# The Lipid Audit: analysis of lipid management in two centres in Britain 2003

JEETESH V PATEL, MICHAEL KIRBY, ELIZABETH A HUGHES


## Abstract

**Current guidelines emphasise the importance of lipid management in secondary prevention of coronary heart disease (CHD). This audit of lipid levels and lipid-modifying therapy was undertaken in 1,736 patients, 919 men and 817 women, who were either attending a lipid clinic in inner-city Britain (n=1,035, 60%) or a general practice surgery covering 9,500 patients (n=701, 40%). Patient data were obtained from review of case notes and latest results for serum total, low-density lipoprotein (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were categorised in accordance with UK guideline targets (total cholesterol < 5 mmol/L, LDL-C < 3 mmol/L and HDL-C > 1 mmol/L). Overall, 48% of men and 61% of women had raised total cholesterol levels above target and 23% of men and 8% of women had low levels of HDL-C; these proportions were generally consistent for individual centre data. Amongst patients with established CHD who were receiving statin therapy, 31% of men and 47% of women had raised total cholesterol levels above target and 24% of men and 8% of women had low HDL-C levels. This suggests that a substantial proportion of patients at risk of developing or with established CHD, either attending general practice or a specialist lipid clinic, fail to meet recommended lipid targets. Redress of this failure requires more aggressive management, possibly with multidrug lipid-modifying therapy.**


**Key words:** cholesterol management, statin, lipid audit, lipid targets.

*Br J Cardiol* 2004;**11**:214–17

Sandwell Medical Research Unit, Pathology, Sandwell and West Birmingham Hospitals NHS Trust, West Bromwich, West Midlands, B71 4HJ.
**Jeetesh V Patel,** Post Doctoral Research Scientist
**Elizabeth A Hughes,** Consultant Chemical Pathologist and Honorary Senior Lecturer, University of Birmingham

The Hertfordshire Primary Care Research Network, The Surgery, Nevells Road, Letchworth, Hertfordshire, SG6 4TS.
**Michael Kirby,** General Practitioner, and Visiting Professor, University of Hertfordshire

**Correspondence to:** Dr EA Hughes
**(email: Elizabeth.Hughes@swbh.nhs.uk)**



## Introduction

Current international guidelines[1,2] emphasise the importance of lipid management in primary and secondary prevention of coronary heart disease (CHD). Although reduction in low-density lipoprotein cholesterol (LDL-C) is the primary focus of such guidelines, increasing emphasis has been given to high-density lipoprotein cholesterol (HDL-C) and triglycerides, particularly in patients with type 2 diabetes mellitus or the metabolic syndrome, who commonly exhibit an atherogenic lipid profile characterised by low HDL-C and high triglyceride levels. Revised lipid targets, as recommended by such guidelines, are now incorporated within the National Service Framework for CHD[3] and National Institute for Clinical Excellence (NICE) recommendations.[4]

A previous UK survey[5] had indicated a high prevalence of dyslipidaemia within the adult population (68% had a high serum total cholesterol). However, less than 3% of these patients, including those with established CHD, were receiving lipid-lowering therapy. The aim of this cross-sectional analysis was to investigate the impact of revised guidelines and targets on the clinical management of patients attending either a lipid clinic in inner-city Britain (Sandwell and West Birmingham NHS Trust, West Midlands) or a five-doctor general practice surgery (Letchworth, Hertfordshire).

## Materials and methods

Patients attending the lipid clinic of Sandwell and West Birmingham NHS Trust (West Midlands) between 3 March 2001 and 30 June 2003, as well as those attending a single general practitioner surgery (Letchworth, Hertfordshire) between 30 June 2002 and 30 June 2003 who underwent lipid testing as part of their routine clinical care, were included in this analysis. Information on the following was derived from patient notes:

- demographics and smoking history
- recorded history of CHD, stroke, peripheral vascular disease, hypertension and diabetes
- medications, including types of lipid-modifying therapy (statin, fibrate or other lipid-lowering therapy) and aspirin
- most recent biochemical results for serum cholesterol, HDL-C and fasting triglycerides. Lipid targets as defined by current guidelines (total cholesterol < 5 mmol/L, LDL-C < 3 mmol/L, HDL-C > 1 mmol/L)[3,4] were used for categorising lipid test data.

