevented with aggressive secondary prevention.[1 2] Despite this, both the contemporary epidemiology and primary care burden of this condition are remarkably poorly described. Most existing studies were conducted at least a decade ago. The majority examined selected cohorts (for example, male civil servants, with resultant under-representation of women and the elderly) and used patient questionnaires to diagnose angina.[3–9] One study, carried out in 1984, used nitrate prescriptions as a proxy for the diagnosis of angina.[10] Another study, conducted by the Northern Region Faculty of the Royal College of General Practitioners, did try to identify patients with a physician-reported diagnosis of angina.[11] This survey, however, which was conducted in 1979 by 51 general practitioners in the Newcastle region in England, focussed only on patients aged 30–59 years.

Not only is the contemporary public health burden of angina poorly described but so is its treatment. With the emergence of new evidence-based treatments,[1 2] publication of guidelines[12 13] and government-directed national health-improvement programmes in coronary heart disease,[14] the analysis of current prescribing patterns for angina is relevant and topical.

The Scottish continuous morbidity recording (CMR) in general practice scheme prospectively collects detailed information from several general practices, broadly representative of the whole Scottish population.[15–17]

We have used this scheme to give a more contemporary picture of the epidemiology, primary care burden and treatment of physician-diagnosed angina than existing studies would.

METHODS

CMR practice data are compiled by the Primary Care Clinical Informatics Research Unit based at the University of Aberdeen. The informatics unit collates both prescribing and morbidity data from 55 general practices with a total practice population of 362 155 fully registered patients (7% of the Scottish population). All people resident in Scotland (including children) are registered with primary care, which is free at the point of contact and manages the treatment of patients once they are discharged from hospital. Secondary care is usually accessed through a general practitioner based in a primary care practice.

Trained entry clerks in the general practices participating in the CMR scheme have recorded the reason for every face to face doctor–patient contact since March 1996.[15–17] Information is collected on the index condition and up to

10 concomitant medical problems. Each diagnosis is given a read code[18] along with an appropriate modifier of ''first'', ''recurrent'' or ''persistent'' to denote whether the problem is new, a recurrence of a previous problem or a continuing problem, respectively. The information and statistics division administers the CMR project and operates a continuous quality assurance system for completeness and accuracy of entry. In 1999–2000 the completeness of capture of contacts was 91% and the accuracy of read coding was 91%. From the dataset, we identified all patients registered with the practice who had a computer record of angina. The practices record encounters as clinical diagnoses based on a general practice diagnosis supplemented (especially for serious conditions) by investigation and diagnostic input from specialist colleagues. The long-term nature of the database and its clinical focus ensure that initially uncertain events are confirmed or refuted over time and the diagnostic codes are amended appropriately.[19 20]

For the year 1 April 2001 to 31 March 2002 we identified all patients who had a record of ever having angina (including stable and unstable angina). To calculate prevalence the denominator used was the total registered practice population for that year. We also estimated incidence by including all patients with a read code for angina during the year ending March 2002 that had a modifier of ''first''.

General practitioners were asked to record a ''contact'' for a condition only if the patient presented with that condition or if the consultation was relevant to the condition in question (for example, involving a change of drug for the condition).

Contact rates (total number of consultations or attendances for the year where that condition was indicated as relevant to the visit) were also calculated. The average number of contacts for each patient was calculated by dividing the number of contacts for angina by the number of patients with angina.

As patients attending the CMR practices are representative of the Scottish population, the CMR data were used to estimate prevalence, incidence and contact rates for the whole Scottish population (5.1 million) on an age- and sex-specific basis, derived from the 2001 census.

Postcodes of residence were used to assign a Carstairs deprivation category from 1 (least deprived) to 5 (most deprived) to each patient.[21]

Practices routinely record prescribing data on the General Practice Administration System for Scotland computer system.[19]

Statistical analysis

We used χ^2 tests and χ^2 tests for trend to compare prevalence, incidence, contact rates and prescribing data between different age groups and deprivation categories. By using the drug of interest as the dependent variable we analysed multivariate logistic regression to examine the independent effects of age, sex and deprivation category on prescribing of different angina drugs. The odds ratios (ORs) were adjusted for the potential prognostic factors sex, age, deprivation category, type of general practitioner and co-morbidity (including prior myocardial infarction, hypertension, heart failure, stroke, atrial fibrillation and chronic obstructive airways disease).

RESULTS

Prevalence

The overall prevalence of angina was 28/1000 in men and 25/1000 in women (1.57 first, 7.70 recurrent and 20.65 persistent). The prevalence of angina was lower in women than men at all ages ($p < 0.05$). In men the prevalence was extremely low in those < 45 (1/1000) increasing to 141/1000 in those ⩾ 75 years. In women the prevalence of angina was 108/1000 in those ⩾ 75 years. The highest prevalence in both sexes was in the age range 75–84 years. Although the prevalence was higher in men than in women, the greater number of elderly women in the population meant that more women than men aged ⩾ 75 years had angina and that, overall, almost as many women as men had angina (table 1).

