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Poor Cardiovascular Risk Profile Following a Vegan Diet: A Case Report

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Authors' contributions

This work was carried out in collaboration between both authors. Authors OHK and AB interpreted the patient data, collected information from the literature and both were major contributors in writing the manuscript. Both authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Introduction: Vegetarianism and veganism are becoming increasingly popular in North America due to reasons ranging from environmental motives to animal rights. While the vegetarian lifestyle allows some egg and dairy items, vegans completely abstain from all animal products in favour of plant-based diets. Of additional interest to vegans, are the health benefits associated with cardiovascular disease, type 2 diabetes, weight loss and some particular forms of cancer.
Case Presentation: Numerous studies have demonstrated drastic improvements in lipid markers such as low-density lipoprotein and total cholesterol that follows vegan dieting when compared to vegetarians or omnivores. This case report discusses a female patient who revealed abnormal lipid markers following blood analysis, despite observing a strict vegan diet for two years.
Conclusion: It is questioned whether a vegan diet and its associated macronutrients are indeed beneficial for cholesterol levels or if adhering to this diet require more thorough investigation for an overall reduced risk of cardiovascular disease.

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1. INTRODUCTION

In the past decade, vegan and vegetarian diets have been trending the North American society as a means to encourage animal rights, the environment, and/or health advantages. A vegetarian diet emphasizes on restricting meat, while still enjoying other animal products such as eggs or dairy, while vegan diets are characterized by complete exclusion of all animal products. Among many reasons for the increased popularity over the last years, is that veganism has been suggested to lower the risk of Cardiovascular Disease (CVD) and mortality as well as improve glycemic and lipid control [1-3].

Cardiovascular Disease (CVD) is the principal reason for premature death in the Western world and has been suggested to become the leading cause of death worldwide by 2020 [4]. It is established that while the etiology, risk factors, and clinical presentation differ between individuals, the incidence increases with age. Routine bloodwork is a common method for monitoring risk of CVD as there seems to be a linear relationship between the risk of CVD, elevated Total Cholesterol (TC), low-density lipoprotein cholesterol (LDL-c), while there is a low association with CVD and triglycerides (TG) [4,5]. Decreased levels of LDL-c are clinically beneficial, however, there is no absolute value or threshold below which levels are 'safe' and whereby risk disappears [4].

Elevated LDL-c, hypercholesterolemia, relates to CVD risk through its involvement in inflammation, followed by lipid oxidation. Inflammation due to retention and oxidation of LDL-c succeeded by endothelial dysfunction typically initiates the development of atherosclerosis subsequently leading to an intima layer covered in lipids and debris [6]. Repeated exposure to risk factors thickens this lesion eventually rendering reduced blood flow and stenotic arteries.

There is an ongoing debate in the literature as to what is the most appropriate and accurate lipid to use for evaluating the risk of CVD. LDL-c remains a significant indicator but will, when used alone, provide a mere incomplete diagnosis. A suggested approach has been to quantify the apolipoproteins ApoB or ApoE as this will indirectly determine the concentrations of Very Low-Density Lipoprotein (VLDL), Intermediate Density Lipoprotein (IDL), and LDL [7]. The attained information can then be used to calculate TC/HDL-c, LDL-c/HDL-c, and TG/HDL-c, all known predictors of CVD risk in women [7].

With the relationship between these biomarkers and the development of CVD, a natural method to reduce and maintain healthy blood lipid concentrations is diet modification. The 'DASH' diet, for example, geared towards hypertensives, can reduce the risk of CVD by lowering the LDL-c concentrations [8]. The inverse relationship has been reported, whereby the replacement of trans- or saturated fats by unsaturated lipids provide favorable in lowering the LDL-c concentration [9]. Wise and healthy choices of fats have been shown to be more effective in preventing CVD than reducing overall fat intake [9].

