DETECTION AND MEASUREMENT OF HYPERCHOLESTEROLAEMIA IN SOUTH AFRICANS ATTENDING GENERAL PRACTITIONERS IN PRIVATE PRACTICE — THE CHOLESTEROL MONITOR

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Background. This paper reports data on the detection and management of hypercholesterolaemia in patients attending general practitioners in private practice in South Africa.

Methods. The frequency of cholesterol testing and the level at which active therapeutic intervention occurred at medical practices were monitored over a 2-year period. A sample of 200 medical practitioners was selected from private practices in major cities. Data on patients seen by the selected doctors during a 5-day monitoring period were recorded on a standardised form.

Results. 12 842 patients were seen by the 200 private practice GPs. More men (18.7%) than women (10.4%) had coronary heart disease (CHD), and their mean total cholesterol (TC) levels were 5.9 mmol/l and 6.0 mmol/l, respectively. Only 3.1% of the patients were reported to have familial hypercholesterolaemia (FH) and 12.8% were reported to have a family history of CHD. Reported smoking rates were exceptionally high (77.5% of women and 64.4% of men). The most commonly prescribed group of lipid-lowering agents was HMG-CoA reductase inhibitors.

Conclusions. Inadequate management of hypercholesterolaemia leaves many patients with a high risk of CHD mortality in South Africa. Appropriately investigated patients with hypercholesterolaemia should receive treatment to reduce cardiovascular disease using more effective TC control programmes than are currently used in South Africa.

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The management of hypercholesterolaemia, as one of the major risk factors for ischaemic heart disease (IHD) and other atherosclerosis-related cardiovascular diseases, has been addressed via consensus management guidelines in many countries during the past decade.[1-4] This became necessary as population surveys in several countries with typical westernised lifestyles showed that hypercholesterolaemia is poorly diagnosed and frequently managed ineffectively. In South Africa several community-based studies, which included serum total cholesterol (TC) measurements,[5] suggested that lipid disorders were underdiagnosed. From these localised, cross-sectional surveys, it was crudely estimated that there are 5 million adults who have TC levels that put them at risk of developing IHD. These findings resulted in the Heart Foundation of Southern Africa calling for the formulation of guidelines to manage hypercholesterolaemia, and consequently the publication of the action limits for serum TC in 1988.[6] Selective screening was recommended, targeting individuals likely to have elevated TC levels or who might be at high risk for IHD on the basis of a family history of early IHD or other IHD risk factors.

After the publication of the Heart Foundation's action limits, an extensive cholesterol education programme incorporating information from the guidelines was targeted at general practitioners. Patients were also targeted by means of brochures in doctors' waiting rooms; these enabled patients to identify whether they were at risk of IHD, and if so to request TC measurement. The current survey was conducted 7 - 8 years after these measures were introduced.

The actual burden of hypercholesterolaemia and the strategies explored by private practitioners to address it have not yet been evaluated in South Africa. Although a national survey has been planned to determine the burden of adult disease in this country, mass screening of serum TC levels has not been considered due to logistic factors and costs.

In various European countries regular surveys conducted among private practitioners have reported trends in the management of hypercholesterolaemic patients since 1988. These surveys were conducted by independent professional market research organisations and sponsored by the pharmaceutical company Merck, Sharp & Dohme (MSD) among approximately 406 000 patients who attended randomly selected private practitioners. These data, available from MSD as a software package, are referred to as the Cholesterol Monitor. The data were analysed at Glasgow University.[7]

A similar study financed by MSD was conducted in South Africa. Data collection was done by the company Strategic Marketing Services. The objective of the study was to monitor the frequency of cholesterol testing and the level at which there is active therapeutic intervention by medical practitioners over a 2-year period. This paper reports the findings of the South African Cholesterol Monitor conducted in 1993 and 1994. Data analyses were conducted at the Medical Research Council in

collaboration with Glasgow University. Particular focus was placed on the reported lifestyle modifications that occurred among patients who were found by the participating clinicians to be suffering from coronary heart disease (CHD) as well as familial hypercholesterolaemia (FH). The South African data will also be compared with those for certain European countries.