The prevalence of angina increased with increasing socioeconomic deprivation from 18/1000 in the least deprived group to 31/1000 in the most deprived group—that is, socioeconomically deprived patients had a 72% higher prevalence of angina than did affluent patients ($p < 0.001$ for trend). Similar significant trends were seen in men and women (table 2).

Extrapolating from the CMR practices to the whole of Scotland, the estimated number of Scots with angina in 2001 was 133 131 (67 867 men), 68% of whom were ⩾ 65 years old and 32% of whom were ⩾ 75 years.

Incidence

The overall incidence of angina for 2001–2 was 1.6/1000. The incidence was higher in men (1.8/1000) than in women (1.4/1000). As with prevalence, the incidence of angina greatly increased with age from 0.1/1000 in men < 45 years to 6.5/1000 in men aged 65–74 years, and thereafter declined by 50% to 3.1/1000 in men ⩾ 85 years. In women the incidence of angina also increased with age, although it peaked in the 75–84 year age group (5.8/1000) and thereafter declined to 3.2/1000 in those ⩾ 85 years. In those ⩾ 65 years, the incidence of angina was 6.1/1000 in men and 4.7/1000 in women (table 1).

The incidence of angina increased with increasing socioeconomic deprivation from 0.8/1000 in the least deprived stratum to 2.2/1000 in the most deprived stratum ($p < 0.001$ for trend)—that is, socioeconomically deprived men were twice as likely to develop angina and socioeconomically deprived women were three times more likely to develop angina compared with affluent men and women (table 2).

The estimated number of Scots presenting with angina for the first time in the year 2001 was, therefore, 8099 (4378 men), 53% of whom were aged ⩾ 65 years and 23% of whom were ⩾ 75 years old.

Contact rates

One-year contact rates for angina were higher in men (15.7/1000) than in women (12.3/1000). Contact rates increased with age. These were extremely low in patients < 45 years old, increased 48-fold in men and 44-fold in women from < 45 years to 45–64 years and more than doubled again between 45–64 years and ⩾ 65 years. Contact rates per 1000 population were highest in both sexes in the age group 75–84 years (table 1). Men and women with angina had about three times as many general practitioner contacts a year as those without angina and, for men and women with angina, contacts for angina (as opposed to other reasons) accounted for about one in 20 of all general practitioner contacts made.

On average, patients with angina saw their general practitioner 0.5 times per annum.

For both men and women, the highest number of contacts for each patient with angina was in the 45–54 year age band (0.8 in men and 0.7 in women). After this, in contrast with prevalence and incidence, the number of contacts declined with age (table 1). Compared with men, women aged 45–64 years and ⩾ 85 years had fewer contacts per patient per year ($p < 0.05$).

The number of contacts per patient with angina declined with increasing socioeconomic deprivation so that patients in the most deprived group were 33% less likely to see their general practitioner on an ongoing basis than were affluent patients (table 2).

Table 1 Contact rates, incidence and prevalence per 1000 population by sex and age group for all continuous morbidity recording practices in Scotland for the year ending March 2002

Age group	Practice population 2001–2	No of patients with angina ever	Prevalence	No of first diagnoses of angina	First ever incidence	No of contacts for angina	Contact rate	No of contacts per patient
Men								
<45	110080	137	1.2	16	0.1	71	0.6	0.52
45–54	25763	566	22.0	63	2.4	463	18.0	0.82
55–64	19929	1313	65.9	98	4.9	859	43.1	0.65
65–74	13740	1713	124.7	89	6.5	784	57.1	0.46
75–84	7256	1061	146.2	44	6.1	540	74.4	0.51
⩾85	1628	187	114.9	5	3.1	83	51.0	0.44
⩾65	22624	2961	130.9	138	6.1	1407	62.2	0.48
⩾75	8884	1248	140.5	49	5.5	623	70.1	0.50
All ages	178396	4977	27.9	315	1.8	2800	15.7	0.56
p value for trend for age			<0.001		<0.001		<0.001	<0.001
Women								
<45	106743	69	0.6	7	0.1	48	0.4	0.70
45–54	25185	364	14.5	39	1.5	264	10.5	0.73
55–64	20304	965	47.5	60	3.0	541	26.6	0.56
65–74	15959	1454	91.1	70	4.4	668	41.9	0.46
75–84	11241	1294	115.1	65	5.8	612	54.4	0.47
⩾85	4327	385	89.0	14	3.2	121	28.0	0.31
⩾65	31527	3133	99.4	149	4.7	1401	44.4	0.45
⩾75	15568	1679	107.8	79	5.1	733	47.1	0.44
All ages	183759	4531	24.7	255	1.4	2254	12.3	0.50
p value for trend			<0.001		<0.001		<0.001	<0.001
Both sexes								
<45	216823	206	1.0	23	0.1	119	0.5	0.58
45–54	50948	930	18.3	102	2.0	727	14.3	0.78
55–64	40233	2278	56.6	158	3.9	1400	34.8	0.61
65–74	29699	3167	106.6	159	5.4	1452	48.9	0.46
75–84	18497	2355	127.3	109	5.9	1152	62.3	0.49
⩾85	5955	572	96.1	19	3.2	204	34.3	0.36
⩾65	54151	6094	112.5	287	5.3	2808	51.9	0.46
⩾75	24452	2927	119.7	128	5.2	1356	55.5	0.46
All ages	362155	9508	26.3	570	1.6	5054	14.0	0.53
p value for trend			<0.001		<0.001		<0.001	<0.001

