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Role of diet in hypertension: A review

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Abstract

One of the major contributors to the global burden of cardiovascular disease-related morbidity and mortality is hypertension, which affects about a quarter of the adult population worldwide. The current study uses prior studies as a guide to explore the relationship between diet and hypertension. Research was conducted throughout all of the research that was available to uncover studies on the relationship between food and the management of hypertension. To find this information, electronic searches were made in databases like Scopus, Google and Google Scholar. The study's conclusions suggest that one should increase their intake of fruits and vegetables in order to lower the prevalence of non-communicable diseases. In order to increase public health and lower healthcare costs, this is of highest importance.

Keywords: Diet, blood pressure, dietary pattern, hypertension

Introduction

According to the World Health Organization, hypertension affects an estimated one billion people worldwide, and its prevalence is rising ^[1, 2]. The most significant modifiable risk factor for early cardiovascular disease worldwide is hypertension, and it is a risk factor that can be managed. Over half of all cases of ischemic heart disease and strokes are brought on by hypertension ^[3].

The prevention and treatment of hypertension both need alterations to one's dietary habits. An ideal diet that includes whole grains, fruit, nuts, legumes, dairy products, red and processed meat, and sugar-sweetened beverages is linked to a significantly lower risk of developing hypertension, according to the results of a recent dose-response meta-analysis of prospective cohort studies ^[4]. The most recent dietary recommendations from the American Heart Association should be followed by patients who have hypertension or are at risk for developing it. These guidelines include minimizing alcohol consumption, consuming less sodium, and emphasizing consuming more fresh produce, vegetables, and low-fat dairy products ^[5, 6]. The dietary guidelines for the prevention and control of hypertension are not exhaustive, especially when several criteria are taken into account ^[5, 7].

Lower salt intake with usual care/control diets or DASH (Dietary approaches to stop hypertension) with integrated dietary approaches ^[8], or pairwise meta-analyses ^[9] reveal small drops in blood pressure ^[10]. Given the high prevalence of hypertension and the potential preventative effects that dietary factors can have, is that which dietary approach offers the best advantages. This is one of the most important question that need to be answered. One strategy that shows promise for addressing this issue is network meta-analysis ^[11, 12].

Hypertension

Only half of the adults in the United States who have hypertension, which is another name for high blood pressure, receive medication for their condition. An additional 25% of people have blood pressure values that are considered pre-hypertensive, putting them at risk for hypertension and cardiovascular disease. A person can get hypertension at any age, however their risk rises as they become older.

Blood pressure is the term used to describe the pressure that the body's blood flow places on the artery walls. A blood pressure reading gives the systolic and diastolic pressures, both of which are reported in milli metres of mercury (mm Hg).

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Systolic pressure is measured while the heart is pumping blood. A measurement known as the diastolic pressure is performed when blood is returning to the heart between heartbeats.

The term "silent killer" refers to high blood pressure, often known as hypertension, because it rarely causes any symptoms. This is because it's possible for it to go undetected for years prior to having a fatal heart attack or stroke. Blood vessels will eventually suffer damage from untreated hypertension. This can lead to a number of further health issues, such as heart failure, renal failure, bad vision, stroke, and heart attack. It is important to regularly check and continually monitor blood pressure readings.

Types of hypertension

Essential hypertension, sometimes referred to as primary hypertension

Undiagnosed hypertension, which has an unknown aetiology but may be influenced by both genetics and poor lifestyle choices. Smoking, insufficient exercise, stress, an unhealthy diet (high salt intake, low fruit and vegetable intake), and being overweight or obese are all lifestyle factors that may contribute to the development of this illness.

Secondary hypertension

A subsequent complication of another illness, most usually one that affects the endocrine system (the body's gland system responsible for hormone synthesis), is secondary hypertension, which may disappear when the underlying condition is cured.

Hypertension Management and Prevention

Changing one's lifestyle in addition to receiving medical care can help reduce hypertension. Research has demonstrated that, despite the fact that there are medications for the treatment of hypertension, even relatively little changes to one's diet and way of life can help control, and frequently delay or prevent, high blood pressure.