2. PRESENTATION OF CASE

A 51-year-old premenopausal female presented to her general practitioner for stomach pain. The patient suffers from disc degenerative disease, meralgia parasthetica, and lumbar arthritis. Due to immobility, and subsequent weight gain, the patient has been adhering to a strict vegan diet for two years in an attempt to lose weight. Medications taken include Metoprolol 200 mg/day for hypotension, left bundle branch block (LBBB) and transient palpitations. The patient's medical history does not involve any cardiovascular events.

Following a firm vegan diet, the patient consequently does not consume meat, fish, eggs, cheese, or any other animal products. The patient has an average daily caloric intake of 1106 kcal based on a self-reported food journal which demonstrates that on average, the patient receives 51% of her energy from carbohydrates, 39% from fat, and 10% from protein. The individual's choice of foods does not include anything with trans- or saturated fats, as the majority is raw or non-preservative.

Upon completion of full blood analysis, the results reveal her remarkable cardiovascular risk profile.

3. DISCUSSION

The analysis of the patient's blood revealed above average LDL-c and TC, as well as low HDL-c. Aside from primary dyslipidemia typically caused by familial hypercholesterolemia or LDL-receptor deficiency, secondary dyslipidemia may

Table 1. Results of blood test with the guidelines set by the American Heart Association

	Patient's values (mmol/L)	Healthy range (mmol/L)
Total Cholesterol (TC)	5.86	3.15-5.18
High-density lipoprotein (HDL)	1.17	1.3-2.5
Low-density lipoprotein (LDL)	4.09	1-2.59
TC/HDL	5.0	0-4.4
Atherogenic Index LDL/HDL	3.5	0-2.9

be induced by diet (high saturated or trans- fat intake), obesity, hyperthyroidism, diabetes mellitus, nephrotic syndrome, pregnancy, or other conditions [10].

Fraser [11] has demonstrated significant improvements in LDL-c, TC, and C-reactive protein after only 5 weeks on a strict vegan diet. Furthermore, in older hyperlipidemic patients the introduction of a vegan diet allowed for a 20-30% decrease in TC and LDL-c. Studies specifically following women demonstrate that a vegan diet is typically associated with a reduction in HDL followed by a decrease in LDL-c and TC [12,13].

Vegetarians generally experience a lower risk of CVD, obesity, type 2 diabetes, and some types of cancers. Furthermore, Fraser [11] has shown that, compared with vegetarians, vegans are leaner, have lower LDL cholesterol, and modestly lower blood pressure. Vegans, compared to vegetarians and omnivores, consume greater quantities of fruit and vegetables which provide a diet higher in antioxidants such as folic acid, vitamins C and E [14]. Additionally these choices include increased fiber content which increase the absorption, and thus loss of bile acids through defecation [9]. This loss is compensated by increased hepatic modulation of plasma cholesterol into bile acids [15] with a subsequent reduction in serum cholesterol and thus a lower risk of CVD in vegans.

The sources of protein and fat can also impact whether the effects of a diet can be beneficial [16]. Low-carbohydrate diets with protein and fat primarily from vegetable as opposed to animal sources have been associated with decreased mortality and risk of CVD. Moreover, replacing saturated fatty acids with the unsaturated fatty acids primarily found in vegetables, have been shown to decrease the TC:HDL-c ratio, with monounsaturated fatty acids resulting in even greater reduction in LDL-c.

4. CONCLUSION

This case report suggests that additional studies are needed to clarify whether saturated, compared to unsaturated fats, are more dangerous in boosting the lipid risk profile. Although the patient, as expected, demonstrated below target levels of HDL, the type of fat consumption does not reflects her other blood lipid markers.

The patient in this case report qualifies as a strict vegan for two years which raises the question: how is it possible to have such an unusually poor lipid profile? Reductions in LDL-c and TC should develop within weeks of vegan dieting. Our patient has, after two years not yet encountered such improvements. More research is needed to make accurate and appropriate dietary recommendations on which types of fats to consume or avoid when on a vegan diet, in order to decrease overall CVD risk.

CONSENT

All authors declare that written informed consent was obtained from the patient for publication of this case report and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all information obtained in this case report have been examined and approved by Concordia University Human Research Ethics Committee (Certification number: 30005463) and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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