Table 2 Incidence, prevalence, and contact rates (per 1000 population), stratified by socioeconomic status for year ending March 2002

Deprivation category	Practice population	No of patients with angina	Prevalence	No of first diagnoses of angina	First ever incidence	No of contacts for angina	Contact rate	No of contacts per patient
Men								
1 (least)	39277	768	19.6	36	0.9	491	12.5	0.64
2	34298	898	26.2	57	1.7	448	13.1	0.50
3	54240	1622	29.9	102	1.9	884	16.3	0.55
4	34221	1163	34.0	89	2.6	718	21.0	0.62
5 (most)	15612	511	32.7	31	2.0	255	16.3	0.50
Odds ratio between category 1 and 5			1.70		2.17		1.31	0.56
95% CI			1.51 to 1.90		1.34 to 3.51		1.13 to 1.53	0.45 to 0.71
p for trend			<0.001		<0.001		<0.001	0.142
Women								
1 (least)	40488	677	16.7	30	0.7	343	8.5	0.51
2	36070	815	22.6	42	1.2	429	11.9	0.53
3	55976	1501	26.8	86	1.5	759	13.6	0.51
4	34614	1067	30.8	60	1.7	511	14.8	0.48
5 (most)	15908	458	28.8	37	2.3	207	13.0	0.45
Odds ratio between category 1 and 5			1.74		3.14		1.54	0.80
95% CI			1.55 to 1.97		1.94 to 5.09		1.30 to 1.84	0.63 to 1.02
p for trend			<0.001		<0.001		<0.001	0.015
Both sexes								
1 (least)	79765	1445	18.1	66	0.8	834	10.5	0.58
2	70368	1713	24.3	99	1.4	877	12.5	0.51
3	110216	3123	28.3	188	1.7	1643	14.9	0.53
4	68835	2230	32.4	149	2.2	1229	17.9	0.55
5 (most)	31520	969	30.7	68	2.2	462	14.7	0.48
Odds ratio between category 1 and 5			1.72		2.61		1.41	0.67
95% CI			1.58 to 1.87		1.86 to 3.66		1.26 to 1.58	0.57 to 0.79
p for trend			<0.001		<0.001		<0.001	0.006

Table 3 Proportion of patients with angina seen in the year ending March 2002 with a specified concomitant condition or illness

Condition/illness	CMR angina patients		Total CMR practice population*	
	Men (n = 4977)	Women (n = 4531)	Men (n = 178396)	Women (n = 183759)
Upper respiratory tract infection	1915 (38.5%)	2224 (49.1%)	57620 (32.3%)	76901 (41.9%)
Hypertension	1685 (33.9%)	1904 (42.0%)	14232 (8.0%)	19283 (10.5%)
Pain in limb	1330 (26.7%)	1564 (34.5%)	18323 (10.3%)	25670 (14.0%)
Backache	1279 (25.7%)	1570 (34.7%)	31071 (16.9%)	23254 (13.0%)
Chest infection	1291 (25.9%)	1458 (32.2%)	10945 (6.1%)	14809 (8.1%)
Dyspepsia	1142 (22.9%)	1243 (27.4%)	13270 (7.4%)	15600 (8.5%)
Depressive disorder	474 (9.5%)	816 (18.0%)	8096 (4.5%)	18437 (10.0%)
Chronic obstructive airways disease	609 (12.2%)	629 (13.9%)	3949 (2.2%)	4461 (2.4%)
Diabetes	661 (13.3%)	501 (11.1%)	4538 (2.5%)	3936 (2.1%)
Myocardial infarction	647 (13.0%)	357 (7.9%)	1470 (0.8%)	745 (0.4%)

*p<0.01 for difference in proportion of continuous morbidity recording (CMR) angina patients and total CMR practice population.