It is also advised that people abstain from tobacco use, limit their alcohol intake to no more than 2 drinks per day for men and no more than 1 drink per day for women, and engage in moderate physical activity for 30 to 45 minutes most days.

Research objective

The primary objective of this review is to study the role of diet in Hypertension.

Research method

The study relies solely on previously collected information (secondary data). Research was conducted through the available research to find studies on the relationship between diet and the management of Hypertension. The study was looked for by electronic searches of databases such as Scopus, Google and Google Scholar. In the process of doing the literature review, the following terms were utilized as keywords: Diet, Blood pressure, Dietary pattern, Hypertension.

Five Recommendations for a Healthy Diet to Lower Blood Pressure

1. The DASH diet, or Dietary Approaches to Stop Hypertension. The DASH diet (Dietary Approaches to

Stop Hypertension) is recommended by both the American Heart Association and the National Cancer Institute. The DASH diet is a comprehensive eating strategy that emphasizes consuming twice as many fruits, vegetables, complex carbs, and low-fat dairy products per day as is recommended. In comparison to the traditional American diet, the DASH diet is richer in potassium, magnesium, and calcium and lower in fat, saturated fat, cholesterol, and salt. The DASH diet also has less sodium in it. The high levels of potassium, magnesium, and calcium that are present in the DASH diet are thought to be responsible for at least some of its outcomes ^[5].

2. Limiting the number of calories you eat each day cutting back on daily caloric intake is associated with a significant decrease in systolic and diastolic blood pressure. As was said in tip number one, following the DASH diet may make it simpler to monitor daily caloric intake and may lower blood pressure more effectively than simply following a low-fat diet.
3. Eating a diet low in sodium - It has been demonstrated that reducing sodium intake, which constitutes a sizable amount of salt, is associated with a decrease in blood pressure. The most recent Dietary Guidelines state that a person should take no more sodium than 2,300 mg per day. It is advised that people with high blood pressure, African Americans, middle-aged people, and the elderly limit their daily sodium intake to 1,500 mg.
4. Potassium, calcium, and magnesium - Potassium and sodium interact to regulate the body's water balance. In this process, calcium and magnesium also have a part to play. Numerous studies have found that high potassium to sodium ratio is associated with a higher likelihood of maintaining a normal blood pressure level. People should ingest 4.7 grammes of potassium daily, according to the American Society of Nutrition.
5. Dietary fat: According to the most recent guidelines, dietary fat intake should be decreased overall as well as in terms of saturated and trans fats. These recommendations are aimed at maintaining a healthy weight over time. Omega-3 fatty acids are still a crucial fat to have in one's diet even though studies on their effects have not shown any reduction in blood pressure.

Nutritional factors in hypertension management

Sodium

The physiological concept put forth by Guyton-namely, that the kidney's function in digesting salt is crucial to the long-term regulation of blood pressure, is now widely acknowledged to be true ^[13]. However, there is ongoing controversy over the precise role that dietary sodium plays in this connection. It would seem that a complex combination of elements, some of which include dietary considerations, environmental considerations, genetic considerations, neurohormonal considerations, and metabolic considerations, affects the link between renal processing of salt and blood pressure.

Potassium

It has been demonstrated that potassium intake has a detrimental effect on both SBP and DBP. A sizable body of evidence from population-based studies corroborates this. Patients who consumed 1000 mg of potassium daily had a 0.9 mm Hg lower systolic blood pressure and a 0.8 mm Hg

lower diastolic blood pressure. Lack of potassium has been associated with decreased sodium excretion, decreased plasma renin activity, and elevated systemic and diastolic blood pressure by 7 mmHg and 6 mmHg, respectively ^[14].

Calcium

Simple inferences concerning the link between calcium consumption and hypertension are difficult to make. The benefits are not clearly demonstrated by the evidence. This is primarily because of how calcium interacts with the other nutrients in diets and because it is challenging to acquire accurate information about calcium intake. Numerous studies have shown that there is an inverse relationship between blood pressure and the amount of calcium taken in the diet. Even though the results were conflicting and were mostly observed in hypertensives, taking a calcium supplement of 1,000 milligrams per day was shown to lower blood pressure ^[13].

