

Lipid concentrations and the use of lipid lowering drugs: evidence from a national cross sectional survey

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Editorial
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Abstract

Objective To evaluate the prevalence of the use of lipid lowering agents and its relation to blood lipid concentrations in English adults.

Design Cross sectional survey.

Setting England, 1998.

Participants Nationally representative sample of 13 586 adults (aged ≥ 16 years) living in non-institutional households.

Main outcome measures Mean blood concentrations of total cholesterol and high density lipoprotein (HDL) cholesterol, and the ratio of total cholesterol to HDL cholesterol, in participants classified by age and sex; prevalence of raised total cholesterol concentrations and increased ratio of total to HDL cholesterol; prevalence of use of lipid lowering agents and the lipid concentrations of people taking them.

Results Mean total cholesterol concentrations were 5.47 (SE 0.02) mmol/l in men and 5.59 (0.02) mmol/l in women. Mean HDL cholesterol concentrations were 1.28 (0.01) mmol/l in men and 1.55 (0.01) mmol/l in women. Overall, of 10 569 adults who had a valid cholesterol measurement taken 7133 (67.5%; 95% confidence interval 66.5% to 68.4%) had a total cholesterol concentration ≥ 5 mmol/l, 2804 (26.5%; 25.7% to 27.4%) had a ratio of total cholesterol to HDL cholesterol ≥ 5 mmol/l, and 237 (2.2%; 1.9% to 2.5%) reported taking lipid lowering drugs. Of 117 participants with no history of cardiovascular disease but whose estimated 10 year risk of coronary heart disease was $\geq 30\%$ and whose total cholesterol concentration was ≥ 5 mmol/l, four (3%) were taking lipid lowering drugs. Of 385 adults aged 16-75 with a history of coronary heart disease and eligible for lipid lowering treatment, 114 (30%; 25% to 34%) were taking lipid lowering drugs, of whom only 50 (44%; 35% to 53%) had a total cholesterol concentration < 5 mmol/l.

Conclusions Despite the high prevalence of dyslipidaemia in English adults, the proportion of adults taking lipid lowering drugs in 1998 was only 2.2%. Rates of treatment were low among high risk patients eligible for primary prevention with lipid lowering drugs, and less than one third of patients with established cardiovascular disease received such treatment.

Introduction

Mortality from coronary heart disease in the United Kingdom is among the highest in the world,¹ which is compatible with the country's high levels of standard risk factors.²⁻³ Until the mid-1990s, the importance of dyslipidaemia as a risk factor for coronary heart disease was controversial,⁴ as was the use of lipid lowering treatment.⁵ However, after publication of the 4S trial in 1994,⁶ four other trials⁷⁻¹⁰ confirmed significant reductions in fatal and non-fatal cardiovascular events when statins were used in both primary⁷⁻⁸ and secondary prevention.⁶⁻⁹⁻¹⁰

National guidelines on use of statins recommend,¹¹⁻¹² largely on the basis of cost, that lipid lowering drugs be restricted to people with active vascular disease and, in primary prevention, to those with the highest absolute risk of coronary heart disease, levels that far exceed those at which trials have shown statins to be effective.⁸

In light of the national guidelines and evidence on the benefits of statins (and, more recently, of gemfibrozil),¹³ we used data from the nationally representative health survey for England in 1998² to evaluate current lipid concentrations in English adults, the proportion of adults receiving lipid lowering medication, and lipid concentrations of adults receiving treatment.

Methods

The health survey for England is an annual nationwide household survey¹⁴ that invites the participation of members of a stratified random sample (drawn from the Royal Mail's Postcode Address File) that is socio-demographically representative of the English population. The annual response rate is about 78% of households overall but is slightly lower among men and in inner cities. Data are collected at two home visits: one by an interviewer to administer the questionnaire and one by a nurse to record the use of prescribed medicines and to take blood samples (among other investigations).