Concomitant medical conditions

Table 3 shows the top 10 concomitant medical problems in patients consulting with angina. In both sexes, upper respiratory tract infection was the most common reason for general practitioner consultation and the most common concomitant diagnostic coding in patients with angina (39% of men and 49% of women). Hypertension was the second most frequently coded, reported for 34% of men and 42% of women. After adjustment for age, women were more likely than men to have concomitant respiratory problems (upper respiratory tract infection, $p < 0.001$; chest infection, $p < 0.001$; chronic obstructive airways disease, $p = 0.035$), hypertension ($p < 0.001$), backache ($p < 0.001$), dyspepsia ($p < 0.001$) and depression ($p < 0.001$) and men were more likely than women to have diabetes ($p = 0.003$), pain in a limb ($p < 0.001$) and myocardial infarction ($p < 0.001$).

Pharmacological treatment

Table 4 shows the drugs prescribed for patients with angina stratified by age. A β blocker was prescribed for 49%, a calcium channel blocker for 43%, a nitrate for 56%, an angiotensin converting enzyme (ACE) inhibitor, an angiotensin receptor blocker or both for 33%, a statin for 50% and an antiplatelet agent for 73%.

There were significant sex differences in prescribing. Of men, 52% were prescribed a β blocker, 44% a calcium channel blocker, 72% aspirin, 54% a statin, 36% an ACE inhibitor or an angiotensin receptor blocker and 20% optimal evidence-based treatment (that is, an antiplatelet drug plus a statin plus an ACE inhibitor). The corresponding prescription rates for women were 46% ($p < 0.001$), 41% ($p = 0.02$), 69% ($p < 0.001$), 45% ($p < 0.001$), 30% ($p < 0.001$) and 14% ($p < 0.001$). The prescription rates were lower if a history of myocardial infarction was excluded, with 17.3% of men and 12.0% of women receiving optimal evidence-based treatment, compared with 35.8% (36.5% men and 34.5% women) with a previous myocardial infarction. On multivariate analysis after adjustment for age, deprivation, general practitioner practice and co-morbidity, compared with men, women were less likely to be prescribed a β blocker (OR 0.86, 95% confidence interval (CI) 0.78 to 0.93), a calcium channel blocker (OR 0.85, 95% CI 0.78 to 0.93), an antiplatelet agent (OR 0.82, 95% CI 0.74 to 0.90), a statin (OR 0.83, 95% CI 0.76 to 0.91), an ACE inhibitor, angiotensin receptor blocker or both (OR 0.69, 95% CI 0.63 to 0.76) and optimal evidence-based treatment (OR 0.68, 95% CI 0.60 to 0.76) (table 5).

There were also significant age-related differences in prescribing (table 4). A β blocker was prescribed for 52% of patients < 75 years compared with 42% of those ⩾ 75 years old ($p < 0.001$). Similarly, younger patients were more likely to be prescribed a statin (58% < 75 years compared with 31% ⩾ 75 years, $p < 0.001$) and optimal evidence-based treatment (19% < 75 years compared with 12% ⩾ 75 years, $p < 0.001$). Older patients were more likely to be prescribed a nitrate (61%) and warfarin (8%) than were younger patients (54%, $p < 0.001$ and 5%, $p < 0.001$, respectively).

On multivariate analysis, men ⩾ 75 years old were less likely to be prescribed a β blocker (OR 0.67, 95% CI 0.59 to 0.78), a statin (OR 0.30, 95% CI 0.26 to 0.34), an ACE inhibitor, angiotensin receptor blocker or both (OR 0.76, 95% CI 0.65 to 0.89) and optimal evidence-based treatment (OR 0.51, 95% CI 0.42 to 0.62) and were more likely to be prescribed a nitrate (OR 1.42, 95% CI 1.23 to 1.62). Women ⩾ 75 years old were also less likely to be prescribed a β blocker (OR 0.71, 95% CI 0.62 to 0.81), a statin (OR 0.33, 95% CI 0.29 to 0.38) or an ACE inhibitor, angiotensin receptor blocker or both (OR 0.78, 95% CI 0.66 to 0.91) and were also more likely to be prescribed a nitrate (OR 1.24, 95% CI 1.08 to 1.41).

With increasing socioeconomic deprivation, patients were less likely to be prescribed a β blocker (p for trend = 0.018) and more likely to be prescribed a nitrate (p for trend = 0.006) and an ACE inhibitor (p for trend = 0.02). On multivariate analysis, patients in the most deprived stratum were 25% more likely to be prescribed a nitrate or a calcium channel blocker, 51% more likely to be prescribed an ACE inhibitor angiotensin receptor blocker or both, and 81% more likely to be prescribed warfarin than were patients in the least deprived stratum. There were no differences, however, in prescribing of statins (OR 0.92, 95% CI 0.77 to 1.10) or antiplatelet drugs (OR 1.08, 95% CI 0.89 to 1.32) according to socioeconomic deprivation. Socioeconomically deprived patients with angina were 64% more likely to be prescribed optimal evidence-based treatments.