Magnesium

Currently, nothing is known about how magnesium affects the control of blood pressure. A few studies have found that having too little of it can cause blood pressure to increase. On the other hand, a thorough analysis of 29 distinct observational studies discovered an inverse connection between blood pressure and the intake of magnesium.

Fibre

The term "fibre" refers to the portion of plant-based foods that cannot be digested. It has been demonstrated that increasing fibre intake helps to reduce blood pressure. It is unclear exactly how the mechanism of action functions. The results of a study with 30,681 male health professionals aged 40 to 75 years showed that individuals with a daily fibre intake of less than 12 grams were more likely to develop hypertension ^[15].

OMEGA-3 polyunsaturated fatty acid (fish oil)

The fatty acid class known as omega-3 fatty acids, sometimes called polyunsaturated fatty acids (PUFA), is made up of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). An important element that is crucial to the treatment and prevention of heart diseases is omega-3 fatty acids.

Garlic

Garlic is one of the organic plants that is most frequently used. Additionally, researchers have looked examined its potential connection to hypertension (high blood pressure). In patients with baseline hypertension, garlic was found to significantly lower systolic blood pressure by a mean of 16.3 mmHg and diastolic blood pressure by 9.3 mmHg when compared to a placebo ^[16]. A second meta-analysis ¹⁸ also offered a large number of instances to demonstrate the effect.

Dry nuts and fruits

- A. serving of 30 grammes of pistachios contains high levels of MUFA, high levels of fibre, high levels of potassium (295 mg), low levels of sodium (3 mg), and high levels of magnesium (34 mg).
- B. Almonds have low levels of saturated fats but high quantities of magnesium (76 mg), potassium (200 mg),

fibre (4 gm), and vitamin E (24.2 mg) in a serving of thirty grammes.

- C. Although hazelnuts (30 grammes) contain a lot of total fat, their saturated fat level is quite low. Additionally, they contain a lot of potassium (193 mg), magnesium (46 mg), and fibre (3 gms).
- D. Resins are highly high in potassium, very low in sodium, and very low in saturated fat.
- E. Cashews contain a lot of fat, although the majority of it is MUFA. Additionally, they contain a lot of salt (3.5 mg), as well as a lot of potassium (185 mg).
- F. Despite their widespread name, peanuts are really classed as legumes rather than nuts because of their structural resemblance to nuts. This food contains large amounts of niacin and other antioxidants.
- G. Walnuts have a higher concentration of PUFA (1980 mg per 30 gm), are low in sodium (1 mg), high in fibre (4 gm), and include a sizable amount of potassium.

Flax seeds

In a rare instance of a double-blind, placebo-controlled, randomized study of a dietary intervention (flaxseeds) to lower blood pressure, extraordinary outcomes were reported. Daily consumption of flax seeds decreased systolic blood pressure by around 10 mm and diastolic blood pressure by about 7 mm²¹. An investigation into flaxseeds that was carried out in the UK reported this outcome.

Green tea

Green tea contains antioxidants called polyphenols, which have been shown to delay the ageing process and prevent disease. Polyphenols are made up of flavonoids, whereas flavonoids contain catechins. Epigallocatechin-3-gallate, or EGCG, is the most powerful catechin. Systolic and diastolic blood pressure decreased by 2.6 and 2.2 mmHg, respectively, after 12 weeks of tea consumption ^[4].

Vegetables and Fruits

Starchy vegetables, like potatoes and sweet potatoes, have a propensity to lower blood pressure due to their high potassium and low salt contents.

Citrus fruits like oranges, tangerines, and grapefruits, as well as berries like strawberries, raspberries, blueberries, and blackberries, have been demonstrated to lower blood pressure due to their high quantities of potassium, vitamin C, and dietary fibre.

Legumes like beans, peas, and lentils are good for those with high blood pressure due to their high quantities of dietary fibre and potassium.

