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## Review

## Review of Dietary Practices of the 21st Century: Facts and Fallacies

Fatheema B. Subhan PhD, RD<sup>a</sup>, Catherine B. Chan PhD<sup>a,b,c,\*</sup><sup>a</sup> Department of Agricultural, Food and Nutritional Sciences (Division of Human Nutrition), University of Alberta, Edmonton, Alberta, Canada<sup>b</sup> Department of Physiology, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada<sup>c</sup> Diabetes, Obesity and Nutrition Strategic Clinical Network, Alberta Health Services, Edmonton, Alberta, Canada

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## ABSTRACT

The prevalence of chronic metabolic diseases, such as diabetes, cardiovascular diseases and cancer, is increasing around the world. Nutritional interventions can reduce the prevalence and provide effective treatment, even when weight loss is not dramatic. The 2013 Canadian Diabetes Association Clinical Practice Guidelines concluded that certain dietary patterns and popular weight-loss diets had sufficient evidence to suggest their use by individuals with diabetes, but many other diet patterns and diets exist. Our specific objectives were to review the nutritional quality of various dietary patterns and diets, with emphasis on the evidence that they are efficacious for weight loss, glycemic control and cardiovascular risk factors.

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## R É S U M É

La prévalence des maladies métaboliques chroniques telles que le diabète, les maladies cardiovasculaires et le cancer augmente à travers le monde. Les interventions nutritionnelles peuvent réduire la prévalence et offrir des traitements efficaces. Les lignes directrices de pratique clinique 2013 de l'Association canadienne du diabète ont conclu que certains modèles de consommation alimentaire et régimes amaigrissants populaires comportaient suffisamment de données probantes pour suggérer aux personnes diabétiques leur utilisation, mais plusieurs autres modèles de consommation alimentaire et régimes existent. Nos objectifs précis étaient de passer en revue la qualité nutritionnelle de divers modèles de consommation alimentaire et régimes en insistant sur les données probantes qui démontrent leur efficacité en matière de perte de poids, de régulation de la glycémie et de facteurs de risque cardiovasculaire.

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## Introduction

The prevalence of noncommunicable chronic health conditions such as diabetes, cardiovascular diseases (CVDs) and cancer, is increasing around the world, in part due to nutrition transitions to more Westernized dietary patterns (1). In 2012, deaths resulting from the 3 mentioned diseases amounted to more than 27 million people worldwide, while in Canada the number was nearly 140,000 deaths in 2011 (2,3). Modification of lifestyle choices and dietary intake is an important strategy for effectively reducing chronic health risks, even when weight loss is not dramatic. General nutrition recommendations are intended to meet nutrient needs for normal growth and sustenance without causing any nutritional

deficiencies or health risks (4). Additionally, specific nutrition guidelines for individuals who suffer from chronic health conditions, such as diabetes, are also available to manage these conditions effectively and to reduce the risk for comorbidities (5,6). However, several types of diets and dietary programs are available on the market today, many of which are not derived from standard nutrition recommendations, yet they claim quick solutions to the existing health burden. The most common claims centre around promoting weight loss and thus improve health by normalizing blood lipids, glycemia and blood pressure (BP). The number of diets available in the market is overwhelming; a recent report, “Best Diets,” by *US News and World Report* documented at least 35 popular diets circulating in the media (7). Each of these diets is based on certain principles, such as cultural and religious norms, specific nutrient or food groups or, sometimes, scientific evidence to promote healthful lifestyles. The Canadian Diabetes Association, in its 2013 guidelines, reviewed the efficacy of some of the more prominent dietary patterns or diets and concluded that dietary patterns, including vegetarian,

\* Address for correspondence: Catherine B. Chan, PhD, 6-126B Li Ka Shing Centre for Health Research Innovation, University of Alberta, Edmonton, Alberta T6G 2R3, Canada.

E-mail address: [cbchan@ualberta.ca](mailto:cbchan@ualberta.ca)

Mediterranean and Dietary Approaches to Stop Hypertension (DASH) diets could be recommended. In addition, certain popular weight-loss diets (Atkins, Protein Power Plan, Ornish, Weight Watchers and Zone) had sufficient evidence to suggest their use by people with diabetes whose lifestyles and personal preferences were congruent with the diets (5).

Several systematic reviews and meta-analyses of randomized control trials (RCTs) report comparisons of specific diets to each other and to standard diets. However, reviews offering comprehensive discussions of various current popular diets and their effects on health outcomes are limited. Hence, to address this question, we conducted a critical review of the literature to report various dietary practices and examine their association with health outcomes. Our specific objectives were 1) to review various dietary patterns and diets and 2) to examine the effects of dietary patterns on weight loss, nutritional status, glycemic control and CVD risk factors.

## Methods

We searched MEDLINE and PubMed databases (2000 to October 2015) for prospective cohort studies, RCTs and systematic reviews using the following keywords: paleolithic, vegetarian, New Nordic diet, Mediterranean diet, weight-loss diets, Atkins, low-sodium or DASH diet, and gluten free diet. Human studies in the English language, published between 2000 and October 2015, that described dietary patterns and compared various interventions were included. Primary outcomes included nutritional status, weight change, glycemic control and risk factors for CVD. The results from the studies extracted were heterogeneous in terms of the dietary interventions, lengths of follow up, participant demographics, data collection and data reporting. Hence, a narrative review approach was adopted in writing this manuscript.