All data were entered into an Access database and validated by cross-checking for duplicate, incomplete and unexpected values. Data were then transported for analysis using SPSS (SPSS Inc., Chicago, USA). Descriptive analysis of the data was summarised by percentages with 95% confidence intervals (CIs) for men and women. Differences between the proportions of each

**Table 1.** Summary patient characteristics, by percentage (95% CI)

| Characteristics | Combined data | | Sandwell and West Birmingham | | Letchworth | |
|---|---|---|---|---|---|---|
| | Men (n=919) | Women (n=817) | Men (n=545) | Women (n=490) | Men (n=374) | Women (n=327) |
| **Co-morbidity** | | | | | | |
| Hypertension | 44.6 (41.4–47.9) | 49 (45.6–52.5) | 36.5 (32.5–40.5)** | 40.2 (35.8–44.5)* | 53.9 (48.8–59.0) | 62.9 (57.7–68.1) |
| Coronary heart disease | 34.8 (31.7–37.9) | 25.3 (22.4–28.3) | 37.3 (33.2–41.3) | 23.3 (19.6–27.0) | 30.7 (26.0–35.3) | 27.9 (23.0–32.8) |
| Cerebrovascular disease | 8.1 (6.3–9.8) | 7.1 (5.3–8.8) | 7.1 (4.9–9.2) | 4.9 (3.0–6.8) | 8.3 (5.5–11.1) | 9.9 (6.6–13.1) |
| Peripheral vascular disease | 6.0 (4.5–7.5) | 1.9 (0.9–2.8) | 9.5 (7.0–11.9)** | 2.4 (1.1–3.8) | 1.3 (0.1–2.4) | 1.5 (0.2–2.9) |
| Diabetes | 28.7 (25.8–31.7) | 23.5 (20.5–26.4) | 25.9 (22.2–29.5) | 24.5 (20.7–28.3) | 33.1 (28.3–37.8) | 22.7 (18.2–27.3) |
| **Lipid-modifying treatment** | | | | | | |
| Statin | 55.4 (52.2–58.6) | 50.6 (47.1–54.0) | 55.8 (51.7–60.0) | 54.6 (50.2–59.0)* | 53.9 (48.9–59.0) | 42.3 (37.0–47.7) |
| Fibrate | 18.8 (16.3–21.3) | 13.6 (11.2–15.9) | 30.3 (26.4–34.1)** | 21.1 (17.5–24.7)** | 1.5 (0.3–2.7) | 1.5 (0.2–2.9) |
| Other | 4.3 (3.0–5.6) | 4.3 (2.9–5.6) | 7.1 (4.9–9.2)** | 6.7 (4.5–9.0) | 0.3 (0–0.8) | 0.5 (0–1.3) |
| Aspirin | 38.0 (34.8–41.4) | 32.2 (29.0–35.4) | 32.3 (28.4–36.2) | 25.7 (21.9–29.6) | 45.0 (39.9–50.0) | 41.1 (35.8–46.5) |
| Other treatment | 31.6 (28.6–34.6) | 42.5 (39.1–45.9) | 31.1 (27.2–35.0) | 40.5 (36.5–44.9) | 34.2 (29.5–39.1) | 46.5 (41.1–51.9) |

Statistically significant difference, Sandwell and West Birmingham versus Letchworth *p<0.05, **p<0.001

variable were compared using the Chi-square test. An independent *t*-test on age between the two centres revealed that mean age differed significantly between the two centres (p<0.0001) and so all analyses were subsequently age-adjusted using the age distribution for men and women for the combined cohorts.

## Results

Data from a total of 1,736 patients, 919 men and 817 women, aged 6–103 years, were available for analysis. Overall, 60% (1,035) of patients were attending the lipid clinic and 40% (701) were attending the general practice surgery. Data are summarised by centre and as combined data in table 1. Only 12% of patients attending both centres were smokers. For combined data, the most common co-morbidities were hypertension (nearly 50% of patients), CHD (35% of men and 25% of women) and diabetes (29% and 24%, respectively). There were differences in the patient profile of each centre. A significantly higher proportion of patients enrolled by the general practice centre had hypertension (54% of men and 63% of women compared with 37% and 40%, respectively, attending the lipid clinic). Additionally, a higher proportion of men attending the lipid clinic had peripheral vascular disease (10% *vs.* 1% of men attending general practice) (table 1).

Overall, more than 50% of patients were receiving statin therapy. This proportion was similar for each centre. However, the proportion of patients receiving fibrate therapy was substantially higher amongst those attending the lipid clinic than general practice (30% of men and 21% of women *vs.* 2% of patients attending general practice). Additionally, use of other lipid-lowering therapy was higher amongst patients attending the lipid clinic than those attending general practice (7% *vs.* < 1%) (table 1). This represents the more complex case mix experienced in the lipid clinic compared to primary care requiring use of fibrates for specific conditions and use of combination therapies for familial dyslipidaemias. Such combinations were almost exclusively statins/fibrates, although some omega-3 polyunsaturated fatty acid fish oils were also used very occasionally in combinations. The overall percentage of combination therapy was 10% in men and 4.7% in women in the lipid clinic compared to 0.3% in men and 0% in women in primary care.