METHODS

Sample of private practitioners

The sampling frame routinely used by the market research company is based on the list of GPs and specialists registered with the South African Medical and Dental Council. The company updates this list at regular intervals and identifies the number of patients usually seen by each doctor. A random sample of 800 (400 per year) medical practitioners in private practice was selected countrywide from the company's list in 1993 and 1994. The aim was to select approximately 70 general practitioners and 30 specialists catering for cardiology patients each year. These specialists were registered cardiologists or physicians who reported seeing at least 25% of their patients for cardiological conditions. One doctor was randomly selected from each practice where there was more than one partner and no doctor participated in the study period twice. The sample was stratified according to geographical area using metropolitan and non-metropolitan categories. Only doctors who saw on average a minimum of 25 patients per day were considered. In 1993 and 1994 the list of 400 medical practitioners was supplied to the fieldworkers in each area who had to see the specified number of doctors as set out in Table I.

Data collection

The fieldwork procedure was piloted at five practices to ensure the feasibility of the process. Data were recorded for all patients over the age of 25 years seen by the selected doctors during a 5-day monitoring period during December of each year. The data were captured by the doctor on a standardised form at the time of consultation, similar to the one used in the European surveys. The 5-day survey period for the participating doctors took place during consecutive working weekdays and respondents started monitoring on different days of the week to ensure an overall uniform method of reporting for every day of the week.

The standardised form contained information as to whether the patient was obese, a smoker or suffering from any other conditions that put the patient at risk of IHD. It also recorded whether serum cholesterol levels had been determined. In addition, the lipid levels were recorded for patients who received either a cholesterol-lowering diet or medication. The participating private practitioners were remunerated at the rate of a consultation fee. The doctors received specific briefing regarding the required procedures, and the trained fieldworkers checked each doctor's records after the first few cases to ensure correct completion of the special forms. These were collected by the fieldworkers and were computerised and analysed centrally in the USA, as were all the surveys done globally. (The questionnaire is available on request from the authors.)

RESULTS

The sampling procedures selected 200 doctors from a random

Table I. Distribution of the sampling frame of 800 practices and the realised sample of 200 private practices participating in the Cholesterol Monitor survey

		1993 and 1994 sample				
	Random sample frame	Total number selected	General practitioner	Specialist	Metropolitan	Non-metropolitan
Total	800	200	140	60	160	40
Metropolitan areas	640	160	100	60	160	—
Pretoria, Witwatersrand and Vereeniging	344	86	56	30	86	—
Cape Town	138	34	20	14	34	—
Durban	74	20	13	7	20	—
Pietermaritzburg	34	2	1	1	2	—
East London/Port Elizabeth	14	9	6	3	9	—
Bloemfontein	36	9	4	5	9	—
Non-metropolitan areas	160	40	40	—	—	40
Southern Transvaal (around* Johannesburg)	46	12	12	—	—	12
Northern Transvaal (around Pretoria)	22	6	6	—	—	6
Natal (around Durban)	46	12	12	—	—	12
Orange Free State (around Bloemfontein)	20	4	4	—	—	4
Western Cape (around Cape Town)	18	4	4	—	—	4
Eastern Cape (around Port Elizabeth)	8	2	2	—	—	2

*'Around' a city means small towns close to the metropolitan areas, e.g. in the Western Cape one GP from Stellenbosch and one from Paarl were selected from the provided random sample frame.

sample of 400 practices per year for 1993 and 1994. The distribution of these and the realised sample of practices are shown in Table I. During these two survey periods 12 842 patients were seen by the 200 GPs in private practice.