DISCUSSION

In Scotland, in 2001–2, the prevalence of angina was 2.6%. Both prevalence and incidence were higher in men than in women, and increased steeply with age and with increasing socioeconomic deprivation. Women and older patients were less likely to receive evidence-based treatment.

Our estimates of prevalence (and incidence) were based on general practitioner-reported diagnoses. This approach has strengths and weaknesses compared with the more commonly used alternative of administration of a questionnaire (usually the Rose one).[22] There have been concerns that the questionnaire approach may overestimate the prevalence of angina, especially in women. The positive predictive value of the Rose angina questionnaire in comparison with exercise thallium testing has been reported to be 67%[23] and as low as

Table 4 Pharmacological treatment of both men and women with angina for the year ending March 2002

Treatment	Age group (years)									p Value for trend for age groups
	<45	45–54	55–64	65–74	75–84	⩾85	<75	⩾75	All ages	
Number	206	930	2 278	3 167	2 355	572	6581	2 927	9508	
β blocker	95 (46.1%)	505 (54.3%)	1 235 (54.2%)	1 585 (50.0%)	1 035 (43.9%)	195 (34.1%)	3 420 (52.0%)	1 230 (42.0%)	4650 (48.9%)	<0.001
CCB	46 (22.3%)	342 (36.8%)	1 010 (44.3%)	1 385 (43.7%)	1 050 (44.6%)	207 (36.2%)	2 783 (42.3%)	1 257 (42.9%)	4040 (42.5%)	<0.001
Nitrates	90 (43.7%)	464 (49.9%)	1 219 (53.5%)	1 751 (55.3%)	1 441 (61.2%)	338 (59.1%)	3 524 (53.5%)	1 779 (60.8%)	5303 (55.8%)	<0.001
Nicorandil	1 (0.5%)	6 (0.6%)	33 (1.4%)	28 (0.9%)	43 (1.8%)	11 (1.9%)	68 (1.0%)	54 (1.8%)	122 (1.3%)	0.002
ACEI	42 (20.4%)	246 (26.5%)	686 (30.1%)	1 016 (32.1%)	743 (31.5%)	137 (24.0%)	1 990 (30.2%)	880 (30.1%)	2870 (30.2%)	<0.001
ARB	3 (1.5%)	24 (2.6%)	75 (3.3%)	168 (5.3%)	96 (4.1%)	18 (3.1%)	270 (4.1%)	114 (3.9%)	384 (4.0%)	<0.001
ACEI/ARB	43 (20.9%)	264 (28.4%)	735 (32.3%)	1 138 (35.9%)	815 (34.6%)	150 (26.2%)	2 180 (33.1%)	965 (33.0%)	3145 (33.1%)	<0.001
Statins	79 (38.3%)	523 (56.2%)	1 353 (59.4%)	1 864 (58.9%)	848 (36.0%)	53 (9.3%)	3 819 (58.0%)	901 (30.8%)	4720 (49.6%)	<0.001
Aspirin	104 (50.5%)	546 (58.7%)	1 592 (69.9%)	24 05 (75.9%)	1 698 (72.1%)	375 (65.6%)	4 647 (70.6%)	2 073 (70.8%)	6720 (70.7%)	<0.001
Clopidogrel	7 (3.4%)	40 (4.3%)	88 (3.9%)	140 (4.4%)	89 (3.8%)	15 (2.6%)	275 (4.2%)	1 04 (3.65%)	379 (4.0%)	0.332
Antiplatelets*	105 (51.0%)	567 (61.0%)	1 636 (71.8%)	2 483 (78.4%)	1 149 (74.3%)	383 (67.0%)	4 791 (72.8%)	2 132 (72.8%)	6923 (72.8%)	<0.001
Warfarin	3 1.5%)	25 (2.7%)	93 (4.1%)	176 (5.6%)	205 (8.7%)	25 (4.4%)	297 (4.5%)	230 (7.9%)	527 (5.5%)	<0.001
Optimal treatment†	25 (12.1%)	166 (17.8%)	450 (19.8%)	621 (19.6%)	325 (13.8%)	23 (4.0%)	1 262 (19.2%)	348 (11.9%)	1610 (16.9%)	<0.001

*Aspirin or clopidogrel; †antiplatelet agent + statin + angiotensin converting enzyme inhibitor (ACEI).
ARB, angiotensin receptor blocker; CCB, calcium channel blocker.

