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Review Article

Diet Therapy for Hypertension

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Abstract

One of the main health issues that the world faces is hypertension. Patients' quality of life and survival are significantly impacted by the related morbidity and mortality consequences. It has been demonstrated that enhancing blood pressure regulation improves general well-being. In addition to pharmacological therapy, non-drug approaches including nutrition modifications are crucial for blood pressure control as well. strain. Several research have been done on the impacts of alcohol, hard water, obesity, and small dietary reductions salt and increases in consumption of potassium, foods high in calcium, diets heavy in unsaturated fats and low in animal fats, and finally higher dietary fiber levels associated with obesity. Although a few of these, while certain minerals are clearly recommended, others are contentious and yet undergoing investigation.

Patients are often counseled on dietary changes, which have a significant positive impact on blood pressure control. Consequently, an analysis of the available data will be highly beneficial in assisting patients' doctors or nutritionists in making decisions. This review paper examines the role of nutrition in the treatment of Hypertension that aimed to investigate the part that dietary variables played in hypertension both separately and in relation to eating patterns as a whole.

Keywords: Hypertension; Diet therapy; Blood pressure; Dietary fiber; Nutrition; Pharmacological therapy.

Introduction

Systolic blood pressure (SBP) of 140 mmHg or higher and/or diastolic blood pressure (Diastolic BP) of 90 mmHg or higher is referred to as hypertension. Blood pressure, or BP, is a public health is a big issue both in India and globally. It's an important cardiovascular risk factor that has a notable effect on cardiopulmonary death. According to the Collaboration of Prospective Studies, cutting blood pressure was linked to a significant decrease in cardiovascular risk as well as cardiovascular and total cause of death. Each of these relative variations in vascular Compared to ages 4049, mortality

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was around half at 8089, however the Age-related differences in absolute risk varied more each year. As stated to the World Health Organization's 2012 report on global health statistics High blood pressure has an impact on the Health Organization (WHO). roughly 24.8% of people on the planet, with a prevalence varying by location from 19.7% to 35.5% [1,2].

One of the most prevalent illnesses requiring medical attention or hospital stays, it poses a significant risk for stroke, congestive heart failure (CHF), myocardial infarction (MI), and peripheral vascular illness and death overall. Many hypertensive individuals are undiagnosed, and almost two thirds of those who have poor in control. Early intervention can greatly lower blood pressure plus its complexities. Dietary and lifestyle changes are available as treatments. modifications (such as losing weight, giving up smoking, and increasing exercise), blood pressure treatments, and surgery in unique situations [2].

History

Frederick Mohamed is credited with discovering "essential" hypertension when, in the early 1870s, Frederick Mohamed was a resident physician at Guy's Hospital in London and measured the general public's blood pressure (BP). Frederick Mohamed created a spring-loaded gadget with a watchmaker that could use a portable sphygmomanometer to measure radial pulse tension. created ten years earlier in France by Étienne-Jules Marais. Despite the fact that people with renal illness and Frederick Mohamed discovered that a portion of those with proteinuria can also have high blood pressure. Without proteinuria, the population also has elevated blood pressure [3].

Blood pressure measurement was not made possible despite Mohamed's findings until the 1890s, when Scipione Riva-Rocci (1863–1937) invented the mercury manometer and the BP cuff. Nikolai Sergeivich Korotkoff's auscultation (1874–1920). Below the cuff is widely employed to guarantee total blockage of blood flow is reached and the diastolic blood pressure may be measured exertion [3]. Harvey Cushing and Theodore Janeway both contributed and introduced the blood pressure monitor to the US market. In a prior investigation, Janeway and colleagues discovered that individuals under 65 had an uncommon systolic blood pressure of more than 140 mmHg (0.5 to 1%), whereas the threshold was closer to 160 mmHg for those over 65. 1906 saw Insurance providers acknowledged the rise in death rates in patients with hypertension, as demonstrated by MetLife in a 1912 write up. Blood pressure monitoring quickly became commonplace. process for medical professionals, with a set threshold of 140/90 mmHg like hypertension [4].

Types of hypertension

1. Essential Hypertension: Essential hypertension is also called essential hypertension. Most adults with high blood pressure fall into this category. Despite years of research on high blood pressure, the exact cause is unknown. It is thought to be a combination of genetics, diet, lifestyle, and age [5].