Table II shows the profile of the South African patients whose records were used for the local Cholesterol Monitor. Overall, GPs reported that 39.1% of the participating patients had had TC levels measured at some stage, and more than 85% of the 39% had their latest TC level recorded. Almost 50% of the participating men and only about 30% of the women had these data recorded. Data for those with recorded TC levels showed that almost 25% had TC levels above 6.5 mmol/l. For patients who were reported to suffer from CHD, 68.3% of men and only 49.5% of women had recorded TC levels. More men than women had CHD and their mean TC levels were 5.9 mmol/l and 6.0 mmol/l, respectively. Only 3.1% of the patients were reported to have FH and 12.8% were reported to have a family history of CHD.

CHD risk factors were exceedingly common in the total group of patients, with 81% having at least one of the following risk factors: hypertension, diabetes, cigarette smoking, family history of CHD, and/or raised serum triglyceride levels. Particularly high smoking rates were reported by the participating doctors for the total group (77.5% for women and 64.4% for men).

Table III provides the TC profile and treatment pattern of patients who were reported to have FH and those reported to have suffered and not suffered from CHD. All the FH patients' doctors reported that their TC levels had been measured in the past. These FH patients had the most recorded TC levels, while almost 90% of the CHD patients and 85% of those without CHD had recorded TC levels. The FH patients had a higher TC level than the other two groups whose TC levels were very similar. A mere 5.4% of the FH patients had TC levels below 5.0 mmol/l, while only 24% of those patients who suffered from CHD had similarly controlled TC levels. Almost 20% of the FH patients had TC levels above 8.0 mmol/l.

The degree of TC lowering could be determined for patients who had an initial and a most recent recorded TC level while under treatment of the participating doctors. For FH patients their latest TC level was 14.6% lower than their initial level, for those with CHD the reduction was only 11.3%, while for patients without CHD it was 5.7%. The levels achieved in these groups of patients, after treatment, were very much higher than those recommended by the South African Guidelines.

Participating doctors reported that all the FH patients were given either a diet or lipid-lowering agents, while 40.8% of the CHD patients and 28.5% of the non-CHD patients received such treatment. Only 59.6% of the FH patients had specific lipid-lowering agents recorded on their data sheets, while this figure was 17.3% and 7.2% for the CHD and non-CHD patients, respectively. By far the most commonly prescribed group of lipid-lowering agents was the HMG-CoA reductase inhibitors, with the fibrates the next commonest group of agents prescribed. Very few of the other lipid-lowering agents were prescribed and only 6.1% of the FH patients received a

Table II. Profile of South African patients participating in the 1993/4 Cholesterol Monitor survey

	Total (*N* = 12 842)		Men (*N* = 5 754)		Women (*N* = 7 038)	
	%	*N*	%	*N*	%	*N*
Patients who had ever had their TC level measured	39.1	5 018	49.3	2 839	30.6	2 156
Of these, patients who had their latest TC level recorded	86.4		87.5		85.9	
Mean TC level of these patients (mmol/l)	5.8	4 336	5.8	2 484	5.8	1 852
Distribution of patients' most recent recorded TC levels						
TC < 5 mmol/l	28.0	1 215	26.4	655	30.2	560
TC ≥ 5 < 6.5 mmol/l	50.0	2 168	52.0	1 293	47.3	875
TC ≥ 6.5 < 8 mmol/l	17.9	774	18.0	448	17.6	326
TC ≥ 8 mmol/l	4.1	179	3.6	88	4.9	91
Patients reported to be suffering from CHD*	14.1	1 813	18.7	1 078	10.4	729
Patients with CHD (*N* = 1 813) who had ever had their TC measured	67.1	1 216	75.2	811	55.0	401
Patients with CHD (*N* = 1 813) who had recorded TC levels	60.5	1 097	68.3	736	49.5	361
Mean TC level of these CHD patients (mmol/l)	6.0	1 097	5.9	136	6.0	361
Patients reported to have FH	3.1	396	4.1	234	2.3	161
Patients reported as having a family history of cardiovascular disease	12.8	1 640	13.0	749	12.6	886
Patients reported to be obese	32.0	4 085	28.2	1 620	34.8	2 451
Patients reported to be smokers	72.0	9 198	64.4	3 704	77.5	5 453
Patients reported to have hypertension	23.1	2 961	24.9	1 437	20.5	1 516
Patients reported to have diabetes	5.3	681	6.3	360	4.5	316
Patients who had one or more CHD risk factors†	81.0	10 384	76.6	4 406	82.3	5 933

*Patients who were reported to suffer from IHD, arteriosclerosis, previous myocardial infarction, arrhythmia or cardiac insufficiency.
†CHD risk factors considered were cigarette smoking, hypertension, family history of CHD, diabetes, elevated triglycerides.