In the 1998 survey smoking habits and any history of cardiovascular events and diabetes were recorded in the questionnaire. Informants who reported a history of angina or myocardial infarction diagnosed by a doctor were classified as having coronary heart disease. Standard methods were used to measure concentrations of total cholesterol and HDL cholesterol from a single non-fasting blood sample at a central laboratory.¹⁵

Table 1 Mean (SE) concentrations of total cholesterol and high density lipoprotein (HDL) cholesterol, and ratios of total to HDL cholesterol (patients taking lipid lowering drugs are included)

	Age 16-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65-74	Age ≥75	All ages
Men	(n=423)	(n=912)	(n=967)	(n=964)	(n=724)	(n=621)	(n=390)	(n=5001)
Total cholesterol (mmol/l)	4.37 (0.04)	5.11 (0.03)	5.52 (0.03)	5.76 (0.03)	5.80 (0.04)	5.75 (0.04)	5.54 (0.05)	5.47 (0.02)
HDL cholesterol (mmol/l)	1.30 (0.02)	1.27 (0.01)	1.29 (0.01)	1.27 (0.01)	1.27 (0.02)	1.25 (0.02)	1.33 (0.02)	1.28 (0.01)
Ratio	3.55 (0.06)	4.31 (0.05)	4.64 (0.05)	4.89 (0.06)	4.92 (0.06)	4.96 (0.07)	4.51 (0.08)	4.61 (0.02)
Women	(n=450)	(n=967)	(n=1071)	(n=1092)	(n=804)	(n=636)	(n=548)	(n=5568)
Total cholesterol (mmol/l)	4.56 (0.04)	4.92 (0.03)	5.22 (0.03)	5.67 (0.03)	6.16 (0.04)	6.43 (0.05)	6.33 (0.05)	5.59 (0.02)
HDL cholesterol (mmol/l)	1.53 (0.03)	1.52 (0.01)	1.54 (0.01)	1.58 (0.01)	1.57 (0.02)	1.52 (0.02)	1.62 (0.02)	1.55 (0.01)
Ratio	3.20 (0.05)	3.42 (0.04)	3.60 (0.04)	3.87 (0.04)	4.22 (0.05)	4.54 (0.07)	4.17 (0.06)	3.84 (0.02)

The most recent UK guidelines on lipid lowering treatment in primary prevention^{11 12 16} recommend treatment for those whose 10 year risk of coronary heart disease is ≥30%. We applied the Framingham risk equation to estimate 10 year risk of coronary heart disease.¹⁷ This equation, which has been shown to be acceptably accurate in northern European countries,¹⁸ includes participants' age, sex, smoking status, systolic blood pressure, and total cholesterol and HDL cholesterol concentrations, and whether they have diabetes. The equation was applied to people aged 30-70, the range for which risk assessment in primary prevention is recommended and above which evidence from trials of lipid lowering drugs is required.

Results

In the 1998 survey, 13 586 adults (≥16 years) were visited by a nurse, of whom 294 (2.2%) reported taking lipid lowering drugs and 10 569 (77.8%) had a valid cholesterol measurement taken. Our analyses relate to these 10 569 participants (5001 men, mean age 47.8 (SE 0.25); 5568 women, mean age 48.5 (SE 0.24)).

Mean total cholesterol concentrations rose with age among men and women until the ages of 64 and 74, respectively (table 1). Total cholesterol concentrations were higher among men than women from age 25 to 54 but not outside this range. HDL cholesterol concentrations were lower and the mean ratio of total cholesterol to HDL cholesterol was higher in men than in women at all ages. Of the 10 569 participants whose cholesterol concentration was measured (including 237 patients on lipid lowering treatment), 5.8% (95% confidence interval 5.3% to 6.2%) had a concentration ≥7.8 mmol/l, 22.1% (21.3% to 22.9%) ≥6.5 mmol/l, and 67.5% (66.6% to 68.4%) ≥5 mmol/l (table 2). Among men the highest proportions above all three cut-off concentrations were in participants aged 45-64, whereas among women the highest proportions were found in those aged ≥65. Similarly, the proportion of

participants with a ratio of total cholesterol to HDL cholesterol ratio of 5 or above, including participants taking lipid lowering drugs, increased with age only among women, and the ratio was always higher among men than women. Overall 237 (2.2%; 1.9% to 2.5%) adults reported taking lipid lowering drugs; the relation between use of lipid lowering drugs and age reflected that between adverse lipid concentrations and age.