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2. Secondary hypertension: Secondary hypertension occurs when you have an identifiable and possibly reversible cause of your high blood pressure. Only about 5-10% of high blood pressure is of the secondary type. It is more common in young people. It is estimated that 30% of hypertensive patients between the ages of 18 and 40 suffer from secondary hypertension [6].

Symptoms

One can have high blood pressure for years without symptoms. Some people with high blood pressure may experience:

1. Dizziness
2. Headache
3. Shortness of breath
4. Nosebleed

However, these symptoms are not specific. They usually don't appear until the hypertension reaches a serious or life-threatening stage [7].

Causes

Conditions and medications that can cause secondary high blood pressure include:

1. Tumors of the adrenal glands
2. Blood vessel problems present at birth, also called congenital heart defects
3. Cough and cold medications, certain pain relievers, birth control pills, and others prescription drugs
4. Street drugs, such as cocaine and speed
5. Kidney disease
6. Obstructive sleep apnea
7. Thyroid problems
8. Sometimes a simple checkup can cause your blood pressure to rise. This is called white coat hypertension [8].

Risk factors

Uncontrolled high blood pressure can lead to complications, including Heart attack or stroke. Hardening and thickening of the arteries due to high blood pressure or other factors can lead to heart attack, stroke, or other complications [9].

There are many risk factors for high blood pressure, including:

1. Family history: You are more likely to develop high blood pressure if one of your parents or siblings had it.
2. Age: The risk of high blood pressure increases with age. High blood pressure is more common in men until around age 64. Women are more likely to develop high blood pressure after age 65.
3. Lack of exercise: Not exercising can lead to weight gain. Weight gain increases the risk of high blood pressure. People who don't exercise also tend to have higher heart rates.
4. Obesity or overweight: Being overweight can lead to changes in blood vessels, kidneys and other parts of the body.
5. Low Potassium Levels: Potassium helps balance salt levels in the cells of the body. A good balance of potassium is important for heart health. Low potassium levels can be due to a lack of potassium in your diet or certain health conditions, including dehydration [10].

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6. Stress: High levels of stress can cause a temporary increase in blood pressure. Stress-related habits, such as eating more, smoking, or drinking alcohol, can cause your blood pressure to rise further.
7. Certain chronic diseases: kidney disease, diabetes, and sleep apnea are some of the conditions that can cause high blood pressure.
8. Pregnancy: Sometimes pregnancy can cause high blood pressure [11,12].

Complications

Excessive pressure on arterial walls due to high blood pressure can damage blood vessels and organs in the body. The higher the blood pressure and the longer it remains uncontrolled, the greater the damage. Uncontrolled high blood pressure can lead to complications including:

1. Heart attack or stroke: Hardening and thickening of the arteries due to high blood pressure or other factors can lead to heart attack, stroke or other complications.
2. Kidney problems: High blood pressure can cause narrowing or weakening of blood vessels in the kidneys. This can cause kidney damage.
3. Eye problems: High blood pressure can cause thickening, narrowing, or tearing of blood vessels in the eyes. This can lead to vision loss.
4. Metabolic Syndrome: This syndrome is a group of metabolic disorders in the body. It involves the irregular breakdown of sugar (also known as glucose). The syndrome includes an enlarged waist circumference, high triglycerides, low high-density lipoprotein (HDL or "good") cholesterol, high blood pressure, and high blood sugar. These conditions make you more likely to develop diabetes, heart disease, and stroke [13].

Pathophysiology

Chronic high blood pressure, or hypertension, raises the risk of morbidity and death and damages target organs over time. The result of heart contraction is blood pressure. systemic vascular resistance and output heightened activation of Alpha-adrenergic receptors or elevated peptide release, including Endothelin or angiotensin II can make blood vessels more elastic.

Vascular smooth muscle experiences a rise in cytosolic calcium, which ultimately results in vasoconstriction. Angiotensin and endothelin are two growth hormones that cause a rise in smooth Vascular remodeling, or the build-up of muscle mass in blood arteries. elevated vascular resistance and systemic vascular resistance rigidity increases the stress on the left ventricle, which results in left ventricular left ventricular diastolic dysfunction and hypertrophy. The autonomic nerve system contributes significantly to regulating blood pressure.

There is an increase in norepinephrine release and peripheral norepinephrine sensitivity in hypertension individuals.