Table III. Treatment profile of groups of patients with recorded TC levels (*N* = 5 018)

	Patients with FH (*N* = 396)		Patients reported to have CHD (*N* = 1 066)		Patients without reported CHD (*N* = 3 556)	
	%	*N*	%	*N*	%	*N*
Patients whose TC level was reportedly never measured			35.9	597	67.0	7 227
Patients who had their most recent TC level recorded	97.8	388	89.7	958	84.7	3 013
Mean latest TC value recorded for the whole group (mmol/l)*	7.0	388	5.8	955	5.6	3 013
Distribution of patients' most recent recorded TC levels*						
< 5 mmol/l	5.4	21	24.0	229	32.2	970
≥ 5 < 6.5 mmol/l	35.6	138	55.4	529	50.2	1 514
≥ 6.5 < 8 mmol/l	40.7	158	18.0	172	14.7	444
≥ 8 mmol/l	18.3	71	2.6	25	2.9	85
Patients who had their initial and latest TC levels recorded	94.9	381	37.9	404	23.6	840
Mean initial TC value (mmol/l)†	8.2	376	7.1	404	7.0	840
Mean latest TC value recorded (mmol/l)†	7.0	376	6.3	404	6.6	840
Patients, with latest TC level, who received either a diet or drug treatment	100.0	396	40.8	430/958	28.5	859/3 013
Patients given lifestyle improvement advice	81.6	323	30.8	329	19.9	709
Patients given a specific cholesterol-lowering diet	66.4	263	25	267	15.0	532
Patients for whom a specific lipid-lowering agent was recorded	59.6	236	17.3	184	7.2	256
Patients who received a HMG-CoA reductase inhibitor	50.5	203	12.5	133	4.8	172
Patients who received fibrates	11.4	45	3.4	36	1.7	61
Patients who received probucol	2.3	9	0.8	8	< 0.01	10
Patients who received cholestyramine	3.0	12	< 0.01	2	< 0.01	1
Patients who received nicotinic acid	0.7	3	< 0.01	2	0.0	0
Patients on more than one drug	6.1	24	0.4	8	< 0.01	5
Mean TC level that doctors realistically expected patients to achieve	5.8	393	5.5	417	5.6	828
Mean TC level that doctors reported to be a satisfactory level to achieve	5.5	393	5.4	416	5.4	825

*Denominator those patients who had a latest known TC level recorded.
†Denominator those patients who had both an initial and a latest TC level recorded.

combination of two agents. The effect of the different classes of lipid-lowering agents was assessed in patients for whom baseline and follow-up TC levels were recorded. Compared with the initial TC reading, the percentage of patients with a TC level above 6.5 mmol/l at follow-up was reduced by 40.4% and 37.4% for those who received HMG-CoA reductase inhibitors and fibrates, respectively.

In addition to the TC levels actually recorded for the patients, the doctors also recorded much lower TC levels that they felt would be realistic and/or satisfactory to achieve.