Table 5 Relative risk of being prescribed various drugs for women compared with men*, for men and women aged ⩾75 years compared with <75 years†, and for Carstairs deprivation category 5 compared with Carstairs deprivation category 1‡

	Women *v* men		Men ⩾75 years *v* <75 years		Women ⩾75 years *v* <75 years		Carstairs deprivation category 5 *v* 1	
	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value	OR (95% CI)	p Value
β blockers	0.86 (0.78 to 0.93)	<0.001	0.67 (0.59 to 0.78)	<0.001	0.71 (0.62 to 0.81)	<0.001	0.94 (0.78 to 1.12)	0.485
CCB	0.85 (0.78 to 0.93)	<0.001	1.03 (0.90 to 1.19)	0.625	1.04 (0.91 to 1.19)	0.536	1.25 (1.04 to 1.48)	0.015
Nitrates	0.96 (0.88 to 1.04)	0.312	1.42 (1.23 to 1.62)	<0.001	1.24 (1.08 to 1.41)	0.002	1.25 (1.05 to 1.50)	<0.012
ACEI/ARB	0.69 (0.63 to 0.76)	<0.001	0.76 (0.65 to 0.89)	<0.001	0.78 (0.66 to 0.91)	0.001	1.51 (1.23 to 1.85)	<0.001
Statins	0.83 (0.76 to 0.91)	<0.001	0.30 (0.26 to 0.34)	<0.001	0.33 (0.29 to 0.38)	<0.001	0.92 (0.77 to 1.10)	0.368
Antiplatelet§	0.82 (0.74 to 0.90)	<0.001	1.15 (0.98 to 1.35)	0.079	0.96 (0.84 to 1.11)	0.618	1.08 (0.89 to 1.32)	0.439
Warfarin	0.79 (0.64 to 0.94)	<0.035	0.84 (0.62 to 1.14)	0.266	0.85 (0.61 to 1.20)	0.363	1.81 (1.15 to 2.85)	0.01
Optimal treatments¶	0.68 (0.60 to 0.76)	<0.001	0.51 (0.42 to 0.62)	<0.001	0.53 (0.43 to 0.65)	<0.001	1.64 (1.29 to 2.09)	<0.001

*Adjusted for practice, age, deprivation category and co-morbidity; †adjusted for practice, age, deprivation category and co-morbidity; ‡adjusted for age, sex, type of practice and co-morbidity; §aspirin or clopidogrel; ¶antiplatelet drug + statin + angiotensin converting enzyme inhibitor (ACEI).
ARB, angiotensin receptor blocker; CCB, calcium channel blocker; OR, odds ratio.

25% in women.[24] Conversely, reliance on a medical diagnosis may underestimate prevalence, as patients with unrecognised angina or very mild symptoms may not attend (or be correctly identified by) their general practitioner. In the Whitehall II study 70% of those who developed angina did not have a diagnosis at the time of their initial report.[25]

We found an overall prevalence of angina of 2.8% in men (7.1% in patients ⩾ 45 years old and 13.1% in those ⩾ 65 years) and 2.5% in women (5.8% in patients ⩾ 45 years and 9.9% in those ⩾ 65 years). Our findings, therefore, give a somewhat higher rate than the 7.1% prevalence in men > 65 years old in the Nottingham nitrate study carried out during 1984–85[10] and a slightly lower rate than the 8.3% prevalence in patients > 45 years reported in a more recent study of 48 general practices in the Wakefield region of northern England, which used a similar investigative approach to that of the Nottingham study.[26] Another study, based on data from the 1998 Health Survey for England, gave a self-reported prevalence of angina (recall of a doctor's diagnosis) of about 3% in men and women ⩾ 16 years old.[27]

The prevalence we found is also comparable with that reported from some studies with a questionnaire-based approach,[3 7 6 28] but lower than in others of this type.[8 29 5] Why our prevalence is lower than in those latter studies is not entirely certain. Apart from the methodological difference discussed above, many of the other surveys were conducted in selected cohorts and up to 25 years earlier than the current study (that is, since when the incidence of coronary disease is thought to have been declining). Even the more recent questionnaire-based studies, however, have reported a higher prevalence of angina than that found in our study. Another explanation is the inclusion of possible as well as definite Rose angina.[29]

Prior studies commonly reported a higher prevalence of angina in women than in men, a finding inconsistent with the epidemiology of acute coronary syndromes and coronary deaths and the protection from coronary heart disease enjoyed by premenopausal women.[5 9 28 30–33] This anomaly has been attributed to an increased tendency for women to score positive for angina on the Rose questionnaire. We did not find a female preponderance of angina; indeed, we saw the opposite, as have other studies based on a physician's diagnosis or prescription of angina drugs.[10 26 34]

As in all prior studies, we also found that the prevalence of angina increased with age, although hardly any have explored the full age range.[35] Most patients (59% of men and 69% of women) were aged ⩾ 65 years and a substantial minority were ⩾ 75 years old (25% of men and 37% of women). This is in striking contrast with the typical age range of patients enrolled in clinical trials[36] or undergoing coronary revascularisation (only about 6% of patients in Scotland undergoing revascularisation in 2002–3 were older than 75 years). Also of note, although the overall prevalence of angina was lower in women than in men, the prevalence in older women approached those of men and, because of the greater number of older women than men in the population generally, more women than men aged ⩾ 75 years had angina.