Furthermore, greater reactivity to stressful stimuli was seen. One more One feature of arterial hypertension is the bar's recovery. reflex and the reduction in baroreceptor

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sensitivity. The. At least certain types of involve the renin-angiotensin system. elevated blood pressure. Reno vascular hypertension, for instance, and reduced in primary excessive aldosterone. Black people or the elderly typically have low renin elevated blood pressure. Some are more hypertensive and have higher renin levels. vulnerable to heart attacks and other cardiac difficulties [14].

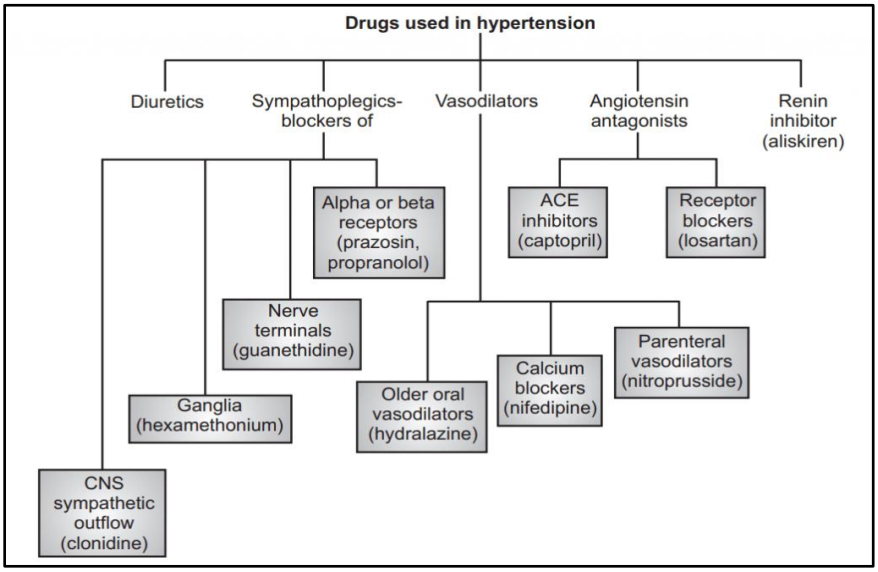

Figure 1: Allopathic Remedies.

Nutritional management of hypertension

Sodium

It has been debated for decades how variations in blood pressure and salt consumption are related. The majority of hypertensive cultures are those with average sodium intake of chloride >100 mmol/day and is extremely uncommon in those with a consumption <50 mmol/day [15,16]. The idea of sensitivity to salt as opposed to salt tolerance emerged from research showing the diverse blood pressure's reaction to variations in salt consumption. Such Both normotensive and hypertensive patients showed alterations. topics [17]. But the most popular approach was made known by Weinberger. To give a quick summary of physiology, tubular reabsorption and glomerular filtration are responsible for maintaining sodium homeostasis. Neurohumoral hormones mediate 65%–75% of salt reabsorption. angiotensin II and norepinephrine in the proximal duct, and collecting duct (atrial natriuretic hormone, testosterone), while 30- The loop of Henle accounts for 35 percent of salt reabsorption, while the lower tubule and the flow determines this [18]. Evidence suggests that salt sensitivity is more common in some groups, such as Black people, elderly folks, and those with insulin resistance low renin, chronic kidney disease (CKD), and microalbuminuria stages [19]. According to recent research, some genetic Salt-responsive genes are developed in part due to polymorphisms. various causes of hypertension: impact on renal tubular K+Na+AT reduced renal proximal tubular

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dopamine and pace activity decreased endothelial function or receptor function [20]. Many professional organizations strongly support dietary salt reduction as a lifestyle behavior modification for the prevention and treatment of hypertension and the associated death and morbidity from cardiovascular disease [21].

Potassium

The connection between blood pressure and potassium has been the subject of several research. An analysis of a population-based study revealed that the relationship between potassium consumption and diastolic and systolic blood pressure was inverse. renin activity plasma concentration, sodium excretion, and a drop in plasma aldosterone levels linked to blood volume along with a 7 mmHg rise in blood volume in PAS and the pressure at diastole [22]. The impact of potassium consumption in decreasing blood pressure seems to be higher in those with hypertension, with a longer duration of supplementation and increased consumption of salt concurrently. It ought to be said that a few of the benefits of elevated potassium consumption on heart health may not be influenced by blood pressure. A 40% decreased risk of stroke-related death was linked to an increase in potassium consumption of 10 mmol per day [23]. The impact of potassium on hypertension supplementation might result from a number of mechanisms:

1. Sodium first outflow by preventing salt reabsorption in the nearby inhibition of renin secretion and renal tubules,
2. normalization plasma levels,
3. increased excretion of urine,
4. relaxation by boosting the synthesis of nitric oxide and/or rectifying K (+) channels resulting in the hyperpolarization of the membrane below and resulting in smooth muscle dilatation,
5. prevent the development of free radicals and
6. shield salt from causing vascular injury [24].