Discussion

The market research company that collected the data shown here is of high standing, and used internationally accepted market research methodology. The two major differences distinguishing this methodology from that usually followed in epidemiological surveys are firstly the process and sampling frames that were used to generate the study population, and secondly the data on TC levels. Information in this study is based on those TC levels recorded by the doctors and not actual serum TC measurements. In epidemiological parlance this sample would be considered a convenience sample with all the possible biases that apply to data collected from such study populations. This sampling frame is clearly biased towards participants from urban areas and smaller towns close to cities. The results will not be generalisable to private practice patients from deep rural areas. Furthermore, doctors in solo practices will also be over-represented in the sample compared with doctors in practices that have more than one partner, as only one partner per practice was selected. Only doctors from busy practices were included as one of the selection criteria was that doctors should see a minimum of 25 patients per day. Finally, the possibility needs to be considered that this type of survey attracts participating private practitioners who are enthusiastic about the management of hyperlipidaemia. As such these results may give a more optimistic picture of hyperlipidaemia management than actually prevails in South African private practices.

Despite the above limitations, these data represent information on hyperlipidaemia in the largest sample of South African patients ever reported. It is unlikely that more representative local data on hyperlipidaemia will be collected in the foreseeable future; as such the Cholesterol Monitor provides the best available data on hyperlipidaemia in the South African population attending private health services.

All published guidelines on the management of hyperlipidaemia emphasise that persons who have already

suffered from atherosclerosis-related conditions, such as angina or a myocardial infarction, should have their lipid levels controlled in order to prevent further ischaemic events.[1-4] The overall impression from these data is that South African patients who are attending private practitioners and who are known to be at high risk for CHD are not having their TC levels measured frequently enough, and when measured, are not managed effectively. Table II indicates that this seems to be the case particularly for women, whether they suffered from CHD or not. Only 50% of the women with CHD had recorded TC levels, while just less than 70% of men had their levels recorded. This neglect of appropriate preventive action in female CHD patients, and those without CHD, has been recorded in a number of countries and probably reflects the long-held notion that CHD is less common in women than in men.[5]

Low screening rates for hypercholesterolaemia could be due to various reasons, one being the lack of awareness that hypercholesterolaemia is a health risk. The conflicting messages in the media regarding appropriate nutrition and the importance of hypercholesterolaemia as a health risk may also play a role. High costs for TC tests and/or drugs are factors that could influence clinician and patient behaviour.

Data in Table II further illustrate the high level of CHD risk reported in the Cholesterol Monitor. The high rate of tobacco smoking in women is of particular concern. Such high smoking rates have also been reported in a study by Volmink *et al.*[9] of a group of general practices in the Western Cape. This certainly suggests that smokers attend general practices more frequently than patients with risk factors such as diabetes and hypertension. The rates for the latter two conditions reported in our study are similar to those reported in population surveys conducted in South African populations.[10,11] The rate of smoking in South Africa has recently been reported as being 34% (52% in men, 17% in women).[12] Another possibility is that the private practitioners overestimated smoking rates of their patients, particularly among women. Similarly, the reported rate of patients suffering from FH (3.1%) is much higher than the rate estimated by Steyn *et al.* (0.28%).[13] A community with such a high CHD risk should certainly have a higher screening rate for TC than 39% if the impact of this risk on CHD mortality and morbidity is to be reduced.

Table III shows a poor level of cholesterol control in patients who either have FH or were already suffering from CHD. About 75% of CHD patients had TC levels above 5 mmol/l in excess of the USA's National Cholesterol Education Programme guidelines, which still carry risk for further CHD events. The recent Scandinavian Simvastatin Survival Study and some meta-analyses of earlier studies on secondary prevention have clearly shown that these patients could benefit substantially by reducing their TC levels.[14,15] An interesting finding was that the levels of those patients who had both initial and recent TC levels recorded had markedly higher TC levels than those for whom only one such level was recorded. The group of patients for whom more than one TC level was recorded certainly had not been treated effectively enough to reach well-controlled TC levels or those levels that their doctors realistically expected them to achieve.

Lifestyle and dietary management form the backbone of hyperlipidaemia management, particularly in patients who require secondary preventive procedures.[1-4] This approach has not been followed for the CHD patients whose data were reported in the South African Cholesterol Monitor. Only 30% of these patients were given lifestyle improvement advice and only 25% were given a specific cholesterol-lowering diet. Surely such interventions would be the most cost-effective way to protect these patients against further atherosclerosis-related incidents.