Overall, nearly 50% of men and 61% of women had raised total cholesterol levels (> 5 mmol/L), and 23% of men and 8% of women had low HDL-C levels (< 1 mmol/L). In general, these proportions were consistent for both combined and individual centre data. However, a greater percentage of patients attending the Letchworth centre (general practice) achieved target levels, particularly with respect to HDL-C and the ratio of total cholesterol/HDL-C. Amongst men, 86% of men attending general practice achieved a target HDL-C > 1.0 mmol/L (compared with 72% of men attending the lipid clinic) and 73% had a total/HDL-C ratio of < 5 (compared with 61% of men attending the lipid clinic) (table 2). Amongst patients on lipid-lowering therapy, a substantial proportion failed to meet defined lipid targets. Overall, 38% of men and 53% of women on lipid-lowering therapy had raised total cholesterol values above target, and 26% and 10%, respectively had low HDL-C. The proportions were generally consistent showing no statistical difference between combined and individual centre data (table 2).

Amongst patients with CHD, the majority of whom were on statin therapy, 31% of men and 47% of women had raised total cholesterol above target; these data were generally consistent for combined and individual centre data. Similarly, amongst patients with diabetes, the proportions of patients with raised total cholesterol (45% of men and 52% of women) and low HDL-C (29%

**Table 2.** Patients failing to meet lipid targets, for all patients and patients on lipid-lowering therapy*; by percentage mean (95% CI)

| | Combined data | | Sandwell and West Birmingham | | Letchworth | |
|---|---|---|---|---|---|---|
| | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| All patients | (n=919) | (n=817) | (n=545) | (n=490) | (n=374) | (n=327) |
| Total cholesterol > 5 mmol/L | 47.6 (44.7–51.5) | 60.8 (57.5–64.1) | 49.4 (45.2–53.6) | 60.4 (56.1–64.8) | 45.8 (40.8–50.9) | 61.8 (56.5–67.1) |
| HDL-C < 1 mmol/L | 23.0 (20.3–25.7) | 8.3 (6.2–10.4) | 27.5 (23.7–31.2) | 10.5 (7.8–13.3) | 14.1 (10.5–17.6) | 5.1 (2.7–7.5) |
| Total/HDL-C ratio > 5 | 34.8 (31.7–37.9) | 25.1 (22.1–28.1) | 39.4 (35.3–43.5) | 30.8 (26.7–34.9) | 27.4 (22.9–31.9) | 16.1 (12.1–20.1) |
| LDL-C > 3 mmol/L | 94.0 (92.5–95.6) | 97.4 (96.3–98.5) | 96.1 (94.5–97.7) | 98.0 (96.8–99.2) | 92.0 (89.3–94.7) | 96.7 (94.7–98.6) |
| On lipid-lowering therapy | (n=621) | (n=515) | (n=414) | (n=361) | (n=207) | (n=154) |
| Total cholesterol > 5 mmol/L | 37.6 (33.8–41.4) | 52.8 (48.5–57.1) | 42.9 (38.8–47.7) | 53.5 (48.3–58.6) | 26.5 (20.5–32.5) | 46.9 (39.0–54.7) |
| HDL-C < 1 mmol/L | 25.5 (22.0–28.9) | 10.1 (7.4–12.7) | 29.0 (25.2–32.8) | 11.7 (8.8–14.5) | 15.8 (12.1–19.5) | 4.7 (2.4–7.0) |

**Key:** *Lipid targets as defined by UK guidelines;[3,4] HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol

**Table 3.** Patients with coronary heart disease or diabetes failing to meet lipid targets*; by percentage mean (95% CI)