### *Dietary patterns*

Dietary intake is influenced by several factors, such as socioeconomic conditions, physical environments, cultural practices and individual preferences based on palatability, values and habits (8–10). The resulting dietary choices made by individuals or groups are variable and are based on the sources of food. Dietary choices can be derived from animal sources, whereas others are plant based or a mix of both. Further, a spectrum of dietary practices is available on the basis of the macronutrient composition of the foods, such as a low-carbohydrate diet (LCD), low-fat diet (LFD), high-protein diet, high-fat diet and many more combinations. Irrespective of the type of diet, food provides energy and macro- and micronutrients to support growth and sustenance. A discussion of the most common types of dietary practices and their effects on weight and health outcomes is presented; a brief description of each dietary pattern is presented in the Table.

### *Vegetarian diets*

Plant-based foods are staples in the diets of many major human cultures. Evidence dating to the 6th century BCE documents that vegetarian diets (VDs) were consumed by followers of the Orphic mysteries (11). VDs have also been followed for religious and ethical reasons in countries such as India where approximately 35% of the population practices vegetarianism (12). VDs are characterized by the inclusion of all foods of plant origin and the exclusion of all types of meat, poultry and fish. Some VD classifications also exclude dairy products and eggs, whereas others may allow fish (Table 1). VDs are a good source of many vitamins and minerals, fibre, phytoestrogens, antioxidants, phytochemicals and n-6 PUFA fatty acids and are a healthful dietary choice (13).

In recent decades, VDs have become popular internationally due to their beneficial effects in reducing the risks for chronic diseases. A meta-analysis shows that VDs (vegan, lacto-ovo vegetarian, lactovegetarian or semivegetarian) in comparison to omnivorous diets are associated with significant reductions in systolic blood pressure (SBP) in people with hypertension (14). Epidemiologic evidence shows that VDs promote weight loss (15) and improve lipid profiles, thus offering a cardio-protective effect. VDs are associated with lower risk for mortality resulting from all causes, including ischemic heart disease and circulatory and cerebrovascular diseases, and lower incidences of cancer (16). A 74-week intervention trial comparing a low-fat vegan diet with a conventional diabetes diet found that a vegan diet is more effective in improving glycemic control in patients with type 2 diabetes (17). VDs also had protective effects against the risk for developing type 2 diabetes; the rates were lowest in vegans, followed by the rates in lacto-ovo vegetarians, then in semivegetarians in comparison to individuals consuming omnivorous diets (16,18).

Nonetheless, it should be noted that the nutritional quality of VDs is affected by the choice of foods consumed. In a longitudinal study comparing VDs and non-VDs, participants consuming lacto-ovo VDs had higher triglyceride levels and lower high-density lipoprotein (HDL) levels than nonvegetarians; this was attributed to higher consumption of refined carbohydrates and fructose by the lacto-ovo vegetarians (19). Additionally, vegetable oils, such as coconut and palm oil, are higher in saturated fats than other vegetable oils or animal fats. Higher consumption of these oils could increase plasma cholesterol levels and have an atherogenic effect (13).

Eliminating all animal food products (as in veganism) increases the risk for micronutrient deficiency. The nutrients of concern in VDs include vitamins B<sub>12</sub> and D, calcium, iron, zinc and long-chain n-3 (omega-3) fatty acids (20). Vegans have lower serum vitamin B<sub>12</sub> levels compared with people who eat meat. Vitamin B<sub>12</sub> is inversely associated with homocysteine levels, which are an independent risk factor for CVD (21). Similarly, substantially less vitamin D is consumed in a vegan diet compared to a lacto-ovo diet or a nonvegetarian diet. Vitamin D plays an important role in bone health, immune function and reducing inflammation, and vitamin D insufficiency has been associated with risk for chronic diseases, including type 1 diabetes and heart disease (20). Also, VDs that exclude milk products can be low in calcium but, provided that plant sources with high bioavailability are consumed, calcium intake can be sufficient (20). In terms of iron, plant-based foods are sources of non-haem iron that has poor bioavailability compared to haem iron from animal sources. Its absorption is further hindered by phytates (commonly occurring in cereals and tea), calcium, herbal teas, coffee, some spices and fibre (22). Similarly, absorption of zinc is hindered by phytates in the diet; however, overt zinc deficiency is uncommon among Western vegetarians (22). Thus, VDs appear to offer protective effects against noncommunicable chronic diseases, but care should be taken to ensure that they are nutritionally adequate.

### *Mediterranean diet*

The Mediterranean Diet (MedDiet) refers to the dietary pattern of people in the Mediterranean region; it was described in the early 1960s and is characterized by high intake of fruits, vegetables, legumes, nuts, whole grains and olive oil and moderate consumption of fish and poultry, dairy products and alcohol (mainly during meals) as well as low intake of sweet desserts and red and processed meats (23). The MedDiet has gained significant popularity in recent years because it is associated with reduced risk for chronic diseases and longer life expectancy.

There are 2 systematic reviews and meta-analyses of studies investigating the association between dietary factors and chronic

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