Table III reveals that the HMG-CoA reductase inhibitors have the major portion of the market for cholesterol-lowering agents. Further analyses made it clear that the most frequently prescribed drug for hypercholesterolaemia was simvastatin (Zocor). In December 1995 it was reported in the popular magazine *Die Kat* that simvastatin was one of the 10 most popular prescribed pharmaceutical agents in South Africa. A more potent HMG-CoA reductase inhibitor, atorvastatin, has recently been registered by the South African Medicines Control Council.[16] Bezafibrate was the most frequently prescribed fibrate, probably because a single daily dose of this slow-releasing fibrate is available on the local market.

Table IV. Comparison of hypercholesterolaemia management in South Africa and five European countries

	South Africa	France	Germany	Italy	Sweden	UK
Cholesterol testing rate (%)	39.0	65.0	63.0	58.0	35.0	18.0
Cholesterol testing rate in CHD patients (%)	67.0	93.0	91.0	95.0	60.0	45.0
Mean pretreatment TC levels of CHD patients (mmol/l)*	7.5†	7.9	8.2	7.9	7.9	7.8
Mean TC level of CHD patients on treatment*	6.6†	6.4	7.0	6.6	6.9	6.9
CHD patients with TC < 5.0 mmol/l (%)	8.0	-	12.0	-	-	9.0
Reduction from baseline* (%)	–12.0	–20.0	–15.0	–16.0	–12.0	–12.0
Reduction required to reach TC < 5.0 mmol/l (%)	–33.0	–37.0	–39.0	–36.0	–37.0	–36.0

*These data, with the exclusion of South Africa, are from Shepherd and Pratt.[7]
†Values calculated for those 544 patients who had both an initial and latest reading.

Bezafibrate could, therefore, be expected to have a higher compliance rate than other fibrates, as these all require multiple daily dosages.

Table IV compares the data recorded in the South African Cholesterol Monitor with those recorded in five European countries[7] using similar methodology. Cholesterol testing for all patients studied and for those with CHD was less frequently reported in South Africa than in France, Germany or Italy, but more frequently reported than in Sweden or the UK. Patients from France had the greatest cholesterol-lowering reported, followed by Germany and Italy, while South African, Swedish and UK patients only succeeded in reducing their TC levels by an average of 12%. It is well documented that the lowering of CHD rates recorded in America, Australia and New Zealand has not been achieved in the UK.[17,18] The fact that South African TC reduction rates are similar to those reported in the UK, suggests that CHD mortality may also decline as slowly in the portion of our community that currently has high CHD mortality rates. The degree of TC reduction needed to achieve TC levels below 5.0 mmol/l for all six countries is substantial (Table IV), and approximates the degree of cholesterol lowering that has occurred in countries that have reduced their CHD mortality rates significantly.[19]

Despite all the reservations regarding data from a convenience sample using market research techniques, the picture of inadequate hypercholesterolaemia management that emerged is so marked that there must be grave concern for the future of CHD mortality in South Africa. There clearly is an enormous task at hand if patients with hypercholesterolaemia are to receive appropriate treatment, which has been shown to reduce cardiovascular disease through more effective TC control programmes in many countries.

To remedy poor management of hypercholesterolaemia will require extensive intervention. It will be necessary to raise the awareness of the public and health care providers with regard to the need and benefits of effective management, including the high costs of the relevant pharmaceutical agents. Continuing medical education and the development of treatment protocols and appropriate health education material are central to good cholesterol management. Informative food labelling and the development of reasonably priced cholesterol-lowering food products all play an important role in hypercholesterolaemia management.

The reduction of hypercholesterolaemia reduces morbidity and mortality due to CHD in westernised communities. With the upward social mobility of significant sections of the South African community, hypercholesterolaemia management will become an ever-increasing health risk in the country. Health services, particularly in the private sector, will have to be prepared for this.