Of the 2335 participants with either a total cholesterol concentration ≥6.5 mmol/l or taking lipid lowering drugs, 13% of the 1004 men and 8% of the 1331 women were taking lipid lowering drugs, with only 4% of men and 2% of women having their total cholesterol "controlled" to <5 mmol/l (table 3). Hence 35% of men and 20% of women taking treatment reached this currently recommended target. Rates of treatment and control were highest in participants aged 45-64. Of the 2804 participants with either a ratio of total cholesterol to HDL cholesterol ≥5 or taking lipid lowering drugs, 7% of the 1769 men and 11% of the 1035 women were taking lipid lowering drugs, and 4% of the men and 8% of the women had their total to HDL cholesterol ratio "controlled" to <5. Hence 57% of men taking treatment and 71% of women taking treatment had their ratio adequately "controlled."

Of the 7098 participants aged 30-70 who reported no history of coronary heart disease or stroke, 6304 (2895 men and 3409 women) provided sufficient data for a 10 year risk of coronary heart disease to be calculated. Of these, 110 men (3.8%) and 12 women (0.4%) had a 10 year risk ≥30%. Of these 122 men and women, two men and two women were taking lipid lowering drugs, none of whom had their total cholesterol concentration lowered to <5 mmol/l. Of the 118 untreated adults only five (4%) had a total cholesterol concentration <5 mmol/l.

Of all the participants aged 16-75 (no evidence from statin trials is available for people aged over 75), 440 reported a history of coronary heart disease (table 4). Of these, 315 (72%) reported ever having had their

Table 2 Percentages (numbers) of participants with dyslipidaemia and of those taking lipid lowering treatment

	Age 16-44			Age 45-64			Age ≥65			All ages		
	Total (n=4790)	Men (n=2302)	Women (n=2488)	Total (n=3584)	Men (n=1688)	Women (n=1896)	Total (n=2195)	Men (n=1011)	Women (n=1184)	Total (n=10 569)	Men (n=5001)	Women (n=5568)
Total cholesterol:												
≥7.8 mmol/l	1 (67)	2 (46)	1 (21)	8 (289)	9 (146)	8 (143)	12 (261)	7 (67)	16 (194)	6 (617)	5 (259)	6 (358)
≥6.5 mmol/l	9 (453)	12 (277)	7 (176)	29 (1033)	27 (455)	30 (578)	39 (849)	27 (272)	49 (577)	22 (2335)	20 (1004)	24 (1331)
≥5.0 mmol/l	50 (2406)	53 (1230)	47 (1176)	80 (2882)	81 (1359)	80 (1523)	84 (1845)	76 (770)	91 (1075)	68 (7133)	67 (3359)	68 (3774)
Ratio of total to HDL cholesterol ≥5	18 (880)	27 (626)	10 (254)	32 (1147)	44 (741)	21 (406)	35 (777)	40 (402)	32 (375)	27 (2804)	35 (1769)	19 (1035)
Taking treatment	<1 (13)	<1 (9)	<1 (4)	4 (130)	5 (78)	3 (52)	4 (94)	4 (40)	5 (54)	2 (237)	3 (127)	2 (110)

HDL=high density lipoprotein.