Furthermore, they are a superior source of magnesium. Dark green leafy vegetables include significant amounts of dietary fibre, potassium, vitamin C, and magnesium. Eating romaine lettuce, spring greens, fresh spinach, broccoli, and mustard greens, for example, is an excellent idea. Fresh greens are preferable to canned veggies because the salt content of canned vegetables is higher. Frozen vegetables are significantly easier to preserve than fresh vegetables and contain the same nutrients as fresh vegetables ^[4].

Berries, especially blueberries and strawberries, are rich sources of flavonoids. A study found that flavonoids both contribute to lowering cholesterol levels and preventing hypertension. You should increase the amount of berries in your diet, such as blueberries, raspberries, and strawberries. There is proof that consuming beetroot juice helps lower

blood pressure, serum cholesterol, and blood sugar levels in hypertensive.

One of the results of the study was that the nitrates in the juice could lower the participants' blood pressure after just one day. The DASH Diet ^[17], which recommends skim milk, encourages a larger intake of calcium-rich meals. Skim milk offers a significant amount of calcium while still being low in fat, which is a mineral that is crucial for the body.

Due to its high fibre content, low fat content, and low salt content, oatmeal falls within the group of foods that are excellent for lowering blood pressure. One of the best ways to enhance the potassium in one's diet is to eat more bananas. It is better to eat foods high in this mineral than to take supplements that include it ^[17].

Dietary patterns in hypertension

The ways in which changing one's general dietary habits can affect blood pressure have been the subject of extensive investigation. In addition to reducing one's intake of alcohol and salt, as was previously indicated, a number of data points point to the possibility that eating a healthy diet can help lower blood pressure. Although calorie intake and body weight are related, obesity and overweight are also associated with a higher risk of developing hypertension. Studies ^[18] have demonstrated that lowering blood pressure as a result of weight loss can occur without obtaining a healthy body weight. An average weight loss of 5.1 kg was associated with a decrease in mean systolic blood pressure of 4.4 mmHg and diastolic blood pressure of 3.6 mmHg, according to a meta-analysis of 25 trials ^[19].

Additionally, it has been noted that a small weight loss aids in the prevention of hypertension in pre-hypertensives and can make it simpler to reduce medication dosage or stop taking the medication entirely. Numerous research ^[20] have demonstrated that increasing potassium intake lowers blood pressure in both hypertensive and non-hypertensive individuals.

Epidemiological studies have shown evidence that a low dietary intake of calcium and magnesium may increase the prevalence of hypertension. The information that is currently available, however, does not give a complete picture, and calcium and magnesium supplements are not generally recommended for all hypertension patients ^[13].

Additionally, a number of randomized controlled trials have shown that substantial dietary changes may be crucial for the origin, prevention, and treatment of hypertension. A diet rich in fruits, vegetables, fiber, and fish oil is particularly helpful in lowering blood pressure as well as the cardiovascular issues and mortality rates linked to high blood pressure.

More fish should be consumed because studies have shown that omega-3 polyunsaturated fatty acids, which are mostly contained in fish, help to reduce the risk of cardiovascular disease. Additionally, it has been demonstrated that ingesting omega-3 supplements might improve the endothelium's functionality as well as the stiffness of the arteries. The ability of omega-3 fatty acids to incorporate into phospholipid membranes, where they partially replace arachidonic acid as an initial substrate for the production of anti-inflammatory eicosanoids, is likely the cause of these effects. Scientific research has proven that omega-3 fatty acids can integrate into phospholipid membranes. Additionally, patients receiving omega-3 supplements were proven in numerous studies to have their blood pressure

levels drop somewhat but significantly. According to a recent meta-analysis that included 8 studies and more than 56,000 individuals, normotensive people who consumed the most omega-3s in their diet had a 27 percent lower chance of developing hypertension than people who consumed the least ^[17].

Olive oil consumption and having more antioxidant properties are related. The phenolic components hydroxytyrosol and oleuropein, which are both potent antioxidants that can scavenge dangerous free radicals and regulate enzyme function, are found in extra virgin olive oil. Other studies have demonstrated that olive oil also reduces oxidative stress and systemic inflammation while promoting endothelial repair.