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References

1. International Task Force for Prevention of Coronary Heart Disease. Prevention of coronary heart disease: scientific background and new clinical guidelines. Recommendation of the European Atherosclerosis Society. *Nutr Metab Cardiovascular Dis* 1992; **2:** 113-156.
2. Expert panel on detection, evaluation and treatment of high blood cholesterol in adults. Summary of the second report of the National Cholesterol Education Programme (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment panel 11). *JAMA* 1993; **269:** 3015-3023.
3. Canadian Lipoprotein Conference *ad hoc* Committee on Guidelines for Dyslipoproteinemias. Guidelines for the detection of high-risk lipoprotein profiles and the treatment of dyslipoproteinemias. *Can Med Assoc J* 1990; **142:** 1371-1382.
4. Scientific Committee of the National Heart Foundation of New Zealand. Guidelines for detection and management of dyslipidaemia. *N Z Med J* 1993; **106:** 133-141.
5. Steyn K, Fourie J, Bradshaw D. The impact of chronic diseases of lifestyle and their major risk factors on mortality in South Africa. *S Afr Med J* 1992; **82:** 227-231.
6. Rossouw JE, Steyn K, Berger GMB, *et al*. Action limits for serum total cholesterol. A statement for the medical profession by an *ad hoc* committee of the Heart Foundation of Southern Africa. *S Afr Med J* 1988; **73:** 693-700.
7. Shepherd J, Pratt M. Prevention of coronary heart disease in clinical practice: A commentary on current treatment patterns in six European countries in relation to published recommendations. *Cardiology* 1996; **86:** 1-5.
8. Clarke KW, Gray D, Keating NA, Hampton JR. Do women with acute myocardial infarction receive the same treatment as men? *BMJ* 1994; **309:** 563-566.
9. Volmink J, Laubscher J, Furman S. The SASPEN primary care survey — who consults the family doctor? *S Afr Med J* 1996; **86:** 241-245.
10. Jackson WPU, Vinik AI, Joffe BI, *et al*. Prevalence of diabetes, glycosuria and related variables among the white population in Cape Town. *S Afr Med J* 1971; **45:** 1496-1499.
11. Rossouw JE, Du Plessis JP, Benadé AJS, *et al*. Coronary risk factor screening in three rural communities: The CORIS baseline study. *S Afr Med J* 1983; **64:** 430-436.
12. Reddy P, Meyer-Weitz A, Yach D. Smoking status, knowledge of health effects and attitudes in South Africa. *S Afr Med J* 1996; **86:** 1389-1393.
13. Steyn K, Goldberg YP, Kotze MJ, *et al*. Estimation of the prevalence of familial hypercholesterolaemia in a rural Afrikaner community by direct screening for three Afrikaner founder low density lipoprotein receptor gene mutations. *Hum Genet* 1996; **98:** 479-484.
14. Scandinavian Simvastatin Survival Study Group. Baseline serum cholesterol and treatment effect in the Scandinavian Simvastatin Survival Study (4S). *Lancet* 1995; **345:** 1274-1275.
15. Rossouw JE, Lewis B, Rifkind BM. The value of lowering cholesterol after myocardial infarction. *N Engl J Med* 1990; **323:** 1112-1119.
16. Nawrocki JW, Weiss SR, Davidson MH, *et al*. Reduction of LDL-cholesterol by 60% in patients with primary hypercholesterolaemia by atorvastatin, a new HMG-CoA reductase inhibitor. *Arterioscler Thromb Vasc Biol* 1995; **15:** 678-682.
17. Poulter N. The coronary heart disease epidemic. In: Poulter N, Sever P, Thom S, eds. *Cardiovascular Disease: Risk Factors and Intervention*. Oxford: Radcliffe Medical Press, 1993.
18. *Report of the Registrar General for Scotland*. Edinburgh: HMSO, 1994.
19. Gillum RF. Trends in acute myocardial infarction and coronary heart disease death in the United States. *J Am Coll Cardiol* 1993; **23:** 1273-1277.

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