| | Combined data | | Sandwell and West Birmingham | | Letchworth | |
|---|---|---|---|---|---|---|
| | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| Patients with CHD | (n=320) | (n=207) | (n=184) | (n=86) | (n=123) | (n=101) |
| Total cholesterol > 5 mmol/L | 30.5 (25.4–35.7) | 46.7 (39.7–53.6) | 33.5 (26.7–40.3) | 65.0 (55.5–74.6) | 22.9 (15.5–30.3) | 46.9 (37.1–56.6) |
| HDL-C < 1 mmol/L | 23.6 (18.8–28.3) | 7.6 (3.9–11.3) | 21.0 (17.6–24.4) | 14.5 (10.9–18.0) | 25.8 (21.9–29.1) | 3.0 (0–6.4) |
| On statin | 80.2 (75.7–84.6) | 77.3 (71.4–83.1) | 74.4 (70.8–78.1) | 82.3 (78.9–85.7) | 85.6 (82.1–89.2) | 74.5 (69.8–79.3) |
| Patients with diabetes | (n=261) | (n=188) | (n=139) | (n=120) | (n=122) | (n=68) |
| Total cholesterol > 5 mmol/L | 44.5 (18.5–50.5) | 52.4 (45.3–59.6) | 38.2 (30.1–46.2) | 56.6 (41.6–59.5) | 69.6 (61.4–77.8) | 41.7 (30.0–53.4) |
| HDL-C < 1 mmol/L | 28.5 (23.0–34.0) | 14.1 (9.1–19.1) | 37.2 (29.1–45.2) | 16 (9.5–22.6) | 17.7 (10.9–24.5) | 12.5 (4.6–20.3) |
| On statin | 64.6 (52.9–70.4) | 51.7 (44.6–58.8) | 63.7 (50.7–76.8) | 54.1 (40.8–70.4) | 59.7 (49.5–69.8) | 45.7 (28.4–62.9) |
| HDL-C < 1 mmol/L | 27.8 (20.9–34.7) | 10.8 (4.7–17.0) | 32.0 (19.3–44.7) | 12.0 (3.3–20.7) | 13.8 (6.6–21.0) | 4.4 (0–11.6) |
| On fibrate | 26.1 (20.7–31.4) | 25.0 (18.8–31.2) | 47.4 (39.1–55.7) | 39.4 (30.6–48.1) | 3.0 (0–6) | 0 |
| HDL-C < 1 mmol/L | 49.7 (38.3–61.1) | 21.0 (9.1–32.2) | 53.7 (38.1–69.4) | 29.0 (14.0–44.0) | – | – |

**Key:** *Lipid targets as defined by UK guidelines;[3,4] CHD = coronary heart disease; HDL-C = high-density lipoprotein cholesterol



and 14%, respectively) was generally consistent for combined and individual centre data. Despite treatment with fibrate therapy, there were a significant number of patients with diabetes who still exhibited a low HDL-C.

Aspirin use is shown separately although within the 'other drugs' category, there is use of warfarin and clopidogrel in secondary prevention. Whilst it might be argued that use of aspirin is low in the other higher risk patients in this study, it represents the lack of conclusive evidence for its use in diabetes, for example. Since the Antithrombotic Trialists Collaboration in 2002 estimated the risk of bleeding to be increased by 50% with aspirin, then there must be conclusive evidence for its use before physicians initiate therapy.[6]

## Discussion

The results of this audit clearly indicate that clinical management of dyslipidaemia in the UK is still not ideal. In agreement with other reports,[7,8] a substantial proportion of patients at risk of developing or with established CHD failed to achieve recommended lipid targets despite appropriate lipid-lowering therapy. In a recent audit of cholesterol management within general practice in the UK, involving 24 localities and a study population of 2.4 million, it was demonstrated that, despite wide use of statin therapy, many patients were not achieving a target cholesterol of < 5.0 mmol/L.[8] Our data were consistent with this recent audit. In the current survey, it was evident that there was a similar treatment gap, not only in patients attending general practice who underwent lipid testing as part of their routine clinical care, but also amongst patients attending a specialist lipid clinic. Although about 80% of patients with CHD were receiving statin therapy, 31% of men and 47% of women had raised total cholesterol levels (> 5 mmol/L) and 24% of men and 8% of women had low HDL-C levels (< 1 mmol/L). The

### Key messages

- Data from 1,736 patients attending clinics in two UK centres were obtained by patient case note review
- Over 50% of patients had high total cholesterol levels (> 5 mmol/L), and 23% of men and 8% of women had low HDL-C levels (< 1 mmol/L). A substantial proportion of patients at risk of developing or with established CHD failed to meet recommended lipid targets, despite receiving appropriate statin therapy
- This treatment gap has been highlighted before[7]
- An aggressive therapeutic strategy, possibly with combination lipid-lowering therapy, may help to improve lipid management in the UK

proportion of patients with diabetes failing to meet lipid targets was consistent with these findings even amongst patients receiving statin therapy (table 3). Interestingly, the proportion of women with a low level of HDL-C was approximately one-half that in men, a finding that may possibly be explained by the effect of oestrogen in increasing HDL-C in premenopausal women.[9]

Additionally, these data indicate that a substantial proportion of patients may have mixed dyslipidaemia. Although statins are highly effective in reducing LDL-C, as supported by extensive clinical trial experience,[10-13] they have only modest efficacy in increasing HDL-C levels. In order to achieve lipid targets as recommended in current guidelines, multidrug lipid-modifying therapy with complementary activity may offer the potential for improved management, particularly in patients at increased cardiovascular risk, such as those with diabetes.

