

# Vegetarian Diet: A Prescription for High Blood Pressure? A Systematic Review of the Literature

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## ABSTRACT

Hypertension is one of the most costly and poorly treated medical conditions in the United States and around the world. Consequences of hypertension include morbidity and mortality related to its long-term effects, which include stroke, myocardial infarction, renal failure, limb loss, aortic aneurysm, and atrial fibrillation, among many others. Although there is an armamentarium of medications to treat hypertension, we do little for prevention. In this review we examine the relationship between vegetarian and nonvegetarian diets and the prevalence of hypertension.

**Keywords:** diet, high blood pressure, hypertension, nonvegetarian, vegan, vegetarian

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## INTRODUCTION

There are > 70 million adults in the United States currently diagnosed with high blood pressure, with only 52% of them actually having their disease under control, meaning 48% are not adequately controlled. In the US alone, this chronic disease accounted for > 360,000 deaths in 2013 and annual costs of > \$46 billion on health care services, medication costs, and missed work days.<sup>1</sup>

The cause of hypertension is unknown in > 90% of cases. The other 10% include: kidney pathology (eg, renal artery stenosis); endocrine (eg, hyperthyroidism), vascular (eg, atherosclerotic disease), medication-induced (eg, nonsteroidal anti-inflammatory drugs) origins; and obstructive sleep apnea.<sup>2</sup> Current nonpharmacologic treatments include: physical activity ( $\geq$  30 minutes of moderate-intensity activity on most days of the week); smoking cessation; dietary modification (lower sodium, increased potassium; mainly plant-based foods; low-fat foods; reduced-fat dairy products; moderate amounts of lean unprocessed meats, poultry, and fish; and moderate amounts of polyunsaturated and monounsaturated fats, such as olive oil); weight reduction; management of stress; and limited alcohol consumption.<sup>3</sup>

It is well known that hypertension is modulated by dietary influences. In this review we examine vegetarian, vegan, and nonvegetarian (omnivore) diets and prevalence of hypertension among these dietary populations. A vegetarian diet (ie, lacto/ovo-vegetarian) includes plant foods, dairy products, and eggs (excludes all meat, such as turkey, beef, poultry, seafood, bacon, etc.). A vegan diet is similar to vegetarian, except it further excludes dairy products and eggs (no animal or animal products).<sup>4</sup> On the other hand, an omnivore diet (referred to as nonvegetarians throughout this study) includes both plant and animal foods and products. There are other diet varieties that may be discussed, including pescetarian (plant products plus fish, no other meat), pollotarian (excludes all meat except poultry and fowl), or ovo-vegetarian (plant products plus eggs), among others (Table 1). It is important to note that “true” vegetarians do not incorporate any type of meat from land animals, seafood, or any portion of the animal after slaughter.<sup>5</sup> The majority of studies included in this review addressed vegetarians and vegans as a single group (vegetarians), whereas others differentiated them. Vegetarian diets are known to be low in saturated fat and cholesterol, high in fiber, low in sodium, and high

**Table 1. Types of Diets<sup>4,5</sup>**

Diet	Plants/Fruits/ Vegetables/Nuts	Animal Products <sup>b</sup>	Land Animals <sup>c</sup>	Fowl	Seafood <sup>d</sup>
Omnivore (ie, nonvegetarian)	X	X	X	X	X
Pollotarian	X	X (some eat eggs/dairy)	X (poultry only)	X	
Flexitarian/ semivegetarian <sup>a</sup>	X	X (occasionally eats)	X (occasionally eats)		
Pescetarian <sup>a</sup>	X	X (some eat eggs/dairy)			X
Lacto-vegetarian	X	X (dairy/products only)			
Ovo-vegetarian	X	X (eggs only)			
Lacto/ovo- vegetarian	X	X (eggs and dairy/ products only)			
Vegan	X				
Raw vegan	X				

(unprocessed food not heated  
above 115°F)

<sup>a</sup> Pollotarians, flexitarians, and pescetarians are not recognized as “true” vegetarians. “True” vegetarians do not eat any type of meat from land or sea or “slaughter byproducts.”<sup>5</sup>

<sup>b</sup> Animal products include dairy, eggs, cheese, honey/beeswax, and gelatin.

<sup>c</sup> Land animals include beef, poultry, pork, turkey, lamb, venison, game meat, etc.

<sup>d</sup> Seafoods include fish, shrimp, scallops, lobster, crab, mussels, oysters, squid, etc.

in potassium. These key elements have been shown to correlate with lower incidence of cancer, heart disease, and other chronic diseases, such as diabetes type II, hypertension, and hyperlipidemia.<sup>6</sup>

The exact percentage of those following a vegetarian or vegan diet in the US is unknown; however, a 2014 study found that 221 of 11,399 adult respondents, from a group generally representing the demographics of the US, identified as vegan (0.5%), vegetarians (1.5%), or meat-eaters (98%).<sup>7</sup> The prevalence of hypertension in the US in 2011 was roughly 33.8%.<sup>8</sup> Portugal and New Zealand are other countries that also have a higher prevalence of hypertension (34.5%<sup>9</sup> and 36.8%,<sup>8</sup> respectively) with a low vegetarian population (0.3%<sup>10</sup> and 1.5%,<sup>11</sup> respectively). On the other hand, India, Israel, and Taiwan all have a lower prevalence of hypertension (21.1%,<sup>8</sup> 21.2%,<sup>8</sup> and 21.5%,<sup>12</sup> respectively) and a higher vegetarian population (35.5%,<sup>13</sup> 13%,<sup>14</sup> and 13%,<sup>15</sup> respectively). Could the high prevalence of

nonvegetarians (meat eaters) be related to the high prevalence of hypertension, and vice versa, in the US as well as other countries?

The purpose of this review is to evaluate the current available data on the relationship between a vegetarian diet and the prevalence of hypertension relative to that of nonvegetarians. The main objective is to determine whether the data support vegetarian and vegan diets as a viable prevention method for hypertension. Additional health factors, such as ethnicity, body mass index (BMI), tobacco and alcohol use, and physical activity, will be addressed, but will not be the primary object of discussion.

### SEARCH STRATEGIES AND STUDY SELECTION

Databases searched included Academic Search Complete, Cumulative Index of Nursing and Allied Health Literature (CINAHL) Plus, Cochrane Database of Systematic Reviews, Health Source Nursing/Academic Edition, Medline, and PubMed. Key words used included vegetarian diet phrases

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