CASE STUDIES
in Lifestyle
MEDICINEWalter J. Janse Van Rensburg, PhD Lifestyle Change Alone Sufficient
to Lower Cholesterol in Male
Patient With Moderately Elevated
Cholesterol: A Case Report**Abstract:** Background.

Cardiovascular disease is a major cause of deaths. Elevated cholesterol levels to above the normal reference range is a major risk factor for developing cardiovascular disease. Current guidelines recommend the use of cholesterol-lowering drugs to lower cholesterol levels to within the normal reference range. However, the American Heart Association further recommends a change in lifestyle in managing cholesterol levels. Thus, cholesterol-lowering drugs may not be needed if a lifestyle-change alone is sufficient in lowering cholesterol levels to within normal ranges. Unfortunately, limited examples exist in academic literature to illustrate the effectiveness of lifestyle change alone in lowering of cholesterol levels. Case report. We report a case of a 33-year-old man, with moderately elevated cholesterol levels and a family history of cardiovascular disease. Method. The man followed an altered healthy fat diet accompanied with moderate exercise for 6 weeks, without the addition of cholesterol-lowering agents. Results. At the 6-week follow-up, he was

able to decrease his total cholesterol by 40.25% and low-density lipid cholesterol by 52.8%, to within normal ranges. The cholesterol levels remained within normal ranges after 6 months. Conclusion. This case illustrates that in some individuals, lifestyle change alone is sufficient to lower moderately elevated cholesterol levels.

for 17.8% of all deaths in South Africa in 2015. This is the second most common underlying cause of death, surpassed only by certain infectious and parasitic diseases. It is a worrying statistic because a slight increase of 1.1% has been seen in these deaths between 2013 and 2015. Diseases of the circulatory system include thrombosis-related disorders, such as

Statins may also result in a range of adverse effects, including muscle pain, diabetes mellitus, and central nervous system complaints, which might lead to noncompliant use by patients.

Keywords: hypercholesterolemia; lifestyle change; healthy fat diet

Introduction

Diseases of the circulatory system are some of the leading causes of morbidity and mortality in South Africa, accounting

stroke and heart attack. Cardiovascular diseases collectively accounted for 7.5% of deaths in South Africa in 2015. Thus, cardiovascular diseases remain a major cause of concern in South Africa.¹ The World Heart Federation lists high cholesterol (hyperlipidemia), and especially elevated low-density lipid

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(LDL) cholesterol levels, as a major risk factor for developing cardiovascular disease. LDL cholesterol (“bad” cholesterol) accumulates in arteries, increasing the risk of heart attack and stroke. However, high-density lipid (HDL) cholesterol (“good” cholesterol) serves as a carrier, that helps remove cholesterol from the blood stream.² HMG-CoA (3-hydroxy-3-methylglutaryl-CoA) reductase inhibitors, called statins, are the most commonly used cholesterol-lowering drugs. The Blood Cholesterol Expert Panel from the American College of Cardiology and the American Heart Association (AHA) recommends that patients older than 21 years of age, with a LDL cholesterol level of more than 4.92 mmol/L be placed on high-intensity statin therapy (atorvastatin 40-80 mg or rosuvastatin 20 mg) to lower the LDL cholesterol levels by at least 50%.³ However, some controversy and debate has arisen subsequently to the publication of these recommendations, casting some doubt over the correct use of statins in treatment of elevated cholesterol.⁴ Nonetheless, it was found that these guidelines had little to no effect on the use of statins or LDL cholesterol levels in the clinical setting, with only a small increase (4%) in the statin intensity observed in patients treated for hypercholesterolemia.⁵ Statins may also result in a range of adverse effects, including muscle pain, diabetes mellitus, and central nervous system complaints, which might lead to noncompliant use by patients.⁶ Conversely, the AHA also recommends 4 lifestyle changes to help improve hyperlipidemia: (1) eating a heart-healthy diet, (2) regular exercise, (3) avoiding tobacco smoke, and (4) losing weight (if you are overweight or obese).⁷ Therefore, theoretically, a lifestyle change alone may be sufficient to lower elevated LDL cholesterol levels, without the use of cholesterol-lowering drugs, such as statins.