In contrast with prevalence studies, there are very few prior surveys of the incidence of angina and most of these date from the 1970s.[37–39] In one more recent study, comparing coronary heart disease rates between France and Northern Ireland, the incidence of angina in French men aged 50–59 years was 2.6/1000 compared with 5.4/1000 in Irish men; in Scotland it was 3.5/1000 in men aged 45–64 years.[40] In contrast, an earlier study from Southampton, England reported an incidence of only 0.8/1000 in men and women aged 31–70 years (compared with 2.9/1000 in Scotland in patients aged 45–64 years).[41] Although the standardised mortality ratio for coronary heart disease is higher in Northern Ireland and Scotland than in southern England, the Southampton incidence seems unusually low (and lower than in France) and probably reflects the methods used in that study. Patient identification required referral to a special chest pain clinic, patients with any prior evidence of coronary heart disease were excluded and, where possible, patients underwent exercise electrocardiography.

Consultation rates, reflecting the primary care burden of angina, were relatively low with less than one visit per patient per year. Women had a lower number of contacts per patient per year than men, at all ages. The reason for this is not clear, especially as women, in general, have more contacts with primary care physicians than men do (about twice as many)—that is, women have more opportunities for angina to be recorded at a contact. There is some evidence that women may seek help for angina less often than men.[42] It is also possible that primary care physicians may record angina (as one of a number of problems) less often in women than in men (the general practitioner decided which medical problems were recorded as clinically important during contacts); there is evidence that physicians regard chest pain in women as less clinically significant than in men.[43]

The co-morbidities recorded for our patients with angina are not unexpected. Respiratory problems are the most common reason for a primary care consultation, and dyspepsia and depression are also known to be common reasons for consultation. The higher proportion of co-morbidities in the angina group than in the general population may be related to their older age and more frequent general practitioner contact. Hypertension, diabetes and myocardial infarction reflect the known relationships between these problems and angina. The prevalence of these co-morbidities is similar to that reported from other primary care studies and large angina trials.[44 45] Interestingly, we found that patients with angina were more likely to have depression than the general population. An association between a history of depression and a heavier angina burden has been shown previously.[46]

Although patients with angina can be expected to have more co-morbidity than those without, the difference may have been exaggerated because patients with angina have more frequent contact with their general practitioner and therefore more opportunity for co-morbidities to be recorded.

Our study gives one of the most representative and up to date descriptions of the treatment of patients with angina. The use of evidence-based secondary preventive treatments is higher than in most prior studies[27 47] and similar to that found in the Euro Heart Survey of Stable Angina, which focused on newly diagnosed angina in patients presenting to a cardiologist.[48] Although treatment with antiplatelet drugs was recorded for only 73% of our patients, others may be taking over-the-counter, self-purchased aspirin. Only about half of the patients were prescribed a statin, however, and less than a third an ACE inhibitor, although the most recent evidence supports the use of these drugs by all patients who can tolerate them.[1 2 49] Drugs that modify lipids or reduce the risk of thrombosis substantially reduce the risk of myocardial infarction and death.[1 50] ACE inhibitors can also significantly improve outcome in patients with stable coronary artery disease.[49] We found that female sex and older age were associated with underuse of one or more guideline-recommended treatments (particularly β blockers and statins), even after multivariate adjustment. This reflects patterns previously described in the use of coronary revascularisation procedures, in the management of acute coronary syndromes and, recently, in the treatment of coronary heart disease (myocardial infarction and angina combined) in primary care.[27 44 47] We do not know of prior data on angina alone (as

opposed to coronary heart disease); this is an important distinction, as patients with prior myocardial infarction are more likely to be prescribed these treatments than are those with angina.[27 47 51] Although it can be argued that the underprescribing in our study may, in part, reflect the lower number of consultations per patient per year among women and the elderly, this is not supported by examination of the pattern of prescribing among socioeconomically deprived patients, who appeared to be less undertreated despite lower contact rates (see below).