Table 3 Percentages (numbers) of participants with dyslipidaemia taking treatment and percentage whose dyslipidaemia is controlled

	Age 16-44		Age 45-64		Age 65-75		Age >75		All ages	
	Men (n=277)	Women (n=176)	Men (n=455)	Women (n=578)	Men (n=206)	Women (n=354)	Men (n=66)	Women (n=223)	Men (n=1004)	Women (n=1331)
Total cholesterol concentration ≥ 6.5										
Treated	3 (9)	2 (4)	17 (78)	9 (52)	18 (38)	12 (43)	3 (2)	5 (11)	13 (127)	8 (110)
Controlled*	1 (2)	0 (0)	5 (23)	2 (12)	9 (18)	3 (9)	2 (1)	0 (1)	4 (44)	2 (22)
Ratio of total to HDL cholesterol ≥ 5										
Treated	1 (9)	2 (4)	11 (78)	13 (52)	13 (38)	17 (43)	2 (2)	9 (11)	7 (127)	11 (110)
Controlled†	1 (4)	0 (1)	5 (39)	9 (35)	10 (29)	12 (31)	1 (1)	9 (11)	4 (73)	8 (78)

HDL=high density lipoprotein.
 *Total cholesterol <5 mmol/l.
 †Ratio of total to HDL cholesterol <5.

cholesterol measured and 385 (88%) had a total cholesterol concentration > 5 mmol/l or were taking treatment. Of these 385, 114 (30%; 95% confidence interval 25% to 34%) were taking treatment. Control rates (total cholesterol < 5 mmol/l) were 15% in men and 9% in women. Hence, of the participants taking treatment 44% had a total cholesterol < 5 mmol/l and 62% had their ratio of total to HDL cholesterol “controlled” to < 5 . Rates of treatment and control were highest among people aged 45-64.

Of the participants aged > 75 , 180 reported a history of coronary heart disease, of whom 143 (79%) had a total cholesterol concentration above 5 mmol/l or were on lipid lowering drugs. Of these 143, nine (6%) were taking treatment and two (1%) had a total cholesterol concentration < 5 mmol/l.

Discussion

In this large, nationally representative sample, about two thirds of participants had a total cholesterol concentration above the “ideal” of 5 mmol/l, and despite the high prevalence of coronary heart disease in the English population³ only 2% were taking lipid lowering agents. Thresholds and targets for the use of lipid lowering drugs evaluated in this report reflect early guidelines that recommended the use of lipid lowering drugs for primary prevention at various thresholds of total cholesterol, including 6.5 mmol/l and 7.8 mmol/l,^{19 20} as well as more recent guidelines that recommend intervention on the basis of estimated absolute coronary risk.^{11 12} Recent guidelines in the United Kingdom for primary prevention recommend the use of statins in people whose estimated 10 year risk of coronary heart disease is $\geq 30\%$, and treatment targets in the United Kingdom include a total cholesterol concentration of < 5 mmol/l.

Overall, only about 10% of adults with dyslipidaemia (total cholesterol ≥ 6.5 mmol/l or taking lipid lowering drugs) received lipid lowering treatment, and

cholesterol concentrations were reduced to the current target of < 5 mmol/l in less than one third of people undergoing treatment. Defining dyslipidaemia as a ratio of total to HDL cholesterol > 5 gives a treatment rate of only one person in 12, but most people treated had their ratio reduced to < 5 .

The low rate of lipid lowering treatment in people reporting a history of coronary heart disease is also worrisome. Less than one third of this group—for which lipid lowering drugs are recommended—were taking them, and total cholesterol concentrations were reduced to current targets in only about one in eight eligible participants. We estimate, on the basis of changes in lipid concentrations and effects on outcomes reported in recent trials,^{6 9 10} that if an equivalent amount of lipid lowering was achieved in the 70% of untreated adults aged 16-75 in England with a history of coronary heart disease and eligible for such treatment,^{12 16} about 7000 fatal or non-fatal myocardial infarctions and about 2500 fatal or non-fatal strokes would be avoided each year.

People who are eligible for primary prevention with lipid lowering treatment, on the basis of a 10 year risk of coronary heart disease of $\geq 30\%$, cannot be identified from these data because treatment with lipid lowering drugs means that the proportion of people above this risk level before treatment started is underestimated. Furthermore, we cannot evaluate whether the use of lipid lowering drugs by those whose risk of coronary heart disease risk was $< 30\%$ during treatment was appropriate on the basis of current recommendations. Nevertheless, of the 117 participants whose 10 year risk of coronary heart disease was estimated at $\geq 30\%$ and whose total cholesterol concentration was ≥ 5 mmol/l, only four were taking lipid lowering drugs, and none of these had achieved a total cholesterol of < 5 mmol/l.