In addition to providing an acceptable amount of vitamins, minerals, and other healthy non-nutrient substances like polyphenols and anthocyanins, this diet is low in saturated fats. Numerous epidemiological studies have demonstrated the effectiveness of this eating plan. There is also a tonne of evidence to support the idea that altering one's diet to include fewer calories, whether or not this is reasonable, more fish, fruits, and vegetables, and less saturated fats gives an additional nutritional strategy for the prevention and treatment of hypertension.

People who increased their intake of fruits and vegetables while decreasing their sodium intake showed the greatest blood pressure reduction. Because fruits and vegetables include a variety of different nutrients and phytochemicals, including fibre, potassium, and folic acid, increasing one's intake of these food groups can help lower one's blood pressure. The high potassium concentration of fruits and vegetables means that consuming more potassium can actually lower blood pressure. This occurs as a result of potassium's vasodilatory function, which reduces blood pressure by reducing the resistance to blood flow in the arteries ^[21]. Vegetables and fruits are rich in potassium. The DASH diet, the Nordic diet, and the Mediterranean diet are the three diets that are most effective for lowering blood pressure ^[9].

Excessive salt consumption has been recognised in recent years as one of the factors that may cause high blood pressure through the renin-aldosterone-angiotensin system mechanism ^[22]. Additionally, the estimated daily global intake of sodium in 2010 was 3950 mg, which is 97.5 percent higher than the 2000 mg WHO recommendation ^[23] (WHO, 2012). Consequently, lowering sodium intake through salt consumption was advantageous for lowering blood pressure.

A different prospective cohort research that included healthy male participants also discovered an elevated risk of heart failure ^[24]. Red meat's haem iron is to blame for the link between consuming it and high blood pressure; 102.6 g of red meat can result in a 1.25 mmHg increase in blood pressure. High salt concentration is typical of processed food because it preserves the dish's flavour, colour, and shape. The results of a significant prospective cohort study conducted in Spain ^[25] indicated a link between consuming processed meals and an increased risk of hypertension. The mechanism by which sodium increased blood pressure and the mechanism by which processed meals increased blood pressure were both extremely similar.

It's probable that the drop in blood pressure caused by the dietary portfolio is due to the consumption of viscous fibre. ^[26] Studies from 2018 show that increasing fibre

consumption will lower blood pressure by reducing body weight, insulin resistance, total cholesterol levels, and insulin sensitivity. Beta glucan, a type of fibre, has been demonstrated to reduce blood pressure in addition to preventing cardiovascular disease [27]. In addition, the type of fat taken in a low-fat diet that nonetheless results in a drop in blood pressure could play a role. As an illustration, research suggests that consuming saturated fat from yoghurt can lower blood pressure, despite the fact that a low-fat diet can also do so (Nestel, 2019). To dispel the uncertainty regarding the quantity of fat ingested in the diet, more research must be done.

In addition, it has been demonstrated that nitrate-rich plants including spinach, salad, and beetroot can considerably lower blood pressure. Nitrate will cause a decrease in blood pressure because of the vasodilator nitric oxide mechanism it possesses. Even the addition of dietary nitrate was able to reduce systolic and diastolic blood pressure [28].

Additionally, cholecalciferol, one of the forms of vitamin D, may lower blood pressure, according to evidence. One of the vital elements required for the healthy operation of our bodies is vitamin D. Although the precise mechanism by which vitamin D lowers blood pressure is not entirely understood, some persons have been found to have high blood pressure due to vitamin D deficiency. Therefore, in order for vitamin D to be successful at lowering blood pressure, it is crucial to consume the suggested daily quantity [29].

Conclusion

Eating a well-balanced diet with a small amount of sodium will help lower both systolic and diastolic blood pressure. Consuming fruits and vegetables is also crucial for healthy diet because they not only help to lower blood pressure but also provides the additional nutrients to the body to function properly. Therefore, emphasis should be on healthy eating habits to lower the incidence of cardiovascular disease in a population by lowering hypertension. More study on dietary regimens that lower blood pressure needs to be done based on the particular demography of the regions as food consumption pattern varies between the nations.

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