We found a quite strong relationship between socioeconomic deprivation and the prevalence and incidence of angina, in keeping with previous reports of higher rates of several different manifestations of coronary heart disease in these disadvantaged patients. Socioeconomically deprived patients with angina had a lower rate of contacts per patient per year. Despite this lower contact rate, deprived patients were less obviously undertreated than were women or older patients. Indeed, deprived patients were more likely to be treated with ACE inhibitors, perhaps reflecting greater contact with secondary care, where these drugs are more likely to be prescribed. Another recent UK study has also found that, after multivariable adjustment, social deprivation was not associated with underuse of either medical treatments or cardiac procedures.[52]

A limitation to our study is that only patients who attend a physician for angina are included and it is known that there is a significant proportion of people with undiagnosed angina in the community.[25]

In summary, we have described the substantial burden of angina in primary care. It is a common condition affecting 3% of the population, with the prevalence rising to 12% among patients aged $\geqslant$ 75 years. Although the incidence and prevalence of angina increase with increasing socioeconomic deprivation, deprived patients with angina have less frequent follow up with their general practitioner. Although, overall, the use of evidence-based treatments is better than in prior studies, there is scope for further improvement in prescribing. The overall suboptimal use of treatments may, in part, reflect the pronounced age and sex discrepancies in prescribing of evidence-based treatments, with the elderly and women receiving less guideline-recommended treatment. These discrepancies warrant further investigation.

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IMAGES IN CARDIOLOGY

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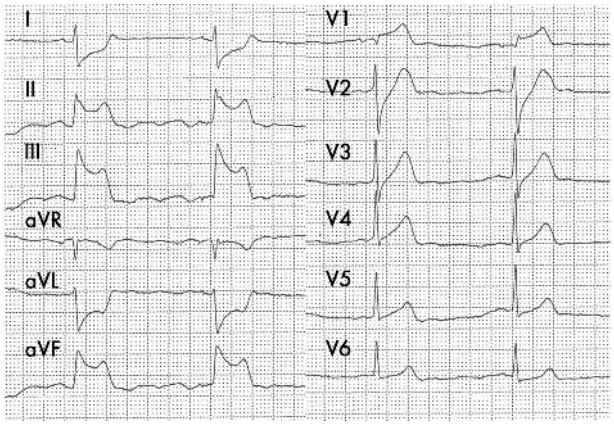
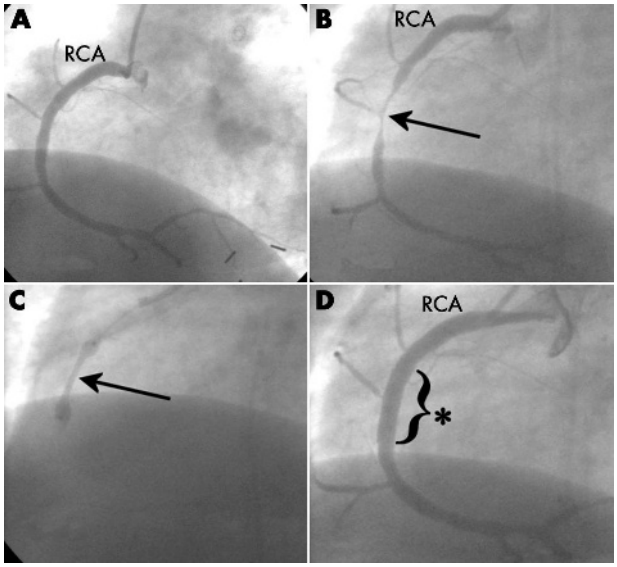
Angiographic documented dobutamine induced coronary spasm successfully treated by stenting

A 66-year-old diabetic and hypertensive patient receiving chronic calcium channel antagonist (CCA) treatment presented with unstable angina caused by single vessel coronary artery disease (CAD), which was successfully treated by direct stenting of the proximal left anterior descending artery (LAD).

Two days after hospital discharge the patient had typical angina with two episodes of syncope. At the emergency department an inferior myocardial infarction was evident upon ECG (upper panel). Coronary angiography showed patency of the LAD stent and no significant lesion on the right coronary artery (RCA) (lower panel A). In order to assess the possibility of RCA vasospasm we performed an intravenous dobutamine stress test which resulted in a significant mid RCA spasm (lower panel B). The spasm persisted despite stopping the dobutamine perfusion and instituting intracoronary nitrate injection. In view of this life threatening RCA spasm refractory to intracoronary nitrates and oral CCA, we decided to treat the culprit lesion by stent implantation (lower panels C and D) with favourable early and late outcomes.

Dobutamine induced coronary spasm is often suspected after stress echocardiography but has only occasionally been reported at angiography. Our case suggests that in the presence of underlying CAD, variant angina may be a challenging problem. Medical treatment (nitrates or CCA) should be attempted in such cases, but if symptoms persist coronary stenting seems to be the rational option. Spasm may occur everywhere in the vessel, therefore in patients suspected of having medical refractory variant angina, provocation tests should always be performed before stenting, in order to identify and treat the culprit spasmodic segment only.





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