Given the huge beneficial effects of statins on cardiovascular events in both primary^{7 8} and secondary^{6 9 10} prevention, it is hard to explain why the

Table 4 Treatment with lipid lowering drugs and control of dyslipidaemia among participants with a history of coronary heart disease

	Age 16-44		Age 45-64		Age 65-75		Age 16-75	
	Men (n=13)	Women (n=9)	Men (n=133)	Women (n=62)	Men (n=131)	Women (n=92)	Men (n=277)	Women (n=163)
No taking treatment or with total cholesterol concentration > 5 mmol/l	10	6	117	55	108	89	235	150
% (No) treated*	30 (3)	0 (0)	41 (48)	36 (20)	23 (25)	20 (18)	32 (76)	25 (38)
% (No) controlled*†	10 (1)	0 (0)	16 (19)	11 (6)	15 (16)	9 (8)	15 (36)	9 (14)

*Among those with total cholesterol concentration > 5 mmol/l or taking treatment.
 †Total cholesterol concentration < 5 mmol/l.

What is already known on this topic

Dyslipidaemia is a major risk factor for coronary heart disease, which is a major cause of mortality in the United Kingdom and Ireland

Five trials since 1994 have shown that statins in both primary and secondary prevention have major benefits for preventing cardiovascular events

What this study adds

At least a quarter of English adults have adverse lipid profiles

Only 1 in 50 English adults uses a lipid lowering agent (30% of people with a history of cardiovascular disease and 3% of people with a 10 year risk of coronary heart disease of $\geq 30\%$)

The total cholesterol concentration is reduced to the currently recommended targets in only a minority of patients being treated with lipid lowering drugs

observed rates of treatment were so low. Undoubtedly, early misplaced concern about possible adverse effects of lipid lowering agents⁵ has contributed. Although lipid data in this survey were based on single non-fasting concentrations rather than repeated measures taken before starting treatment, this is unlikely to have exaggerated the apparent low rates of treatment. Although the use of lipid lowering agents is low, and much lower than recommended both before and during 1998,^{11 12 19} the rate of treatment as monitored in the health survey for England had risen from 0.4% in 1994 to 2.2% in 1998.

We hope that the recently established national service framework¹⁶ will reinforce national and international guidelines on lipid management, so that further growth in the use of statins continues and the massive benefits in terms of preventing cardiovascular events can be realised.

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One hundred years ago Christmas Cards and Calenders

That the habit of sending Christmas and New Year cards has not greatly declined, as some years ago seemed likely to occur, but has, on the contrary, rather increased, is probably due to the greater artistic merit of even the cheaper sorts of cards which can now be obtained. In this renaissance Messrs. Raphael Tuck and Sons (Raphael House, Moorfields, E.C.) have played the chief part, and we have again to call attention to the great excellence of their work. Among the calendars for the table, for the writing desk and for hanging, special mention may be made of a wall calendar exhibiting reproductions in sepia tint of pictures by Landseer, with appropriate quotations from Shakespeare. There are also flower wall calendars with quotations for each quarter, in one case from

Shakespeare, in the other from Ruskin. Among the most artistic cards are the so-called platino-panel reproductions in black and white, resembling platinum photographic prints, of pictures, sporting pictures, landscape, or religious subjects. The cards in imitation of blue-and-white Wedgwood plaques, which we saw for the first time last year, reappear this year, and are among the most graceful and charming to be obtained. In the more brightly-coloured Christmas and New Year cards, the kind of card which a few years ago was practically the only one to be obtained, the patriotic and warlike spirit of the epoch is fully reflected, and one set of coloured drawings of the men of various regiments is appropriately printed on khaki-coloured paper. (*BMJ* 1900;ii:1576.)