Delicate excessively high which of these processes is more important for. It is not entirely effective to lower blood pressure and/or cardiovascular mortality recognized at although it does not outline a threshold, the 2003 WHO/International Hypertension Society statement on the management of hypertension encourages increasing dietary potassium consumption. Still, among patients prone to hyperkalemia, such as individuals with compromised renal potassium excretion brought on by CHF, CKD, insufficient adrenal glands, and using drugs (angiotensin-converting enzyme inhibitors, for example) the recommended daily intake of angiotensin (ACE), angiotensin receptors consumption of potassium may be reduced (receptor antagonists (ARBs), potassium-sparing diuretics, cyclosporine, heparin, trimethoprim, etc.) These individuals need to have routine monitoring [25].

Calcium

Because of interactions with other nutrients in the diet and the challenges associated in gathering data on the connection, the association between calcium consumption and hypertension is complicated and

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challenging to isolate. consuming calcium. calcium consistently and considerably. Perplexing There were no measured variables. While a great deal of study has been conducted on the impacts of dietary or the effects of more calcium on blood pressure, the proof that advantages is contentious and lacks clear evidence. Numerous studies have established a negative correlation between calcium consumption from diet and hypertension [26]. In a similar vein, taking 1000 mg of Daily intake of calcium has been demonstrated to lower blood pressure, although outcomes have been patchy, mostly in hypertensive sufferers. However, other research has shown that there is little to no impact of calcium supplements or food intake on blood.

Changes in intracellular calcium are thought to be one of the processes by which calcium intake controls blood pressure. These changes then impact vascular smooth muscle contraction, calcium metabolism, and the impact of hormonal regulators, elevated blood pressure, and urine. Excretion of sodium and sympathetic nervous system regulation operate. Remarkably, consuming a lot of salt was linked to increased blood pressure in those following a diet low in calcium, and it has been proposed that elevated salt levels cause hypertension. Increasing the amount of calcium in the diet may reduce consumption. The interaction of salt, calcium homeostasis, and the renin-aldosterone system sensitivity in controlling how a salt load affects blood pressure, The use of calcium channel blockers and supplements is explained in depth. These models could offer a focused method for identifying and managing hypertension that contains calcium [27].

Fiber

Fiber is the indigestible part of plant foods. Exactly how fiber affects blood pressure is not understood. An inverse relationship between blood pressure and fiber intake has been described. Consuming less than 12 g of fiber per day was associated with a higher risk of high blood pressure compared to consuming more than 24 g of fiber per day. This relationship was independent of other nutrients, including sodium, potassium, calcium, and magnesium [28].

Omega 3 fatty acids (fish oil)

A high-fiber diet has been demonstrated to considerably reduce blood pressure, and it seems to have a bigger impact in those with high blood pressure. advantages that have been shown to decrease blood pressure. Research points to a connection between enriched omega-3 Fish-derived polyunsaturated fatty acids, sometimes referred to as "fish oil" and reduce vascular resistance. Fish oil may have a dose-limiting impact since it would not have changed the mean arterial pressure of participants who consumed fish on a daily basis or whose plasma levels were higher than average. Baseline for Omega-3 Plus Phospholipid Fatty Acid Exceeding 175.1 L/mg. Note that these investigations made use of elevated dosages of omega-3 PUFAs (at least 3 grams daily), prompting questions regarding security and long-term usage side effects [29].

Garlic

Garlic is one of the most commonly used natural herbs. Researchers have also studied its role in high blood pressure. Despite the potential benefits, issues of lack of

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standardization in product preparation, formulation, and heterogeneity of studies preclude conclusive information on the use of garlic in hypertensive patients. It's beneficial. However, the quantity to be used, the duration of use and the products to be used are not clearly defined. It is one of the most important herbs for lowering high blood pressure [30].