Case Report

A 33-year-old nonsmoking Caucasian man presented at his employer's yearly

wellness screening with a point-of-care nonfasting total cholesterol level of 8.5 mmol/L and was subsequently referred to his general practitioner (GP) for follow-up. The man has a family history of hypercholesterolemia and heart disease, with both his living parents on long-term cholesterol-lowering medications and a paternal grandfather who died of a myocardial infarction at 54 years. He has an office job, with a large amount of time spent sitting, with moderate physical activity after hours. The typical diet at presentation is given in Table 1. The case report was approved by the Health Sciences Research Ethics Committee of the University of the Free State (HSREC 133/2017, UFS-HSD2017/1265). The patient gave informed consent for the results to be published.

Anthropometric Values at Presentation

At presentation, the patient weighed 84.4 kg and, taken together with his height of 178 cm, had an overweight body mass index (BMI) of 26.64 kg/m².

Fasting Lipogram at Presentation

The laboratory fasting lipogram results were as follows (normal reference ranges in brackets):

- Total cholesterol 7.7 mmol/L (2.8-4.9 mmol/L)
- Triglycerides 2.29 mmol/L (0.5-1.6 mmol/L)
- HDL cholesterol 1.7 mmol/L (1.0-1.6 mmol/L)
- LDL cholesterol 5.3 mmol/L (1.6-2.9 mmol/L)
- Non-HDL cholesterol 6.0 mmol/L (0.8-3.7 mmol/L).

Medical Intervention

In consultation with the GP, it was decided to allow the patient to alter his lifestyle via diet and exercise and to perform a follow-up lipogram after 6

weeks, without prescribing any cholesterol lower drugs.

Altered Diet (Table 2)

The patient added clinically proven cholesterol-lowering foods to his daily diet, such as 1/3 cups raw oats, which is equivalent to roughly 1.3 g of oat β -glucan,^{8,9} 30 g of almonds,¹⁰ at least half an avocado,¹¹ and extra virgin olive oil.¹² An omega 3 supplement was also added to the daily diet.¹³ The patient used conjugated linoleic acid (CLA), vitamin C, and a multivitamin as daily supplements prior to the altered diet. The effect of CLA on the blood lipid profile remains highly debated and largely inconclusive.¹⁴ However, because the patient already used a daily CLA supplement, it was decided to continue with 2000 mg CLA in order to limit the amount of variables taken away during the altered diet. Because 500 mg vitamin C per day has a proven positive impact on fat oxidation during moderate exercise,¹⁵ it remained as part of the altered lifestyle. The multivitamin (Staminogro) was previously recommended to the patient by his GP and is a combination of amino acids, antioxidants, B-complex vitamins, calcium, and other vitamins and minerals. An addition of a good multivitamin assists in maintaining a person's nutrient status at optimal levels, and it was therefore continued.

Exercise

The patient exercised a minimum of 30 minutes, twice per week. The exercise included 10-minute cardio exercise (10 minutes treadmill at level 9/10-minute exercise stationary bicycle at resistance level 5/2-kilometre jog), and 20-minute high-intensity free weight routine (with minimal rest between sets).

Anthropometric Values at the 6-Week Follow-up

At follow-up, the patient weighed 77.3 kg, which gives a normal BMI of 24.40 kg/m².

Table 1.

Typical Diet at Presentation.