It is noteworthy that 10% of patients attending the lipid clinic, but only 1% of patients attending general practice, had diagnosed peripheral vascular disease (PVD). It has been estimated that about 27 million patients in Europe and North America (16% of the population aged ≥ 55 years) have PVD, although the majority (16.5 million) are asymptomatic.[14] Despite the fact that PVD represents a major problem in the UK, it is often overlooked as most patients are asymptomatic and therefore undiagnosed and untreated. Less than 50% of patients with PVD were aware of their condition and general practitioners were only aware of the condition in 30% of their patients with PVD.[15] Treatment can also be delayed in patients with symptomatic PVD as they may feel that their symptoms are attributable to a normal part of the ageing process rather than early symptoms of intermittent claudication. It is therefore likely that the prevalence of PVD in the general practice centre has been considerably underestimated.

It should be noted that there are a number of limitations in these findings, as a result of the cross-sectional nature of our survey. Information on the duration of lipid-modifying therapy was not recorded. The data reflect a real-life setting in the two centres, with differences in prescribing practice between the centres indicative of the different patient groups seen in general practice and a specialist lipid clinic, where more difficult to manage patients are likely to be referred. Unlike a clinical trial setting, treatment compliance cannot be estimated in the current survey, and therefore the data may be compromised to an extent by this factor.

In conclusion, our findings indicate that, consistent with a recent UK audit,[7] a substantial proportion of patients at risk of developing or with established CHD who are receiving lipid-lowering treatment, fail to meet recommended lipid targets. Redress of this failure requires more aggressive management, possibly with combination lipid-lowering therapy.

## Conflict of interest

The study was supported by Merck Pharmaceuticals.

## References


1. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA* 2001;**285**:2486-97.
2. International Atherosclerosis Society. Harmonized clinical guidelines on prevention of atherosclerotic vascular disease. http://www.athero.org
3. Department of Health. *National Service Framework for coronary heart disease*. London: Department of Health, 2000.
4. National Institute for Clinical Excellence. Management of type 2 diabetes – management of blood pressure and blood lipids (guideline H). October 2002. www.nice.org.uk
5. Primatesta P, Poulter NR. Lipid concentrations and the use of lipid lowering drugs: evidence from a national cross-sectional survey. *BMJ* 2000; **321**:1322-5.
6. Antithrombotic Trialists' Collaboration. Collaborative meta-analysis of randomised trials of antiplatelet therapy for prevention of death, myocardial infarction, and stroke in high risk patients. *BMJ* 2002; **324**:71-86.
7. Pearson TA, Laurora I, Chu H, Kafonek S. The Lipid Treatment Assessment Project (L-TAP): a multicenter survey to evaluate the percentages of dyslipidemic patients receiving lipid-lowering therapy and achieving low-density lipoprotein cholesterol goals. *Arch Intern Med* 2000;**160**:459-67.
8. de Lusignan S, Dzregah B, Hague N, Chan T. Cholesterol management in patients with IHD: an audit-based appraisal of progress towards clinical targets in primary care. *Br J Cardiol* 2003;**10**:223-8.
9. Stevenson JC, Crook D, Godsland IF. Influence of age and menopause on serum lipids and lipoproteins in healthy women. *Atherosclerosis* 1993;**98**:83-90.
10. Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20,536 high-risk individuals. A randomised placebo-controlled trial. *Lancet* 2002;**360**:7-22.
11. The Long-Term Intervention with Pravastatin in Ischaemic Disease (LIPID) Study Group. Prevention of cardiovascular events and death with pravastatin in patients with coronary heart disease and a broad range of initial cholesterol levels. *N Engl J Med* 1998;**339**:1349-57.
12. Randomized trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S). *Lancet* 1999;**344**:1383-9.
13. Sacks FM, Pfeffer MA, Moyle LA *et al*. The effect of pravastatin on coronary events after myocardial infarction in patients with average cholesterol levels. Cholesterol and Recurrent Events Trial investigators. *N Engl J Med* 1996;**335**:1001-09.
14. Weitz JI, Byrne J, Clagett GP *et al*. Diagnosis and treatment of chronic arterial insufficiency of the lower extremities: a critical review. *Circulation* 1996;**94**:3026-49.
15. Novo S. Classification, epidemiology, risk factors, and natural history of peripheral arterial disease. *Diabetes Obes Metab* 2002;**4**:S1-S6.