Potentially harmful products

1. Coffee: Caffeine may be found in coffee, tea, soft drinks, and a lot of energy drinks as it's a key component of them. Coffee, in fact increases blood pressure in those who don't often consume coffee but having minimal impact on habitual coffee consumers. Based on the information at hand, regular coffee consumers with high blood pressure may not need lifestyle changes. Still, it can hurt those who just sometimes drink coffee. Some data suggests that a component other than caffeine might have the effect of raising blood pressure. An elevation in the blood pressure has been seen among coffee consumers who have cut back on caffeine. As per research in healthy participants, caffeine by itself did not cause a rise in blood pressure [31].
2. Licorice: Licorice has long been used as a flavoring agent in chewing tobacco, candy, spices, and some medicines for gastrointestinal and upper respiratory diseases. It contains glycyrrhetinic acid, which inhibits the type 2 subtype of 11-beta-hydroxysteroid dehydrogenase, which allows cortisol to bind to mineralocorticoid receptors, leading to a state of mineralocorticoid excess, which results in an increased blood pressure. Using licorice can be potentially dangerous for people with high blood pressure [32].

General meal plans

1. DASH Diet: The DASH Diet is high in fruits and vegetables (4-5 servings/day) and low-fat dairy products (2-3 servings/day), including whole grains, poultry, fish, and nuts. This diet was high in potassium, magnesium, calcium, dietary fiber, reduced protein, and fat (total and saturated) and cholesterol [33].
2. Plant-based: Vegetarians were shown to have lower blood pressure than people who followed a typical diet in early investigations. salt consumption in Vegetarian diets don't seem to have much of an impact on variations in arterial pressure. Also, recent research has demonstrated that Vegans are less likely to have high blood pressure, both systolic and diastolic, and prone to use antihypertensive drugs. When lightly neglected Patients with hypertension, a vegetarian diet with higher intake polyunsaturated vegetable margarine, fruits, and veggies fats, carbohydrates, minerals (calcium and magnesium), and less protein caused a five-mmHg drop in SBP. This diet increased blood flow. pressure without changing the excretion of sodium or potassium in the urine, or body mass. Vegetarians seem to have the potential to reduce blood pressure through several

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elements, including increased veggie and fiber [34].

Conclusion

Diet modification plays an important therapeutic role in blood pressure control. Strong evidence supports dietary recommendations that contain high potassium, moderate alcohol consumption and high fiber content. The use of pharmaceutical supplements to achieve these dietary goals is not recommended. Salt restriction is strongly recommended by professional organizations but should be interpreted with caution and individualized given the evidence of potential harmful effects and its variable effectiveness in different patient populations. In terms of increasing the intake of calcium, magnesium, fish oil and garlic, the recommendation is not entirely clear. Infrequent coffee drinkers and licorice drinkers are at risk for hypertension; therefore, patients at risk should avoid these habits. Established nutritional recommendations have been shown to help lower blood pressure, thereby reducing hypertension-related complications and overall mortality. However, given the heterogeneity of risk factors, patient characteristics, and the pathogenesis of hypertension, the approach should be individualized and between patients and their physicians and/or dietitians based on an understanding of the distinct disease characteristics of each patient discussed in detail. The importance of dietary modification in the management of hypertension has been widely studied over the past decades with encouraging results. Further research is needed to further investigate the role of these nutritional factors in the prevention and treatment of this disease in specific populations.

Diet recommendation for hypertension

1. Eat more fruit, vegetables, and low-fat dairy products.
2. Reduce your intake of foods high in saturated fat, cholesterol, and trans-fat.
3. Eat more whole grains, fish, poultry, and nuts.
4. Limit sodium, sweets, sugary drinks, and red meat.
5. Limit sodium intake to no more than 2,300 mg per day (just 6. 1,500mg per day is a more effective goal)
6. Reduces saturated fat to no more than 6% of daily calories and total fat to 27% of daily calories. Low fat dairy products appear to be particularly beneficial for lowering systolic blood pressure.
7. When choosing fat, choose monounsaturated oils like olive or canola.
8. Choose whole grains instead of white flour or pasta products.
9. Choose fresh fruits and vegetables every day. Many of these foods are high in potassium, fiber, or both.
10. Eat nuts, seeds, or legumes (soy or peas) every day.
11. Choose moderate amounts of protein (no more than 18% of your total daily calories). Fish, skinless poultry, and soy products are the best sources of protein.
12. Drink 6-8 glasses of water a day (or even more if you work in a hot, humid environment) to stay hydrated and good for blood pressure.

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