Breakfast		
Item		Amount
Brown bread toast spread with butter or 60% buttermilk-containing margarine		1 Slice
Gouda or cheddar cheese		1 Slice
Espresso coffee (1 teaspoon sugar, dash of low-fat milk)		1 Cup
Lunch		
Item		Amount
Brown bread (sandwich buttered on both sides to toast)		2 Slices
Ham/salami		1 Slice
Gouda/cheddar cheese		1 Slice
Tomato		½ A tomato, sliced
Dinner		
	Item	Amount
Protein ×1	Lasagna	250 g
	Meat sauce	250 g
	Baked battered fish	2 Pieces
	Grilled chicken (skin on)	2 Pieces
	Rump steak (fat retained)	200 g
	Sausage	200 g
	Lamb chops	200 g
Starch ×1	Potato bake	150 g
	Potato mash	150 g
	Oven-baked chips	150 g
	Pasta (cooked)	1 Cup
	White rice (cooked)	1 Cup
Fruit and vegetables ×2 (except the salads ×1)	Steamed vegetables (broccoli, cauliflower, carrots, green beans, peas)	100-g Portions
	Baked butternut	½ A butternut
	Steamed gems squash	½ A squash
	Fruit salad (paw-paw, pineapple, melon, watermelon, apple, banana, orange)	Small salad bowl
	Salad (lettuce, gherkins, tomatoes, cucumber, and feta cheese)	Small salad bowl

(continued)

Table 1. (continued)

Accompaniments	
Item	Amount
Mayonnaise	1-2 Tablespoons
Regular salad dressing	1-2 Tablespoons
Salt and pepper	To taste
Cream to thicken meat sauces	½ Cup
Creamy béchamel sauce made with butter and low-fat milk	¼ Cup
Grated cheese	¼ Cup
Miscellaneous	
Item	Amount
Filter coffee (1 teaspoon sugar, dash of milk)	1 Cup
Dried high-fat sausage ("droëwors")	50-100 g
Alcohol	Moderate consumption (3-5 units per week)
Daily supplements	
2 Capsules 1000 mg conjugated linoleic acid, 500 mg vitamin C, and 1 tablet Staminogro multivitamin	

Fasting Lipogram at 6-Week Follow-up

The follow-up laboratory fasting lipogram results were as follows (baseline results in brackets):

- Total cholesterol 4.6 mmol/L (7.7 mmol/L)
- Triglycerides 0.9 mmol/L (2.29 mmol/L)
- HDL cholesterol 1.9 mmol/L (1.7 mmol/L)
- LDL cholesterol 2.5 mmol/L (5.3 mmol/L)
- Non-HDL cholesterol 2.7 mmol/L (6.0 mmol/L)

Anthropometric Values at the 6-Month Follow-up

At follow-up, the patient weighed 68.2 kg, which gives a normal BMI of 21.50 kg/m².

Fasting Lipogram at 6-Month Follow-up

The follow-up laboratory fasting lipogram results were as follows (baseline results in brackets):

- Total cholesterol 4.6 mmol/L (7.7 mmol/L)
- Triglycerides 0.9 mmol/L (2.29 mmol/L)
- HDL cholesterol 1.7 mmol/L (1.7 mmol/L)
- LDL cholesterol 2.8 mmol/L (5.3 mmol/L)
- Non-HDL cholesterol 2.9 mmol/L (6.0 mmol/L)

Conclusion

The patient in this report was able to reduce his total cholesterol by 40.25% and his LDL cholesterol by 52.8% over the course of 6 weeks, without the use

of cholesterol-lowering drugs. The altered diet reduced the amount of dairy and high animal fat foods, contained more lean meat, and increased the intake of food clinically proven to decrease LDL cholesterol (such as oats, almonds, avocados, and olive oil). After 6 months, the cholesterol levels remained constant within the normal range, and the patient stabilized his weight at a BMI of 21.50 kg/m². It has been reported that weight loss in combination with a cholesterol-lowering diet is more effective in lowering LDL cholesterol levels than weight loss alone; therefore, the substantial decrease in LDL cholesterol in this case cannot be exclusively attributed to either the weight loss or diet but rather the combination of factors.¹⁶ Thus, it can be concluded that in some individuals with moderately high cholesterol levels, lifestyle changes (such as an altered, healthy fat diet and moderate exercise, together with weight

Table 2.

Altered Diet.

Breakfast		
Item		Amount
Raw oats (boiled with 2/3 cup of water)		1/3 Cup
Salt		To taste
Honey		1 Teaspoon
Ground cinnamon		½ Teaspoon
Espresso coffee (1 teaspoon sugar, dash of low-fat milk)		1 Cup
Midmorning Snack		
Roasted, unsalted almonds		15
Lunch		
	Item	Amount
High-kilojoule item ×1	Avocado	½ An avocado, sliced
	Tuna in salt water	50 g
	Skinless chicken breast	50 g
	Sardines	50 g
	Nonfat smooth cottage cheese	2 Tablespoons
Starch ×1	Brown bread spread with ProActive sterol-containing margarine (35% fat)	2 Slices
	Whole wheat pasta (cooked)	1 Cup
	Whole wheat wrap	1
Vegetables (any)	Tomato	½ A tomato, sliced
	Lettuce	1 Leaf
	Cucumber	6 Rounds
	Fresh peppers	¼ Cup
	Cherry tomatoes	5
	Fresh herbs (basil, coriander, parsley etc)	To taste
Seasoning	Salt and pepper	To taste
Midafternoon Snack		
Roasted, unsalted almonds		15
Dinner		
	Item	Amount
Protein ×1	Skinless chicken breast	1
	Ostrich	150 g

(continued)

Table 2. (continued)

Dinner		
	Item	Amount
	Lean venison	150 g
	Unbattered fish	150 g
	Lean pork fillet	150 g
Starch ×1	Baked jacket potato	1
	Baked sweet potato	1
	Lentils	1 Cup
	Wild and brown rice (cooked)	1 Cup
	Whole wheat pasta (cooked)	1 Cup
	Whole wheat or brown burger bread roll	1
	Whole wheat pita bread	1
	Whole wheat burrito	1
	Whole wheat couscous	1 Cup
Fruit and vegetables ×2 (except the salads ×1)	Steamed/grilled vegetables (broccoli, cauliflower, carrots, green beans, peas)	100-g Portions
	Baked butternut	½ A butternut
	Steamed gems squash	½ A squash
	Fruit salad (paw-paw, pineapple, melon, watermelon, apple, banana, orange)	Small salad bowl
	Salad (lettuce, tomatoes, cucumber, ½ avocado and 5 olives)	Small salad bowl
Accompaniments		
	Item	Amount
	Fruit chutney	1-2 Tablespoons
	Apple cider vinegar	1 Tablespoon
	Reduced-oil salad dressing	1 Tablespoon
	Preservative-free tomato sauce	1-2 Tablespoons
	Reduced-oil mayonnaise	1 Tablespoon
	Grated parmesan cheese	1 Teaspoon
	Low-sodium salt and pepper	To taste
	Extra-virgin olive oil	1 Teaspoon
Preparation		
Meat was fried, grilled, or baked in either avocado or olive oil. When cooking minced meat, low-fat vegetable stock was added to the sauce for flavor. Various beans were sometimes added to mince dishes to increase legume intake. Onions, garlic, ginger, and herbs were used to enhance flavor. Canned tomato mixes were used with caution because they sometimes contain extra added fats and sodium for taste		

Table 2. (continued)

Miscellaneous	
Item	Amount
Filter coffee (1 teaspoon sugar, dash of milk)	1 Cup
Alcohol	Moderate consumption (3-5 units per week)
>80% Dark chocolate	1 Piece
Daily Supplements	
1 Capsule OmegaChoice EPA270/DHA180, 2 capsules 1000 mg conjugated linoleic acid, 500 mg vitamin C, and 1 tablet Staminogro multivitamin	

loss) have the potential to lower cholesterol to within normal ranges without the addition of cholesterol-lowering drugs, such as statins.

Declaration of Conflicting Interests

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Ethical Approval

Ethical approval was granted by the Health Sciences Research Ethics Committee of the University of the Free State, HSREC 133/2017, UFS-HSD2017/1265.

Informed Consent

The patient gave consent for the results to be published.

Trial Registration

Not applicable, because this article does not contain any clinical trials.

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